



Relationship between High School Students' Achievement Goal Orientation and Academic Motivation for Learning Biology: A Path Analysis

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Abstract

This study aimed to investigate the relationship between high school students' achievement goal orientation and academic motivation for learning biology. The sample of the study consisted of 281 students taking biology course at science and Anatolian high schools in Kars. Survey method was employed in the study, and "Academic motivation scale for learning biology (AMSLB)" and "Achievement goal orientation questionnaire" were used as data gathering tools. According to the results of the study, while intrinsic motivation had a significant positive relationship with mastery-approach goals and negative relationship with mastery-avoidance goals, there was no significant relation of intrinsic motivation to performance-approach goals and performance-avoidance goals. Mastery-approach goal orientation, compared to other goal orientations, was observed to be the best predictor of all the sub-dimensions of motivation except the extrinsic motivation-social dimension.

Keywords

Achievement goal orientation
Academic motivation
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Introduction

Achievement goal orientation refers to individuals' beliefs towards revealing goals that they form to succeed, focusing on their goals to maintain their success, and their perceptions of why they want to learn (Ames, 1992; Pintrich, 2000a; Kaplan & Maehr 2007; Pintrich, Smith, Garcia & Mc Keachie, 1991). Achievement goal orientation is the primary reason that enables individuals to be motivated to achieve. This theory focuses on individuals' goals that they set to achieve, and the reasons that they choose those ways (Kaplan & Maehr 2007; Pintrich, 2000a).

Goal orientation has been named differently by various researchers and divided into two basic categories. The most widely used among these terms are "mastery goals" and "performance goals" (Ames & Archer, 1988). While, in performance goal orientation, there is the effort of individuals to show others that they can achieve, they strive for their own learning process in mastery goal orientation (Ames & Archer, 1988).

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Later, some researchers considered performance goal orientation as having two dimensions that are "performance-approach" and "performance-avoidance" (Ames, 1992). Students who participate in the activities to show that their performance is higher than the others in the class have performance-approach orientation; those who participate to avoid negative judgements have performance-avoidance orientation (Pintrich, 2000b). Thus, performance orientation was started to be used as with these two subdimensions. However, in recent studies, by discussing that mastery goal orientation has also two dimensions of approach/avoidance based on 2x2 achievement goal orientation theory, it is stated that some individuals may have "mastery-avoidance" goal orientation (Elliot, 1999; Pintrich, 2000a). Such students are those who worry about not being able to learn everything that they should learn, or perfectionists who avoid false learning (Pintrich, Conley & Kempler, 2003).

Achievement goal orientation theory puts emphasis on why students are motivated in the learning process, and aims to reveal learners' reasons behind their performance in school activities, learning formations and academic tasks (Ames, 1992). Accordingly, it is thought that students' academic motivation should be considered.

Regarding academic motivation, one of the basic classifications for academic motivation that is described as students' motivation towards academic activities is proposed by Deci and Ryan (1985). In this classification, motivation is examined in three dimensions, which are intrinsic motivation, extrinsic motivation and amotivation. According to Deci and Ryan (2000) intrinsic motivation is about individuals doing something because they like and enjoy it, while extrinsic motivation, it is about individuals doing something for the outcomes. As for amotivation, it is observed in the case of repeated failure or when individuals feel themselves incompetent and continuously get negative feedback on their performance (Deci & Ryan, 1985).

Academic motivation has positive effects on students' academic performance and learning (Fortier, Vallerand & Guay, 1995; Singh, Granville & Dika, 2002; Wentzel & Wigfield, 1998). Therefore, the relationship between achievement goal orientation which focuses on students' perception of why they are interested in learning (Pintrich et al., 1991), and academic motivation is of significance.

Pintrich (2000c) stated that mastery-approach goal orientation has generally a positive effect on motivation (self-regulated learning), and there is a need for further studies to have an insight for mastery-avoidance goal orientation. Furthermore, Pintrich indicated that performance goal orientation had a negative relationship between cognitive, behavioural and motivational processes in general, without making an approach/avoidance distinction.

As a result of their meta-analysis study covering the articles published between 1971-1997, Rawsthorne and Elliot (1999) asserted that mastery goals had more effect on intrinsic motivation than performance goals. In addition, while performance-avoidance goals were found to be negatively related to intrinsic motivation, performance-approach goals were positively related.

Dweck and Leggett (1988) stated that, based on self-determination theory, mastery goal orientation increased intrinsic motivation. Similarly, studies revealed that mastery goal orientation had a positive effect on intrinsic motivation while performance goal orientation had a negative effect (Nicholls, 1989; Heyman & Dweck, 1992).

In his study at a university mostly having Islamic courses, Asif (2011) found that the variables of performance-avoidance, performance-approach, mastery goal and Islamic goals explained 29% of the variance in intrinsic motivation, and as for the correlation between intrinsic motivation and these variables, mastery goal ($r=.470$) had a higher correlation than performance-approach ($r=.261$) and performance-avoidance ($r=.184$). In the same study, in the regression analysis selecting the intrinsic motivation as the dependent variable, only mastery goals ($\beta = .277$) and Islamic goals ($\beta = .330$) among these variable significantly predicted intrinsic motivation.

In their study with 309 university students, Wang, Liu, Lochbaum and Stevenson (2009) divided the students into two groups as high competence and low competent based on their perceived competence on physical activities, and tested how goal orientations effected intrinsic motivation for both groups through structural equation modelling. The results revealed that in both groups, only mastery-approach goals positively and significantly affected intrinsic motivation ($\beta = .56$ for the high competence groups, $\beta = .94$ for the low competence group), and mastery-avoidance goals significantly but negatively affected intrinsic motivation only for the moderately low level ability group ($\beta = -.35$). On the other hand, performance-avoidance and performance-approach goals were found to be not related to intrinsic motivation in both groups.

Based on the studies summarized above, it is seen that many studies focus on the relationship between achievement goal orientation and intrinsic motivation, but the relationship between achievement goal orientation and extrinsic motivation and amotivation has been neglected. In this sense, this study is thought to contribute to the literature in terms of focusing on motivation with respect to biology rather than general intrinsic motivation and examining all dimensions of motivation based on self-determination theory.

Achievement goal orientation is one of the primary reasons that enable individuals to be motivated to be successful in an academic task and it is an important element for academic motivation (Kaplan & Maehr 2007). In this regard, this study was conducted considering that it would be of significance to identify how high school students' goals to achieve affect their academic motivation towards learning biology. Besides, in contemporary science and technology era, studies that are conducted in the field of biology have an importance place in the literature. Therefore, identifying the relationship between high school students' academic motivation for learning biology and achievement goal orientation is considered to be of significance.

Purpose of the Study

This study aimed to answer the research question "To what extent and how is high school students' achievement goal orientation (i.e., mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance) towards learning biology related to their academic motivation (i.e., intrinsic motivation, amotivation, extrinsic motivation-career, and extrinsic motivation-social)?" Since previous studies in the literature mostly focused on intrinsic motivation, there is a lack of sufficient empirical study on the relationship between other sub-dimensions of motivation and achievement goal orientation. Moreover, the results of the studies on the relationship between intrinsic motivation and achievement goal orientation are not consistent (Rawsthorne & Elliot, 1999). Consequently, in accordance with the limited literature, the conceptual model formed without describing the direction of the relationship (i.e. positive/negative) is presented in Figure 1, and this model is tested through a path analysis to answer the research question.

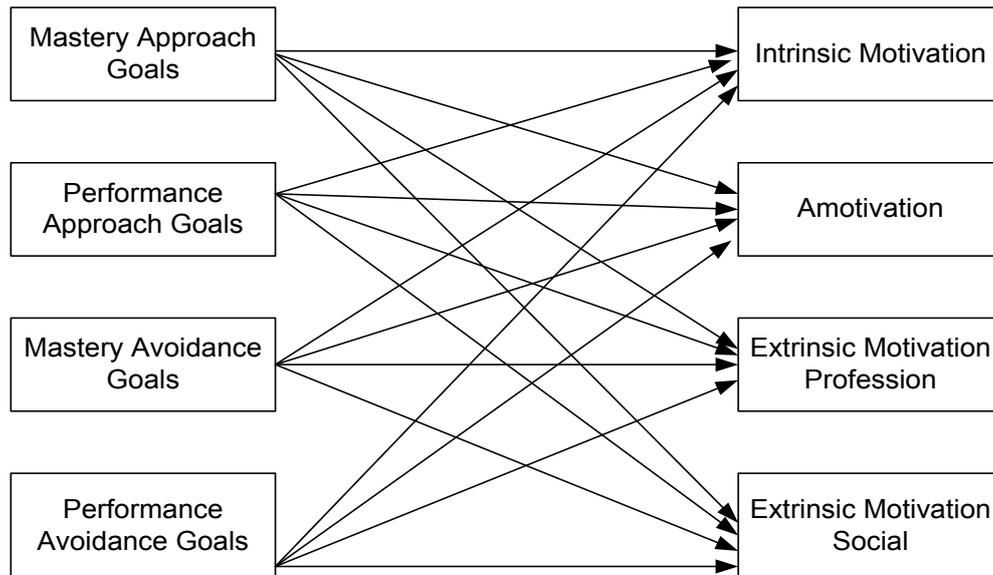


Figure 1. The conceptual model for the relationship between motivation and achievement goal orientation for learning biology

Method

Sampling

The sample of the study consisted of 281 students (131 female, 149 male and 1 missing) at science high school and Anatolian high schools in Kars. One or two classes were randomly selected from these schools and all students in these classroom were participated in the study. These students are mostly taking science courses such as physics, chemistry, and biology. The mean of the students' grade point average in the previous year was 3.12 (SD = 1.09) out of 5.

Procedure

Using survey model, the Academic Motivation Scale for Learning Biology, the Achievement Goal Orientation Questionnaire and the demographic information form were administered to the students in the spring term of 2013-2014 school year. The data were gathered under the supervision of the teachers and at the same time for each class. Before the administration of the instruments, the students were informed about the aim of the study and that their personal information would be kept confidential. The schools and the classes from which the sample was selected had similar characteristics and there were similar learning environments in the classes.

Instruments

Academic Motivation Scale for Learning Biology (AMSLB)

AMSLB was employed to measure the students' motivation for learning biology. AMSLB was developed by Aydın, Yerdelen, Gürbüzöğlü-Yalmançı and Göksu (2014) and its validity and reliability studies were conducted. AMSLB is composed of 19 items and four sub-scales. These sub-dscales are; Intrinsic Motivation (IM, 6 items), Amotivation (A, 5 items), Extrinsic Motivation - Career (EM - C, 4 items) and Extrinsic Motivation - Social (EM-S, 4 items). The answers were based on a 6-point Likert scale ranging from 1 = Strongly Disagree to 6 = Strongly Agree. AMSLB starts with the question "Why do you learn biology?" and then, motivation statements that can be answers for this question are listed in items. The confirmatory factor analysis conducted with the same sample supported the construct validity of the instrument ($\chi^2_{(146)} = 361.75, p < .05; \chi^2/sd = 2.48; CFI = .96; GFI = .88; NFI = .93; RMSEA = .073; 90\% CI = .063, .082$) and the Cronbah alpha values showed that the dataset had high internal consistency, and thus, was reliable (Aydın et al., 2014). The sample items of AMSLB and reliability coefficients are presented in Table 1.

Table 1. Sample items of AMSLB and reliability coefficients

Sub-dimension	Sample item	Cronbach alpha
Intrinsic Motivation	"I enjoy learning biology subjects."	.875
Amotivation	"I have no idea. I don't understand how useful the things I learn will be."	.841
Extrinsic Motivation-Profession	"Because it is important in choice of profession."	.844
Extrinsic Motivation-Social	"To show my family that I'm successful in biology."	.736

Achievement Goal Orientation Questionnaire (AGO)

To measure the students' achievement goal orientation towards learning biology, the Achievement Goal Orientation (AGO) Questionnaire developed by Elliot and McGregor (2001) based on 2x2 achievement goal orientation theory was employed. AGO questionnaire is composed of 15 items and four sub-dimensions. These sub-dimensions are; Mastery-Approach Goals (3 items), Mastery-Avoidance Goals (3 items), Performance-Approach Goals (3 items) and Performance-Avoidance Goals (6 items). The questionnaire was adapted to Turkish through a reliability and validity study by Şenler and Sungur (2007). In this study, the four-factor structure of the instrument was tested by applying confirmatory factor analysis to the dataset obtained from the sample, and the results showed good model fit to the dataset ($\chi^2_{(84)} = 255.29$, $p < .05$; $\chi^2/sd = 3.04$; CFI = .96; GFI = .89; NFI = .94; RMSEA = .085; 90% CI = .073, .097). In addition, reliability coefficient was calculated for each sub-dimension with Cronbach alpha, and it was revealed that the results obtained from this dataset were considerably reliable. Reliability coefficients and sample items for each sub-dimension are presented in Table 2.

Table 2. Sample items of Achievement Goal Orientation Questionnaire and reliability coefficients

Sub-dimension	Sample item	Cronbach alpha
Mastery-Approach	"It is important for me to understand the content of this course as thoroughly as possible."	.849
Mastery-Avoidance	"I worry that I may not learn all that I possibly could in this class."	.735
Performance-Approach	"It is important for me to do better than other students."	.846
Performance-Avoidance	"My goal for this class is to avoid performing poorly compared to the rest of the class."	.821

Results

Descriptive Statistics and Correlations

Mean and standard deviation values for the sub-dimensions of AMSLB and AGO questionnaire employed in the study and Pearson correlation coefficients of these sub-dimensions are presented in Table 3.

Table 3. Descriptive Statistics and Correlations

Factors	Mean	SD	Correlations						
			2	3	4	5	6	7	8
1. Intrinsic Motivation	4.125	1.250	-.502**	.475**	.289**	.678**	.145*	.057	.123*
2. Amotivation	2.604	1.381		-.319**	-.079	-.457**	-.022	.114	.006
3. Extrinsic Motivation - Profession	3.837	1.421			.368**	.477**	.279**	.171**	.154**
4. Extrinsic Motivation - Social	3.559	1.304				.325**	.593**	.588**	.347**
5. Mastery Approach	3.931	1.016					.281**	.182**	.348**
6. Performance Approach	3.422	1.164						.728**	.408**
7. Performance Avoidance	3.100	1.000							.570**
8. Mastery Avoidance	3.182	1.027							

**p<.01, *p<.05

As is seen in Table 3, with respect to the high school students' academic motivation for learning biology, their intrinsic motivation was quite high compared to the mid-point (i.e. 3.5) of the 6-point Likert scale, and their extrinsic motivation was slightly over the mid-point. In other words, while the students learned the biology subjects because they were interested, curious and enjoyed it, they also stated that they learned because they wanted to prove their success to others, be praised by them, and thought it would help them to get the profession that they desired. As for the amotivation sub-dimension, the mean value being low shows that the students were somewhat unwilling and uninterested in learning biology. When Achievement Goal Orientation sub-dimensions were examined, it was seen that the mean values were higher than the mid-point which was 3 in the 5-point Likert scale, but these values were higher for mastery approach and performance approach goals. This shows that the high school students tended to aim for better comprehension of the biology subjects that they were supposed to learn, proving their success to others, and performing better than the other students. Additionally, the lowest mean value among the goal orientation variables was obtained for performance-avoidance goals. Namely, compared to other goals, low level students learn biology because of avoiding performing worse and getting lower grades than their friends in the class. As for the correlation coefficients, the strongest relationship was between performance-approach and performance-avoidance (.728), and between intrinsic motivation and mastery-approach goals (.678) while the weakest relationship was between mastery-avoidance goals and amotivation (.006), and between performance-approach goals and amotivation (-.022).

Path Analysis

To investigate how high school students' achievement goal orientation affected their academic motivation for learning biology, a path analysis was conducted by employing LISREL 8.80 using SIMPLIS command language and maximum likelihood method. The structural model shown in Figure 1 was tested. In the presumed model, all the variables were defined as observed variables. The results of the analysis showed good model fit to the dataset ($\chi^2_{(6)} = 66.25, p < .05$; CFI = .95; GFI = .94; NFI = .95; SRMR = .05). When the variables were examined respectively, the revealed result was found to be sufficient to answer the research question in terms of the extents and the directions (i.e., positive/negative) of the relationships. The model including the standardized path coefficients is presented in Figure 2.

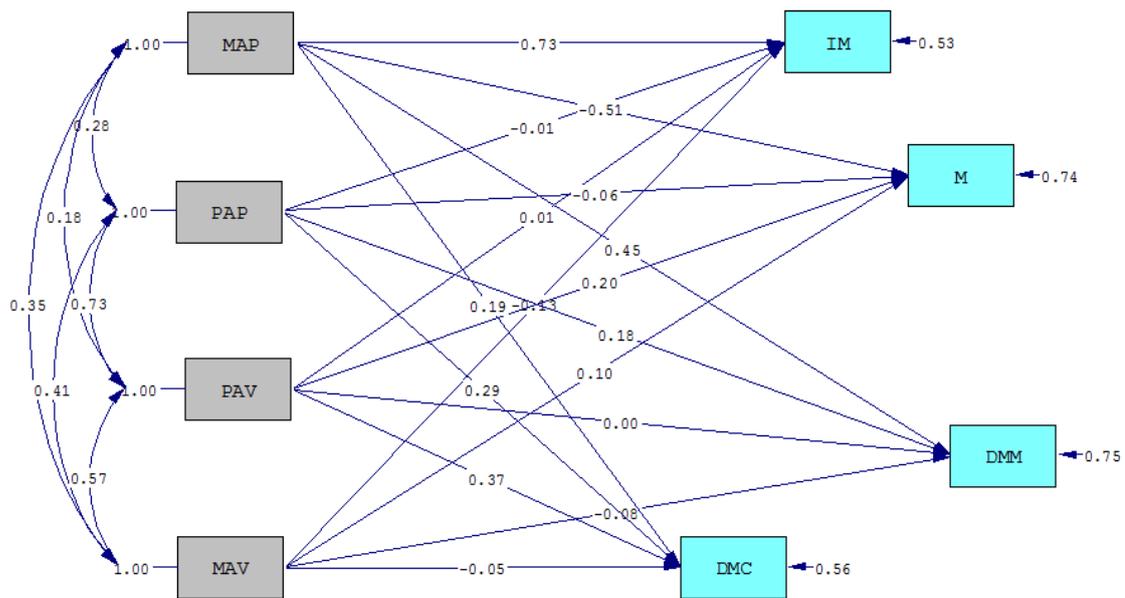


Figure 2. Path model including the standardized path coefficients.

MAP: mastery approach goals, PAP: performance approach goals, PAV: performance avoidance goals, MAV: mastery avoidance goals.

IM: intrinsic motivation, M: amotivation, DMM: extrinsic motivation – career, DMC: extrinsic motivation - social

Examining the parameter estimates in this model, it was found that intrinsic motivation was positively related to mastery-approach goals ($\beta = .73$), but negatively related to mastery-avoidance goals ($\beta = -.13$), and these variables explained 47% of the variance in intrinsic motivation. The amotivation variable had a significant negative relationship with mastery-approach goals ($\beta = -.51$) and positive relationship with performance-avoidance goals ($\beta = .20$). These two variables explained 26% of the variance in amotivation. Extrinsic motivation towards future professional plans were found to be positively and significantly related to mastery-approach ($\beta = .45$) and performance-approach ($\beta = .18$) goals. These approach goals explained 25% of the variation in the extrinsic motivation - profession variable. Finally, it was revealed that extrinsic motivation - social variable was positively and significantly related to mastery-approach ($\beta = .19$), performance-approach ($\beta = .29$) and performance-avoidance ($\beta = .37$) goals. These three goal orientation variables explained 44% of the variance in the extrinsic motivation - social variable.

Discussion

According to the results of the study, while intrinsic motivation had a significant positive relationship with mastery-approach goals and negative relationship with mastery-avoidance goals, there was no significant relation of intrinsic motivation to performance-approach goals and performance-avoidance goals. Rawsthorne and Elliot (1999) stated that consistent results could not be obtained from the studies on the relationship of performance goals and mastery goals with intrinsic motivation. However, Elliot (1999) indicated that while mastery-avoidance goals may have positive correlation with several variables, it may be negatively associated with some phenomenological variables such as intrinsic motivation and self-determination. Similar to the present study in a study conducted by Wang, Liu, Lochbaum and Stevenson'in (2009) by considering 2x2 achievement motivation and conducting structural equation modelling, the authors found positive and significant relationship between intrinsic motivation and mastery approach goals while no significant relation was found between intrinsic motivation and performance-approach and performance-avoidance goals. Additionally, results of the present study are partly consistent with some theorists' statement that indicated that individuals having mastery goals developed more intrinsic motivation than those having performance goals (Rawsthorne & Elliot, 1999). It should be noted that studies in that times

did not consider the 2x2 achievement goal orientation theory while examining the relationship between goal orientations and intrinsic motivation. In another words, those studies ignored mastery-avoidance goals while mentioning about mastery goals and they only focused on mastery-approach goals. Yet, Elliot and Harackiewicz (1996) and Rawsthorne and Elliot (1999) emphasized that approach-avoidance distinction should also be made in addition to the performance and mastery distinction to be able to understand the relationship between intrinsic motivation and achievement goal orientation. Accordingly, based on this finding, it can be said that students who aim to learn and understand the biology content better tend to develop higher intrinsic motivation, and those who aim not to perform worse than the other students in the class tend to develop lower intrinsic motivation.

Examining the results of the study as a whole, mastery approach goal orientation, compared to other goal orientations, was observed to be the best predictor of all the sub-dimensions of motivation except the extrinsic motivation-social dimension. In other words, while students who aim to learn the content of the biology course better mostly develop intrinsic and extrinsic motivation, they tend to be less amotivated. Besides, it was revealed that performance-approach goals were only related to the extrinsic motivation variables. Namely, students whose aim is mostly to perform better and get higher grades than the other students in the class tend to have motivation mostly towards reaching their desired profession and trying to be seen successful to the people around them. Performance-avoidance goals were found to be related to the amotivation and extrinsic motivation-social variables. Similarly, in their study, Dysvik and Kuvaas (2012) stated that performance approach and performance avoidance goals were positively related to extrinsic motivation. Therefore, it can be argued that students who have goals such as not getting lower grades than others and looking unsuccessful, these students are those who do not know how useful biology would be for them, and only learn biology to gain appreciation and prove their success to others. Furthermore, high mastery-avoidance goals were found to be related to low intrinsic motivation. This finding reveals that if students worry about that they will not be able to understand the biology subjects good enough and learn everything that they need to learn, these students tend to be less interested in learning the content of the biology course and do not quite enjoy the course. All these relationships show that the ways to make students set more mastery-approach goals and less mastery-avoidance goals in order for them to develop good academic motivation should be investigated and students should be supported in this sense.

Although the findings revealed from this study partially support previous research, further studies are needed to have a better insight of the relationship between extrinsic motivation and amotivation, and achievement goal orientation. Additionally, this study was performed with the data which was obtained from high school students in the city of Kars. Thus generalization of the results of this study to high school students in other cities of Turkey is limited. Moreover, path analyses was performed by using mean scores of each subscale instead of factor scores. This can be considered as another limitation of this study.

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