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Application of Multilevel Structural Equation Modeling in Testing the Effect of Teacher's and Student's Goal Orientation and Help-seeking on 7th Grade Students' Math Performance

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Abstract

The purpose of the present study was to apply the Multilevel Structural Equations Modeling (MSEM) to investigate the effect of teachers' and student' goal-orientation and help-seeking on the 7th grade students' math performance. For this purpose, 550 seventh grade learners selected by two-stage cluster-sampling method completed Megli et al.'s (2000) Goal-orientation Questionnaire, as well as Rian and Pontrich's (1997) help-seeking Questionnaire. Also, teachers responded to Butler's (2007) questions about goal-orientation. Data were analyzed using Multilevel Structural Equations Modeling. The results showed that goal-orientation had a significant direct effect on academic performance of individuals and the whole class, and the effect of help-seeking on their academic performance was significant as well. Findings also showed a positive and significant relationship between Mastery Goals and Mathematical Performance, and a negative and significant relationship between the Goals of Tendency toward Performance and Avoidance of Performance with students' Mathematical Performance. Also, considering the teacher's orientation, it was disclosed that there is a direct positive relationship between the Mastery Goal and the Functionalism with the Educational Mastery Functions, and between the Function Escaping Goal and Work Avoidance with Functional Teaching Methods. Moreover, teachers with Mastering Goals had positive perceptions of helping out when needed, and teachers who had Functional Goals concerned with the rote learning of assignments The fit for Multilevel Structural Equations Model evaluated as fair enough and students' Goal-orientation explained 22% of Performance Variance while this amount was 28 % for Teachers' Goal-orientation.

Keywords: help-seeking, goal-orientation (teacher and student), math performance, multilevel structural equations modeling (MSEM)

Introduction

Academic performance refers to the amount of individual's learning as measured by various examinations such as math, statistics, science, etc. (Seif, 1392). Mathematics has attracted a particular attention in researches related to the academic achievement. This discipline is of particular importance in the curriculum (Pajaras & Graham, 1991) so that educational systems can measure students' progress and general ability to be at different levels, entering special programs and admitting to university. Also, in order to keep up with scientific developments and technological advances, mathematical topics have been included in their curricula (Morrowaty et al., 2013). Mathematics is one of the branches of science that is effective in the ability of individuals to succeed in occupation and life management, that's why it focuses on different levels of education (Balloglu & Cocaek, 2006). Today, given the remarkable progress of various sciences, it can be said that the use of mathematics has become a necessary requirement in everyday life, and the

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educational system must increasingly focus on students' mathematical performance since mathematics will educate people who can reasonably argue in dealing with various issues of life and who have the power of decomposition and abstraction (Patrick & Swahford, 2008/2008). Also, due to the significant role of problem solving in mathematical performance and the strong relationship between mathematical performance and academic performance, educational systems try to help students to develop their mental abilities and the power of argumentation through the embedment of mathematics topics in educational programs, in order to prepare them to keep synchronous with upcoming scientific developments and technological advances.

One of the variables investigated in this study was the effect of help-seeking on math performance. Newman (1998) described help-seeking as the assistance from others when facing with ambiguity and difficulty while studying. Also, Ames (1992) saw it as a kind of endeavor by individuals to use the opportunities available to succeed. According to classroom observations (Good, Slavings, Harlem & Emerson, 1987; cited by Butler, 1998), help-seeking has three types: a) partial gestures or clues; b) confirmation of previous performance; and c) receiving the answer from another person. On this basis, Newman (2000) differentiated Executive help-seeking from Instrumental Help-seeking. Individuals involved in Executive help-seeking are expressing it in the form of a request for a response. They prefer to solve the problem for others. In instrumental help-seeking, the requested help is limited to gestures, strategies, and clarification of problem-solving methods that lead to mastery of the assignment and supports individual fidelity in the future (Butler, 2006).

Butler (2006) considered help-seeking as an active effort to take advantage of the opportunities available to succeed. Academic help-seeking involves behaviors such as questioning teachers, parents, classmates; asking for more explanation about the problem, getting clues and problem solving methods and seeking other academic aids, which act as a strategy to prevent academic failure (Ryan & Pintrich, 1997). Accordingly, help-seeking can be described as a kind of social interaction of individuals with each other (Newman, 1990; Ryan, Gain, & Miguel, 1998; Ryan, Pintrich, & Miguel, 2001).

Help-seeking may also be affected by cultural values and beliefs. For example, in societies with emphasis on the autonomy, self-reliance, individuality, autonomy and personal development, help-seeking may be viewed as a dependent and non- conforming behavior. In contrast, in societies with emphasis on collectivism, help-seeking is considered as a kind of social interaction and conforming behavior (Butler, 1998).

The classroom is where students face difficulties with, and they need help from experienced and efficient people (such as teachers and classmates). Nonetheless, educational psychologists have been studying the students' helping needs in less analytical environments (Butler, 2006). Nelson-Leigh Gall (1981) presented a new conceptual model of help-seeking. He shifted the emphasis on helping studies from the labeling point of view and self-destructing behavior in an alternative way to deal with current problems. He pointed out that help-seeking behavior can be explained and predicted by using personal characteristics and characteristics of conditions in learning and development situations. Hegazi and Pakdaman (2000) found that students with low performance are more in demand when they cannot solve a mathematical problem themselves, while students with high performance prefer call for referrals or clues to types other helps (requesting confirmation and problem response). Also, according to the results of Webb and Mastergeorge (2003), the behaviors and experiences of the students who worked to solve mathematical problems in heterogeneous small groups, and previously learned to solve problems, during the group work they received the highest level of help and as a result, solved the group's mathematical problems without the need for more help. Their findings showed that help-seeking behavior was the most important determinant in their success in post-test. Instead of asking for solutions or answering the questions, students demanded more detailed explanations.

As another variable investigated in this study, goal-orientation means the extent to which it is important for students to complete the planned activities and to not to leave the subject matter. The conceptual core of goal-orientation theory is what the learner intends to accomplish and performs in classroom tasks (Dweck, 2000). Theoreticians such as Dweck (2000) introduced several types of goal tendencies in explaining the goals of progress, but the two common types are Mastery goal-orientation and Performance goal-orientation. In Mastery goal-orientation, one seeks to master the task, to develop new skills, to gain insight and to develop their competence, and in contrast, in Performance goal-orientation, the individual focuses on exterior aspect of merits and abilities and their main purpose is the expression of their abilities against others, to be the best in the group, and to avoid the unfavorable judgment of others (Ames, 1992). In Avoidance Goals, person focuses on himself/herself to avoid

approving his/her disability and demerit (Cler et al., 2011). These people consider low goals for themselves (Creed et al., 2011) and show the highest concern about failure and have the lowest profile of academic achievement (Tuominen-Soini, Salmela-Aro, & Niemivirta, 2011).

Over the past two decades, goal-orientation has been one of the major concepts used in the study of achievement motivation and aims to disclose an individual's intention to engage in behavioral developments and his/her orientation towards assessing his/her competency at work. Goal-orientation means the intent or motivation that learner follows beyond the direction of progress. The significance of this structure is due to its various motivational, cognitive, behavioral and emotional consequences on performance or academic achievement (Rabbani & Yousefi, 1393). Goal-orientations in recent years have been a three-part approach by Eliot and colleagues. Elliot (1999) defined the motive of progress as general tendencies that triggers progress and leads individuals to success or failure. Elliott's model is divided in three independent goal-orientations:

1. Approach- performance goal that is emphasizes acquiring competence and confirming others. In this orientation, the focus is on the comparison and displaying of power and capabilities to others, and this demonstration of power is the basis of individual self-worth (Ames, 1992). An individual tends to pursue goals that are within the norm of merit.
2. Avoidance- Performance goal, which emphasizes the avoidance of insensitivity to others, in other words, while the person does not want to be the best, but also does not want to fail.
3. Mastery (or learning) Goal, that emphasizes the increase of skills and competence in the assignment. This goal refers to the learning of progress and the skills of mastery. In this Goal-orientation, choosing to master, mastering subjects, raising knowledge and actualizing potential abilities through the learning of the individual's primary goal is considered as an integral part of the learning process, and an impetus for effort and performance modification. Standards of assessment have an internal aspect, and satisfaction and pride are directly related to the amount of effort they have and do not attempt to feel guilty or inadequate (Amaz, 1992; Nicles et al. 1989).

Moreover, Teachers' Goal-orientation, proposed by Butler in 2007 focuses on the teachers' motivation rather than students'. For a while, most researches on psychology focused on teaching students to motive and did not pay attention to teachers' motivation, but studies has shown that the teacher' motivation and their goals play the major role in creating the students' motivation and, ultimately, their success. Although all of the old research has traditionally addressed the issue of student motivation, this has not led to a coherent theoretical framework for examining student achievement goals. Recent researches has found that there are numerous individual differences among teachers, such as competence, perceived ability and educational values that all have effect on the quality of students' motivation (Brophy, 1998; Wayne & Youngs, 2003); unfortunately, most of the researches in the field of teachers' motivation has given more emphasis to power of motivation rather than the its quality, while a teacher's beliefs has a significant effect on students' satisfactory and outcomes (Hoy et al., 1998; Ross 1998). The success of every student in studying is one of the most important concerns of any educational system. Educational performance in each society shows the success of the educational system in goal-orientation and paying attention to individual needs; therefore, the educational system can be considered as effective when its students' learning performance meet highest levels in different periods (Butler, 2007). The four types of educational goals for teacher education are:

1. Mastery-based learning: learning and advancement and professional acquisition;
2. Being able to learn better: an ability-based approach;
3. Avoid showing less ability: avoiding approach; and
4. Putting little effort to achieve: avoid to work.

In fact, the same two previous goals for students are also derived from these four teachers' goals (Butler, 2007).

Different researches are done on the basis of these goals, showing that female students have more goals for mastering, while male students have more than their goals for ability (Dorcklins & Nichols, 1998; Middleton & Miguel, 1997; Pierce & Valianty, 2001).Some researches carried out regarding the relationship between students' help-seeking, their goal of success and generally their teachers' behaviors (Butler, 2006). According to the statements above, the purpose of this study was to investigate the relationship between the teacher-student goal-orientation and help-seeking on math performance. For this reason, these relations were investigated and tested as multi-level structural equations.

Method

Participants

The research design for the present study is correlational- descriptive. The population of this study consisted of all 7th grade students in Tehran in

academic year of 2016-2017. 550 students (225 girls and 225 boys) from 22 public schools in Tehran were selected by two-stage cluster sampling method (means that the contribution of each cluster in the sample is proportional to its volume in the population). The average age of students was 10.52. Lack of disease record such as hyperactivity, learning disorder and school anxiety, took to consideration in selecting the participants. In addition, by using sampling weights, it was ensured that the statistical indices obtained from the sample represent the target community. At first, schools were sampled with probability proportional to the size of the sample. Then, within each selected school, a class was selected using a systematic random method among all the 7th grade classes and eventually all students with the equal probability of sampling classes participated in the test.

Instruments

Teacher's Target Orientation Scale: This 16-item questionnaire was developed by Butler (2007) to measure teacher's orientation. To answer this questionnaire, teachers should specify the amount of agreement they agree with in 16 terms on a 5-point (from 1 to 5). This questionnaire has four components:

Mastery goals, for example: "I have learned something new about teaching or about myself as a teacher, I'm working hard to solve class issues and eventually succeeding."

Ability-approach, for example: "The scores of the classroom test for my students is better than the other teachers', the school principal believes that my ability to teach is better than other colleagues,"

Ability-avoidance for example: "There is no question I cannot answer, my class test results are not worse than other classes".

Work-avoidance for example: "Some of my classes were canceled; I can use the content of the previous year and do not have to. Sham I'll be preparing new lessons." In this questionnaire teachers are asked about progress goals in general, not about specific classes.

Butler (2007) reported that Cronbach's Alpha for four factors of achievement goals, mastery, ability-approach, ability-avoidance, and work-avoidance as 0.76, 0.82, 0.71 and 0.78, respectively.

Help-seeking Scale: This questionnaire was developed by Ryan and Pontrich (1997), containing 14 questions. Questions 12, 10, 9, 8, 6, 4, 2 assess the avoidance factor of helplessness. Questions 14, 13, 11, 7, 5, 3, 1 assess the acceptability of assistance. Respondents rated each item on the Likert scale (1, totally opposed, 5 strongly agree), and have two dimensions of acceptance and avoidance of assistance. Scores range from 14 to 70. Qadampour (2003) used a research on the role of motivational beliefs on the help-seeking and academic achievement of students on a sample of 200 students. The Cronbach's Alpha method was used to determine the reliability of this scale. According to the researcher, the alpha coefficients for admission and helpless admission factors were 0.68 and 0.68, respectively. Ghodampour (1998) used the factor analysis method to determine the validity of this scale.

Academic Achievement: Students' first-semester GPA were collected in a self-report way and used to measure academic achievement.

Procedure

All the students completed Megli et al.'s (2000) goal-orientation questionnaire, as well as Rian and Pontrich's (1997) help-seeking Questionnaire. Also, teachers responded to Butler's (2007) questions about goal-orientation. Data analysis was performed using MPLUS 6 software with maximum probability method. A multivariate structural model (Hack and Thomas, 2009) in which help-seeking was implemented as a predictor of student progress, as well as goal-orientation as a predictor variable at both individuals and the whole class. The model was evaluated using $\chi 2$ indices and fit multiple criteria of CFI, TLI, RMSEA and SRMR.

Findings

The descriptive indicators of the research variables are presented in the following table.

Table 1.
Descriptive Indicators of Variables

Level	variable	Mean	St.d	Min	Max	Skewness	Kurtosis
Student	help-seeking	3.84	0.756	1	5	-0.195	-0.249
	mastery	2.88	0.784	1	5	0.717	0.168
	functional-approach	2.98	0.667	1	5	-1.240	2.989
	functional- avoidance	2.74	0.731			-1.269	-1.087
	Mastery	3.28	0.609	1	5	-0.295	0.209
Teacher	ability-approach	3.23	0.988	1	5	0.918	0.190
	ability-avoidance	2.98	0.778	1	5	-2.261	1.783
	work-avoidance	2.76	0.991	1	5	-0.185	-0.255

The results of the analysis of the multilevel structural equation model are shown in Fig. 2. The model has a good fit and 22% of students' performance variance at the student level and 28% of the variance in student performance at the teacher level are explained. The goal orientation in the level of student has a direct effect on students' performance; mastery goal-orientation (p<0/001 ،β=34/68), tendency (p <0/001, β = -25 / 586), avoidance (P <0/001, β = -33 / 475) and in the level of teacher has a compositional effect; mastery effect (p <0.001, β = 376.66) and functional goals (p <0.001, β = -32 / 227) was significant. At the student level, the goal-orientation has a significant positive effect (p <0/001, β = 0/26) on help-seeking. Help-seeking also has a significant positive effect (p <0/001, β = 0/17) on students' performance.

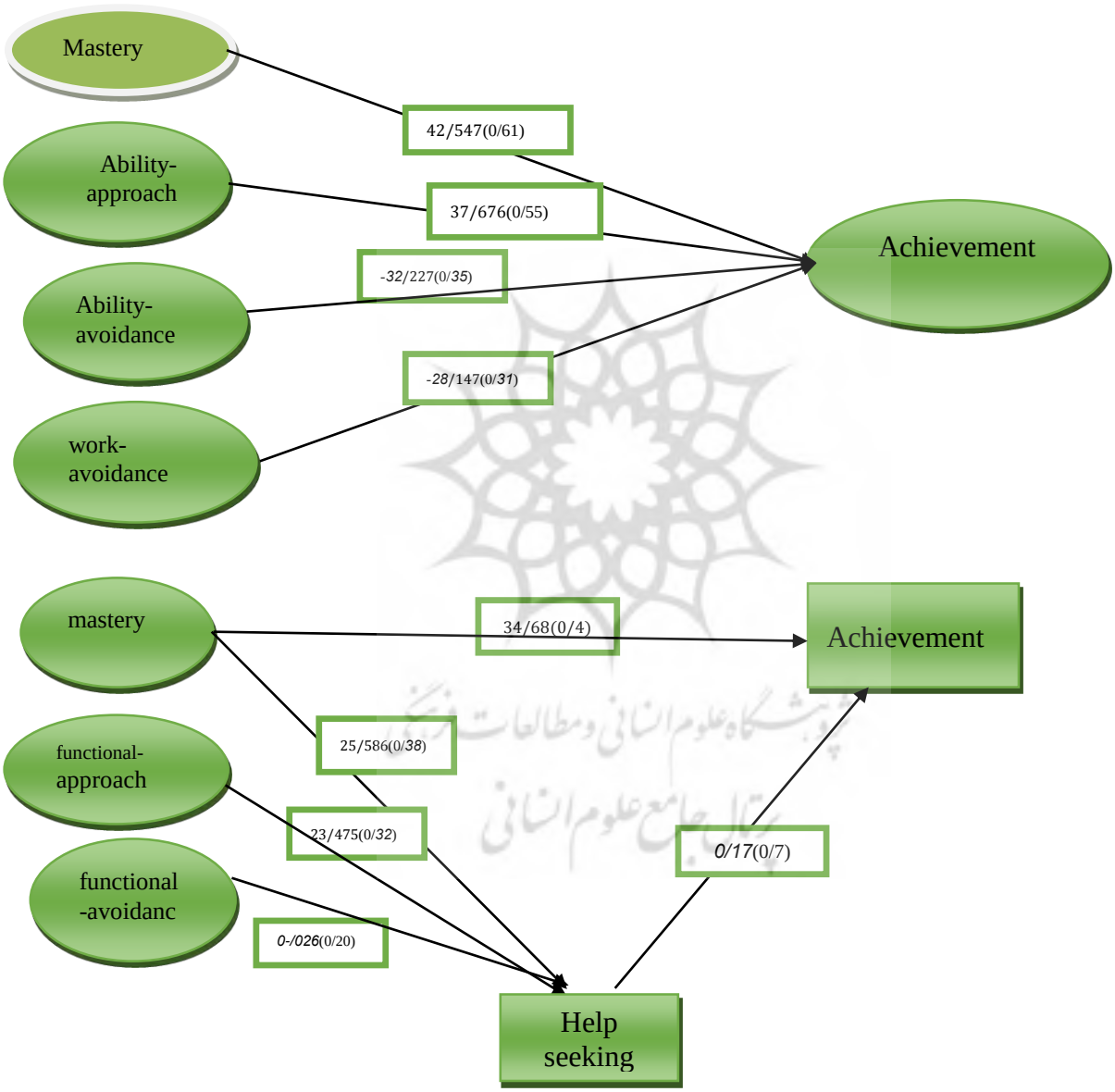

Figure 2.
Results of Multilevel Structural Equation Modeling; All of the parameters are non-standardized (Standard Values Are Given in Brackets), and Continuous Lines Indicate a Meaningful Relationship.
The indexes ($\chi 2$ = 0.684), (CFI = 0.96), (TLI = 0.49), (RMSEA = 0.04), (SRMR within 0.02) and (055 SRMR between = 0 /) Indicates good fit of the model.

Discussion and Conclusion

Mathematics has attracted a particular attention in researches related to academic achievement. Accordingly, the purpose of the present study was the application of Multilevel Structural Equations Modeling in testing the effect of teachers' and students' goal-orientation and help-seeking on math performance of 7th grade students. The model tested in this paper provides useful information on the role of goal-orientation in two levels, as well as on the impact of help-seeking on math performance. Help-seeking may be considered as an indication of inappropriate and dependent behavior in education and learning. Teachers who prefer such an approach would avoid students from help-seeking and expect them to do their tasks independently. Help-seeking is also considered conforming behavior and a kind of learning strategy (Butler & Newman, 1998; Newman, 1998; Ryan & Pintrich, 1997). Teachers watching help-seeking from this perspective will try to persuade students to inquire and help others. Students may ask a lot of questions. The results showed that the effect of teachers' and students' goal-orientation and help-seeking on students' mathematical performance was significant and, as we expected, this was significant at both individuals and the whole class levels. According to the findings of this study, there was a direct and significant relationship between the goal-orientation and help-seeking.

Tanka et al. (2001) examined the relationship between goal-orientation and help-seeking and showed that those goals were useful which had a positive relationship with admittance of help-seeking and had negative relationship with help-seeking avoidance. According to other results of the present study, help-seeking and performance had a direct and significant effect. Karabenick (2002) investigated the amount of students' help-seeking, their goal and intention of help-seeking, preferred help resources, class-related motivations and learning strategies. They concluded that regarding this term students can be divided in two groups:

(a) Students conforming to help-seeking who have higher academic achievement and higher skill orientations. (B) Students avoiding help-seeking who have weaknesses in skills and performance and also have poor academic achievement. These findings are in agreement with the findings of previous studies of Hejazi and Pakdaman (2001), and showed that students who mostly seek for help, succeeded more individually in doing upcoming issues. Pashaei (2009) also showed a positive correlation between help accepting and academic achievement. And this finding is not consistent with Hejazi and Abedini (1999), which showed that the impact of peer education on advancement is negative. According to above-mentioned researches and the results of this study indicated that there was a direct and significant relationship between student's goal orientation and his/her performance. This finding is consistent with Tuyserkani et al. (2012). Tuyserkani et al., in their study entitled "Classroom relationship between progress objectives, reflective thinking with students' math performance", concluded that the relationship between mastery goals and students' mathematical function was positive and significant and the relationship between the goals of tendency toward performance and performance avoidance with students' mathematical performance is negative and significant.

The results of the present study are similar to some researches such as Karabenick (2002) and Hejazi and Pakdaman (2001), Pashaei (1388), Tuyserkani et al. (1391) that showed Help-seeking and performance had a direct and significant effect. But finding are different with Hejazi and Abedini (1378) in which a negative relation between Help-seeking and achievement is depicted. In their study, "Classroom Relationship, Goal-orientation, and Contemplative Thinking has a significant relationship with Student's Math", they found that the relationship between mastery goals and students' mathematical function was positive and significant, and the relationship between the goals of tendency toward performance and Avoiding performance with students' mathematical function is negative and meaningful. In explaining this finding it can be argued that in functional-approach goal, the main goal of the evaluation is to support self-esteem and the individual considers his/her own adequacy depending on the least effort and success; thus failure is a threat for him/her and witnesses his/her inefficiency. It seems that the goals of the performance approach are not derived from a single development motive, but these goals may either be essential to progress or to be motivated by fear of failure. If the person with an orientation of functional- avoidance does not have the incentive to master skills, he/she will be incapable of avoiding the obvious manifestation of progress that shows his disability. It seem functional-avoidance goal lead people to focus on the likelihood of failure. Therefore, they set out the goals of functional- avoidance to prevent failure. The goals of mastery also refer to the learning of progress and the skills of mastery. In this direction, choosing to master, learn, raise knowledge and actualize potential abilities through the learning of the individual's primary goal, and error is considered as an integral part of the

learning process, and the stimulus To try and improve performance.

In the relationship between teacher orientation and performance, goal-orientation is a promising framework for studying the motivation of teachers in different cultures and schools. More importantly, continuous relationships with educational actions, teacher's interest and exhaustion suggest that the teacher's goal-orientation involves meaningful consequences for him/her and his/her students. There is evidence that teacher motivation is like the students affected by the field (Butler & Shibaz, 2014; Peltier et al., 2002). In this regard, a clear implicit reference can be to the fact that teaching occurs when it is most efficiently possible that school and school administrators not only encourage students but also encourage teachers. In the research (Pierre & Azimi, 1393), it was shown that there is a direct positive correlation between the Mastery goal and functional-avoidance goal with teaching functions.

Butler (2007) believed that the theory of goal-orientation is very useful for understanding and motivating teachers in teaching. He found that masters who pursue mastery goals have positive perceptions of helping them when needed to gain more insight into their careers. They consider challenging tasks for students. In contrast, faculty members who have functional goals, insist on rote learning (assigning repeated tests, strengthening the spirit of competition, etc.).Therefore depending on individual's goal of success, it affects the help-seeking and often this non-demanding behavior is passed on to the student, and the student in fact learns how to behave and accept help from his teacher. One of the limitations of this research was the lack of researches related to teacher's orientation and it is suggested that the teacher's goal-orientation to be in line with the student's goal-orientation for scientific researches. In explaining this finding it can be argued that the orientation of functional goals is the main goal of evaluation, supporting self-worth and individual considers his/her adequacy to the least effort and success, thus a failure is considered as a threat and a witness to his insufficiency. Objectives of the performance approach do not appear to be derived from one single motive for progress, but these goals may either come from the basic need for progress or the motivation for fear of failure. If the person with an orientation of performance avoidance does not have the motivation to master skills, he/she will see himself/herself incapable and will avoid the obvious manifestation of the progress that his/her inability manifests.

Objectives of performance avoidance appear to be driven by fear of failure. This motivation leads people to focus on the probability of failure, so they set off the goals of avoidance to prevent failures. The individual's goals of mastery also refer to the progress learning and the skill mastery. In this mastery orientation, learning topics, knowledge raising and actualizing potential abilities through the learning of the individual's primary goal, and error is considered as an integral part of the learning process, and is the stimulus to try and improve performance. Therefore, in the goal-orientation of student's purpose, they try to compare their abilities with others, and emphasize on how others judge them. They try to perk themselves as smart, not incompetent and unscrupulous. Therefore, they avoid challenging tasks, and when faced with difficult tasks, they show less diligence, thus prevent their intellectual inability to be revealed by avoiding challenging tasks. Being out of the others and gaining success with little effort is their goals. Failures are threatening because they are evidence of insufficiency (Ames, 1984; Ames & Archer, 1988; Buffard, 1998; Mays, 1988; Nichols, 1984), and have little positive attitude toward class (Ames & Archer, 1988) They use less learning strategy and seek exterior rewards such as high scores (Pintrich & Garcia, 1991) and focus on themselves, others, and failure. But in orientation of failure avoidance, the individual's goal is simply to not to fail in his studies (Eliot & Harkovich, 1997). Regarding the other findings in this study on the relationship between teacher orientation and performance, the goal orientation is a promising framework for studying the motivation of teachers in different cultures and schools. More importantly, continuous relationships with educational actions, teacher's interest and exhaustion suggest that the teacher's goal orientation for him/her and his/her students involves meaningful consequences. The theory of goal orientation is one of the most effective approaches to motivation and has important motivational implications in learning and practice (Eliot, 1997; Pontrich & Schank, 2002; Vandewalle, 2001). Eliot (1997) determined the target orientation as a way for the individual to judge his/her merit. Now there is evidence that the motivation of the teacher is influenced by the context as for students' (Butler & Shibayz, 2014; Peltier et al., 2002). In this regard, a clear implicit reference can be the fact that teaching occurs when it is most efficiently possible when school and school administrators not only encourage students but also encourage teachers. In the research (Pieri & Azimi, 1393), it was shown that there is a direct positive correlation between the mastery goal-orientation components and the functionalism with mastery teaching functions. This means that teachers who have mastery and functional orientation use

mastery teaching methods. On the other hand, there is a direct and positive relationship between the objectives of the goal of avoidance and work avoidance with educational practices. Butler (2007) believed that the theory of goal orientation is very useful for understanding and motivating teachers to teach. He found that the teachers who pursue mastery goals have positive perceptions of asking for help when needed to gain more insight into their careers. They consider challenging tasks for students. In contrast, teachers who have functional goals are interested in rote learning (assigning repeated tests, strengthening the spirit of competition, etc.).

Hence, it can be concluded that the goals of individuals to achieve success affects their degree of help-seeking and often this behavior (even the absence of help-seeking) is transferred to the student from the teacher, and the student in fact models his/her teacher's behavior. One of the limitations of this research was the lack of researches related to teacher's orientation and it is suggested that the teacher's goal-orientation also to be taken in to consideration while investigating for the student's goal- orientation in future research. Also, it is suggested that the effect of teacher orientation be investigated in relation to the other variables with the aim to help improve students' achieve their educational goals.

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