

WCES-2010

Investigating causal attributions of success and failure on mathematics instructions of students in turkish high schools

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Received October 15, 2009; revised December 24, 2009; accepted January 8, 2010

Abstract

According to cognitive psychologists, student beliefs about their probability and causes for success and failure greatly influence their academic achievement. The aim of this study is to investigate causal attributions of success and failure on mathematics instructions of students in Turkish high schools. A questionnaire composed of 5-point Likert type questions was administered to 96 last year students who were enrolled in some public schools of Istanbul. The findings revealed that some attributions most frequently were observed as follows: differences between some situations used in everyday life and mathematics, insufficiency of mathematical textbooks to meet the students' needs, having the belief that mathematics is difficult due to student's previous experiences.

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Keywords: Causal attribution theories; mathematics education, succes and failure on mathematics.

1. Introduction

The “why” questions are often asked by people, when they express causes or explanations behind their or others actions. For example, a parent may pose this question “why did my child fail in learning foreign languages?” or a more well-known question “why does s/he succeed or failed in mathematics more than others?” to attribute their children's failure and success. In general, the responses of the “why” questions are in the form of causal explanations and give us an idea about reasons of events or actions (Försterling, 2001; Wong & Weiner, 1981). Thus, attributions can be considered as the explanations and justifications individuals give for their success and failure. Weiner (1979, 1982 and 1984) highlighted that attributions influence how individuals react to their successes and failures. As stated by Forsyth & McMillan (1991) and McMillan & Forsyth (1991), attempts to reshape attributions may undo some harmful effects of failure. Wilson, Damiani & Shelton (2002) suggested that attempts to change student attributions could aid in breaking the cycle of self-blame and therefore avoid further failure or poor performance.

In the attribution theory, causality is considered as having three dimensions: *locus*, *stability* and *controllability*. According to factors that are inside or outside the individual, a cause can be viewed as external or internal in respect

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to its locus. In the controllability of a cause, it is important that the factor which causes an event is or is not under the individuals' control. In terms of its stability, a cause can be permanent or subject to change. In this context, for example, intelligence can be taken as internal, stable, and uncontrollable, while effort can be seen as internal, unstable and controllable (Weiner, 1985).

The aim of this study is to investigate causal attributions of success and failure on mathematics instructions of students in Turkish high schools. Our starting point is the assumption that students' behaviour is determined by their beliefs. Therefore, we adopted such cognitive theories by stating that beliefs are mediators of behaviour. Causal attributions for success and failure are considered as a central constructs in a general theory of motivation and attributions exert an impact on students' motivation to learn, emotions and future expectations for success and failure. In other words, student beliefs about their probability and causes for success and failure greatly influence their academic achievement.

2. Methodology

In order to identify the causal attributions of success and failure on mathematics instructions of students, we administered a 5-point Likert-type questionnaire. Gathered data were evaluated by using a software for quantitative analysis. The results of each item were interpreted separately. Subjects were assured of complete confidentiality and were free not to participate. It was also made clear to the participants that the information collected would be used only for research purposes. The content validity of this instrument was established by a panel of experts consisting of three educators who were specialist of mathematics education.

2.1. The participants

The study was conducted with 96 last year students who were enrolled in some public schools of Istanbul. There were 47 females and 49 males ranging from the age 17 to 18 with an average age of 18.

2.2. Data collection procedures

In order to identify the causal attributions of success and failure on mathematics instructions of students, we administered a 5-point Likert-type questionnaire. Gathered data were evaluated by using a software for quantitative analysis. We transferred the answers of the students to the software by scoring the items as the following: 5 for Strongly Agree (SA), 4 for Agree (A), 3 for Undecided (U), 2 for Disagree (D), and 1 for Strongly Disagree (SD). The total score was not calculated and the results of the items were interpreted separately. Subjects were assured of complete confidentiality and were free not to participate. It was also made clear to the participants that the information collected would be used only for research purposes.

The content validity of this instrument was established by a panel of experts consisting of three educators who were specialist of mathematics education. So these educators determined that these items were able to measure students' causal attributions of failure and success in mathematics. The items of this questionnaire were prepared in the light of the literature-review (e.g., Boruchovitch, 2004; Cortes-Suarez, 2004; Natale, 2007) and by discussing with mathematicians and mathematics educators. The total items of the questionnaire are 20. In order to pre-test the items of questionnaire, we conducted a pilot study with 10 students. While selecting these students, we tried to take into account the fact that they belong to each school involved in this study. After this experience, questions were revised and refined based on the information provided by the pilot study, e.g., the incomprehensible items were revised and developed. Students who took part in the pilot study were excluded from the sample. Approximately 11 students reviewed the questionnaire for readability and understanding. The reliability coefficient of the Likert-type questions was calculated as 0.85 (Cronbach's Alpha).

3. Results

In this paper, because of the page limitation, we present only the finding related to the causal attributions of failure on mathematics of the students concerning mathematics, mathematics learning and teacher.

3.1. The causal attributions of failure on mathematics of the students related to mathematics

The Table 1 displays the results of the sampled students' causal attributions related to mathematics itself for failure. The insufficiency of mathematical textbooks to meet the students' needs (76%) was the attribution most frequently selected by subjects for failure on mathematics.

Table 1. Distribution of the items related to mathematics

	SD		D		U		A		SA	
	f	%	f	%	f	%	f	%	f	%
1. Textbooks are not prepared in the manner that students could benefit.	3	3.1	10	10.4	10	10.4	31	32.3	42	43.8
2. The difference between some situations used in everyday life and mathematics.	9	9.4	21	21.9	16	16.7	35	36.5	15	15.6
3. The belief that mathematics is difficult	10	10.4	28	29.2	8	8.3	29	30.2	21	21.9
4. In mathematics concepts are very abstract.	7	7.3	21	21.9	28	29.2	26	27.1	14	14.6
5. In mathematics there are many things to be memorised.	14	14.6	24	25	21	21.9	26	27.1	11	11.5
6. The belief, coming from previous experiences, that mathematics is difficult.	11	11.5	24	25	13	13.5	30	31.3	18	18.8

The difference between some situation used in everyday life and mathematics (53%), having the belief that mathematics is difficult (52%) and the belief that mathematics is difficult due to student's previous experiences (50%) were the attributions by almost half of the participants to explain failing the mathematics. For 42%, in mathematics concepts are very abstract, that is for why students fail in mathematics, while the belief that in mathematics there are many things to be memorized was shared by 39% of the students.

3.2. The causal attributions of failure on mathematics of the students related to mathematics learning and teacher

Data in Table 2 shows the subjects' causal attribution in relation to mathematics learning and teacher. According to the participants, one of the most important reasons of failure including teacher is that teacher conducts their students to memorize them instead of the construction of the sense of mathematical concepts (71%). By assuming that there is a relationship between our complaints and our experiences, this finding also gives us an idea about the nature of the mathematics education in Turkish high schools. That is, there is a mathematics education which promotes learning by heart.

Teacher's lack of content (66%), teacher's lack of teaching methods (67%), asking from students by teacher only their solving process (64%), and not teaching the relationship of mathematics with everyday life (61%) were the attributions considered by approximately two out of three students. The percentage of the students who consider the teacher's incapability in keeping classroom discipline and management as a reason of student's failure in mathematics was to 50%, while the belief that teacher always teaches in the same manner was shared by 59%.

Table 2. Distribution of the items related to mathematics learning and teacher

	SD		D		U		A		SA	
	f	%	f	%	f	%	f	%	f	%
1. The relationships of mathematics with everyday life are not taught.	5	5.2	19	19.8	13	13.5	34	35.4	25	26
2. In instead of the construction of the sense of mathematical concepts, students are conducted to memorize them.	5	5.2	17	17.7	6	6.3	35	36.5	33	34.4
3. Teacher makes gender discrimination.	27	28.1	35	36.5	8	8.3	10	10.4	16	16.7
4. Teacher is very strict.	14	14.6	35	36.5	9	9.4	21	21.9	17	17.7
5. The lack of content knowledge of teacher.	7	7.3	18	18.8	8	8.3	30	31.3	33	34.4

6. Teacher does not know how to teach.	6	6.3	17	17.7	9	9.4	23	24	41	42.7
7. Teacher is not dealt with justly in giving a grade to students.	6	6.3	28	29.2	15	15.6	23	24	24	25
8. Teacher sufficiently does not allow students to talk.	9	9.4	28	29.2	26	27.1	19	19.8	14	14.6
9. Teacher asks from students only his/her own solving process.	4	4.2	18	18.8	13	13.5	25	26	36	37.5
10. Teacher is not able to keep classroom discipline and management.	12	12.5	20	20.8	16	16.7	25	26	23	24
11. Teacher always teaches in the same style.	9	9.4	15	15.6	16	16.7	35	36.5	21	21.9

Teacher's severity was an obstacle before students to get success in mathematics for 40% of the students. Nearly half of the participants indicated that the teacher's injustice in giving a grade to students is one of the causal attributions of failure in mathematics. On the other hand, the gender discrimination made by teacher and the insufficient possibility of talking given to students by teacher were the attributions less frequently selected by the participants to explain failing the mathematics achievement (respectively, 27% and 35%).

4. Discussion and Implications

It is important to be aware of the reasons behind the students' learning difficulties and so that it facilitates to take precautions for the factors that hinder learning. In this study these factors are tried to be determined and it is found out that many of these factors affect students' learning. Among those factors are the course books, the teaching methods that mathematics teachers use and the problems related to the teaching and learning of mathematics in our country. As the solutions to those factors are not included among the aims of this study, only the signs which we should be aware of are expressed here. Without taking so many different factors effecting/determining students' performances in mathematics into consideration, it is wrong to label the students as unsuccessful or incapable. These suggestions can be accepted as the clues that can help the students to gain and to develop the basic mathematical thinking abilities. Those students are the ones who have difficulty in learning because of the reasons that exist and are stated in general education.

With data we obtained from this study, it is very difficult to answer the following question: what level are they these deficiencies in mathematics education? So, we hope that future research will examine in detail this subject.

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