The Effect of Growth-Mindset Strategies on 8th Grade Students' Self-Efficacy, Self-Regulation, Academic Achievement and Mind Development[1]

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Abstract

The aim of the study was to examine the effect of the educational practice including mind development strategies on the self-efficacy, self-regulation, academic achievement and mind development scores of 8th grade students who are continuing their secondary education in Turkey. In order to examine the effect of the use of mind development strategies on the self-efficacy, self-regulation, academic achievement and mindset scores of the 8th grade students, the results obtained as a result of the four-week pilot application carried out with the participation of 42 eighth grade students (experimental group: 21, control group: 21). In this study, which was designed in accordance with the nested mixed pattern, data were obtained through *Mindset Scale*, *Self-Efficacy Scale*, and *Metacognitive Skills Scale* before and after the application. In the qualitative aspect of the research, the data obtained from the interviews with the students, reflection reports filled by the students, self-evaluation forms, peer assessment forms and course observations were subjected to content analysis. The categories and codes that emerged as a result of the analysis were structured under three themes that also constituted the interview questions. Within the scope of the research, semi-structured one-to-one interviews were conducted with 4 students in the experimental group, and after the application, self-assessment, peer assessment forms and reflection reports were filled by the students. Before the application, no significant difference was observed between the experimental and control groups in terms of the average scores showing academic success in mathematics, metacognitive skills and self-efficacy skills. A significant difference was observed only between the average scores of mind development among the posttest scores performed after the mind development training. A positive change was observed between the mindset scores of the experimental group students before and after the application. This paper was published in: "EJER Congress 2023 International Eurasian Educational Research Congress Conference Proceedings," Ani Publishing, 2023, pp. 383-401]

Keywords: growth mindset, self-efficacy, self-regulation, students, *Mixed-method, Turkey.*

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Introduction

Academic achievement is seen as an important indicator of the quality of education. In addition, metacognitive skills such as self-efficacy and self-regulation are important factors that the individual should have in achieving academic success. An individual's belief in their own intelligence and ability influences their success in various areas and the development of their skills (Dweck, 2006).

Carol Dweck (2006), who reframes the Mindset Theory, states that when people are given the perspective that supports the growth mindset, struggle and effort will follow that perspective. On the contrary, when they engage in a fixed mindset that focuses on enduring traits, it states that people will be afraid of challenge and will devalue effort. The growth mindset, which is defined as a mindset based on incremental theory, refers to the individual's having positive judgments that he can develop and achieve (Dweck, 2006). It is possible for the individual who believes that he will develop to be happier, more successful and have higher motivation. Research provides substantial evidence that mindset is an important element influencing an individual's belief that they can learn, self-control, and development (Dweck, 2007; 2008; Paunesku et al., 2015; Rattan et al., 2015; Yeager & Dweck, 2012). So much so that the mindset strategies can have an effect on the academic success of the individual and shapes his/her effort towards success. Besides that, middle school represents a major transition. Blackwell et al. (2007) argue that secondary school "emphasizes competition, social comparison, and ability self-assessment at a time of heightened self-focus" (p. 246).

Growth mindset interventions contribute to encouraging low-performing students to struggle and strive with academic difficulties (Burnette et al., 2013; Claro et al., 2016; Paunesku et al., 2015; Sarrasin et al., 2018; Yeager et al., 2014). Experimental studies suggest that, in general, students who show less progress have lower intrinsic motivation and lower self-esteem than others (Chow & Yong, 2013; O' Shea et al., 2017; Safree et al., 2009). Especially, socioeconomically disadvantaged students' interest in mathematics tends to decrease as they progress through secondary school (Li & Lerner, 2011; Wang & Degol, 2014; Wigfield et al., 2006). Adolescents mostly think that their math performance is based on innate abilities rather than hard work and effort (Ahn et al., 2016). This negative thought reduces mathematics achievement and reduces the rate of participation in the course (Fredricks et al., 2016). At the same time, research findings reveal that a growth mindset intervention in secondary school positively affects students' future mathematics course choices (Romero et al. 2014). Metacognitive skills such as planning, reflection, and evaluation are effective in shaping mathematics learning skills and mathematics performance self-perception (Wang et al., 2021). Wang et al., (2019) also argue that students' mindset beliefs can activate and develop metacognitive skills. At the same time, students need to be aware of their own cognitive development in order to have a growth mindset, and it is possible to receive the message that is intended to be conveyed with mind development strategies, again with the development of

metacognitive skills (Wang et al., 2021). In this context, metacognitive skills associated with mathematics course success and growth mindset are one of the research subjects of the research.

Self-regulation skill can foster a growth mindset and thus shape the perception of effort (Mrazek et al., 2018). In a longitudinal study conducted by Job et al. (2015), students' beliefs about implicit intelligence theories were found to be positively related to the development of self-regulation skills. As a result, the concepts of self-regulation and growth mindset, which are seen as two concepts that are related and influenced by each other, came to the fore as another issue examined by the current research. According to the results of the meta-analysis study conducted by Burnette et al. (2013), self-regulation skill is also effective on the relationship between mindset theory and academic achievement. McWilliams (2014) revealed that students with a growth mindset tend to make internal attribution and have a strong sense of academic self-efficacy. Samuel and Warner (2019), on the other hand, concluded that university students' self-efficacy in mathematics is strengthened by the growth mindset. In conclusion, the difference between research findings reveals the necessity of examining the relationship between growth mindset intervention and academic self-efficacy. The starting point of this study was the research showing that the mindset has the potential to affect behavior and ultimately shape academic achievement and metacognitive skills. The aim of the study was to examine the effect of educational practice includingmindsetdevelopment strategies on self-efficacy, self-regulation, academic success andmindsetdevelopment scores of 8th grade students who are continuing their secondary school education in Turkey. For this purpose, the following questions were sought to be answered:

- What is the effect of growth-mindset strategy use on 8th grade students' mindset score?
- What is the effect of growth-mindset strategy use on 8th grade students' academic achievement?
- What is the effect of growth-mindset strategy use on 8th grade students' self-efficacy?
- What is the effect of growth-mindset strategy use on 8th grade students' self-regulation?
- What are the students' views on the effect of the growth-mindset intervention?
- How is student and teacher performance observed during the growth-mindset intervention process?
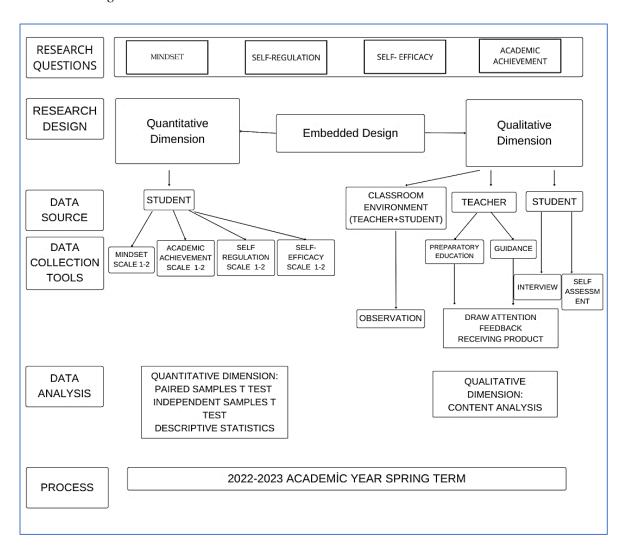
Method

Research Design

The flowchart of the research, which is designed in accordance with embedded mixed design, is presented in Figure 1 as a summary.

Figure 1.

Research design

Research Sample

A four-week pilot study with the participation of 42 eighth grade students (experimental group: 21, control group: 21) in order to examine the effect of mind development strategy use on 8th grade students' self-efficacy, self-regulation, academic achievement and mindset development scores

Research Instrument and Procedure

In the current research designed in accordance with the nested mixed pattern, data were obtained through the Mindset Scale, Self-Efficacy Scale, and Upper Cognition Skills Scale

before and after the application. The Mindset Scale is the Implicit Theories of Intelligence Scale (ITIS) developed by Dweck (2000) and adapted into Turkish by the researcher. The Self-Efficacy Scale was adapted to Turkish by the Self-regulation Skills Scale Üredi (2005). Mathematics course achievement scale was developed by researchers. Within the scope of the research, semi-structured one-to-one interviews were conducted with 4 students in the experimental group and observations were made during the application process.

Results

The findings obtained as a result of the research were presented in line with the research questions. First of all, quantitative data were analyzed. However, the normality distribution of quantitative data was tested before proceeding to analysis. In the making of statistics for parametric tests, based on the assumption of the normal distribution of the universe (Gravetter & Wallnau, 2013), it was first tested whether the data obtained within the scope of the research fit the normal distribution (Table 1). Since the number of study groups of the study was less than fifty, the Shapiro-Wilk test was taken as the basis (Büyüköztürk, 2012).

Table 1.

Normality Test

			Kolmogorov-Smirnov			Shapiro-Wilk		
			Z	n	p	Z	n	p
Supragnial skills	Pretest	Experiment	,105	21	,200*	,941	21	,232
		Control	,153	21	,200*	,948	21	,318
	Posttest	Experiment	,157	21	,191	,917	21	,076
		Control	,180	21	,073	,900	21	,035
Self-efficacy	Pretest	Experiment	,098	21	,200*	,967	21	,672
		Control	,144	21	,200*	,924	21	,107
	Posttest	Experiment	,248	21	,002	,884	21	,017
		Control	,142	21	,200*	,962	21	,553
Mind Development	Pretest	Experiment	,074	21	,200*	,970	21	,736
		Control	,115	21	,200*	,978	21	,891
	Posttest	Experiment	,107	21	,200*	,965	21	,615

		Control	,159	21	,180	,949	21	,330
Academic Achievement	Pretest	Experiment	,175	21	,092	,927	21	,120
		Control	,140	21	,200*	,964	21	,605
	Posttest	Experiment	,127	21	,200*	,956	21	,438
		Control	,115	21	,200*	,938	21	,203

When Table 1 was examined, it was determined that the data obtained as a result of the analysis according to the Shapiro-Wilk test results showed a normal distribution except for the control group self-regulation skills and the experimental group self-efficacy skills average scores (p>0.05). After the evaluation according to the Shapiro-Wilk normality test, the skewness and kurtosis coefficients of the measurements related to the variables were examined (Table 2).

Table 2.

Skewness and Suppression Coefficients for Variables

Variable	Group	n	Measurement	x̄	Ss	Skewness	Kurtosis
Self-regulation skills	Experiment	21	Pretest	4,27	1,05	-,05	-1,02
		21	Posttest	4,88	1,23	-,65	-,68
	Control	21	Pretest	4,17	,99	-,66	,55
		21	Posttest	4,46	1,56	-,38	-1,3
Self-efficacy	Experiment	21	Pretest	3,88	1,31	,06	-,84
		21	Posttest	4,75	1,48	-,90	-,19
	Control	21	Pretest	4,19	1,66	-,14	-1,18
		21	Posttest	4,25	1,42	-,12	-,89
Implicit intelligence skills	Experiment	21	Pretest	3,79	,87	-,01	-,63
		21	Posttest	4,47	,77	,19	,22
	Control	21	Pretest	3,95	,92	,36	-,11
		21	Posttest	3,58	,56	,51	-,25
Academic achievement	Experiment	21	Pretest	59,04	23,27	,33	-1,11
		21	Posttest	58,09	19,33	,37	-,78
	Control	21	Pretest	53,57	21,74	,46	-,25
		21	Posttest	49,52	23,28	,42	-,73

When the literature is examined, in order to accept that the data show a normal distribution, Tabachnick and Fidell (2013) emphasize that the skewness and flatness values should be between +1.5 -1.5 and George and Mallery (2010) should be between +2.0 -2.0. In this respect, when Table 2 is examined, it is possible to say that the flatness and skewness values of the data are within the acceptable normal distribution values according to Tabachnick and Fidell (2013) and George and Mallery (2010).

Comparison of Pretest-Posttest Scores of Self-regulation Skills of the Pilot Study Group. For the purposes of the study, the analyses of whether there is a statistically significant difference between the total scores of the self-regulation skills pretest and posttest of the pilot study group are included in Table 3.

Table 3.

Investigation of Self-regulation Skills Pretest and Posttest Averages by Experimental and Control Group

Measurement	Group	n	x̄	SS	t	p
Pretest	Experiment	21	4,27	1,05	,300	,838
	Control	21	4,17	,99		
Posttest	Experiment	21	4,88	1,23	,960	,098
	Control	21	4,46	1,56		

When Table 3 is examined, although it is observed that there is a difference between the average scores of the experimental group in favor of the final test (x̄: 4.27; x̄: 4.88), it is seen that there is no significant difference between the pretest and posttest scores of the experimental group and control group students from the self-regulation skills scale at the significance level of 0.05.

Results of the Paired Samples T test on the Self-regulation Skills of the Pilot Group. Paired Samples T test was applied to determine whether there was a statistically significant difference between the self-regulation skills scale scores of the students in the experimental and control groups before and after the application (Table 4).

Table 4.

Paired Samples T Test Results for the Self-regulation Skills of Experimental and Control Group Students

Group		n	x̄	SS	t	p
Experiment	Pretest	21	4,27	1,05	-1,66	,11
	Posttest	21	4,88	1,23		
Control	Pretest	21	4,17	,99	-,64	,52
	Posttest	21	4,46	1,56		

When Table 4 is examined, it is seen that there is no significant difference between the sself-regulation scores of the experimental and control group students measured before and after the training they participated in regarding growth mindset strategies at the significance level of 0.05.

Comparison of Self-Efficacy Skills Pretest-Posttest Scores of the Pilot Study Group

For the purposes of the study, the analyses of whether there is a statistically significant difference between the self-efficacy skills, pretest and posttest total scores of the pilot study group are included in Table 5.

Table 5.

Investigation of Self-Efficacy Skill Pretest and Posttest Averages According to Test and Control Group

Measurement	Group	n	x̄	SS	t	p
Pretest	Experiment	21	3,88	1,31	-,68	,50
	Control	21	4,19	1,66		
Posttest	Experiment	21	4,75	1,48	1,11	,27
	Control	21	4,25	1,42		

When Table 5 is examined, there was no significant difference between the total average scores of the pretest of the self-efficacy skills of the experimental and control group at the significance level of 0.05; There was also no significant difference between the posttest scores performed after growth-mindset training.

Paired Samples T Test Results on Self-Efficacy Skills of the Pilot Group. Paired Samples T test was applied to determine whether there was a statistically significant difference between the self-efficacy skill scale scores of the students in the experimental and control groups before and after the application (Table 6).

Table 6.

Paired Samples T Test Results for Self-Efficacy Skills of Experimental and Control Group Students

Group	Measurement	n	x̄	SS	t	p
Experiment	Pretest	21	3,88	1,31	-1,90	,07
	Posttest	21	4,75	1,48		
Control	Pretest	21	4,19	1,66	-,12	,90
	Posttest	21	4,25	1,42		

When Table 6 is examined, it is seen that there is no significant difference between the self-efficacy skill scores of the experimental and control group students measured before and after the training they participated in regarding the mindset development strategies at the significance level of 0.05.

Comparison of Mindset Development Pretest-Posttest Scores of the Pilot Study Group. For the purposes of the study, the analyses of whether there is a statistically significant difference between the total scores of the mindset development pretest and posttest of the pilot study group are included in Table 7.

Table 7.

Investigation of Mind Development Pretest and Posttest Averages According to Experiment and Control Group

Measurement	Group	n	x̄	SS	t	p
Pretest	Experiment	21	3,79	,87	-,57	,57
	Control	21	3,95	,92		
Posttest	Experiment	21	4,47	,77	2,42	,02
	Control	21	3,77	1,07		

When Table 7 was examined, there was no significant difference between the total average scores of the pretest for the mindset development of the experimental and control group at the level of significance of 0.05; There was a significant difference between the posttest scores performed after the mindset development training. Accordingly, after the application, there was a difference between the average scores of total mindset development between the experimental group and the control group.

Paired Samples T Test Results on Mind Development Scores of the Pilot Study Group. Paired Samples T test was applied to determine whether there was a statistically significant difference between the mindset development scale scores of the students in the experimental and control groups before and after the application (Table 8).

Table 8.

Paired Samples T Test Results on Mind Development Scores of Experimental and Control Group Students

Group	Measurement	n	x̄	SS	t	p
Experiment	Pretest	21	3,79	,87	-2,49	,02
	Posttest	21	4,47	,77		
Control	Pretest	21	3,95	,92	1,39	,17
	Posttest	21	3,58	,56		

When Table 8 is examined, a significant difference of 0.05 significance is observed between the mindset development scores of the experimental and control group students measured before and after the training they participated in regarding the mindset development strategies. As a result of the findings obtained, there was no increase between the pretest and posttest average scores of the mind development of the control group; It is possible to say that the mindset development scores of the experimental group increased compared to the pre-application period.

Comparison of Academic Skills Pretest-Posttest Scores of Mathematics Course of Pilot Study Group. For the purposes of the study, the analyses of whether there is a statistically significant difference between the total scores of the pretest and posttest of the academic skills of the pilot study group related to the mathematics course are included in Table 9.

Table 9.

Examination of Academic Skills Pretest and Posttest Averages According to Experimental and Control Group

Measurement	Group	n	$\bar{x}$	SS	t	p
Pretest	Experiment	21	59,04	23,27	,14	,88
	Control	21	58,09	19,33		
Posttest	Experiment	21	53,57	21,74	,58	,56
	Control	21	49,52	23,28		

When Table 9 is examined, no significant difference is observed between the total average scores of the mind mathematics course of the experimental and control group at the level of significance of 0.05. In other words, there was no significant difference between the average scores of the mathematics course indicating academic achievement between the experimental and control group before the application. However, no significant difference was observed between the posttest scores performed after the mindset development training.

Paired Samples T Test Results for Mathematics Course Academic Skills Scores of the Pilot Group. Paired Samples T test was applied to determine whether there was a statistically

significant difference between the academic skills scale scores of the mathematics course of the students in the experimental and control group before and after the application (Table 10).

Table 10.

Paired Samples T Test Results for Mathematics Course Scores of Experimental and Control Group Students

Group	Measurement	n	x̄	SS	t	p
Experiment	Pretest	21	59,04	23,27	,247	,80
	Posttest	21	53,57	19,33		
Control	Pretest	21	58,09	21,74	1,10	,28
	Posttest	21	49,52	23,28		

When Table 10 was examined, no significant difference was observed between the academic achievement test scores of the experimental and control group students in the mathematics course at the significance level of 0.05 before and after the mindset development training they attended. As a result of the findings obtained, there was no difference on the academic success of the experimental group after the training.

Qualitative Dimension

In the qualitative dimension of the research, the data obtained from the interviews with the students, the reflection reports filled out by the students, the self-evaluation forms, the peer evaluation forms and the course observations were subjected to content analysis. The categories and codes that emerged as a result of the analysis were structured under three themes that also make up the interview questions.

Within the scope of the research, semi-structured one-to-one interviews were conducted with 4 students in the experimental group, and after the application, self-evaluation, peer evaluation forms and reflection reports were filled out by the students. Summary information about the themes, codes and categories obtained as a result of the analysis of the data obtained during the process is given in Table 11.

Table 11.

Analysis of Data Obtained as a Result of Student Interviews, Reflection Reports, Peer Evaluation Forms, Self-Evaluation Forms

Theme	Category	Code
Academic Success	Reasons that increase success	Regular work
		Note-taking
		Listen to a lecture
		Affinity
		Intelligence
		Healthy eating
		Awareness
	Causes of failure	Distraction
		Physiological needs
		Communication with the teacher
Effort	Avoiding effort	Insecurity
		Lack of motivation
	Effortlessness	Self-confidence
		Faith
		Self-knowledge
Goal	Goal setting	Realistic
		Appropriate
		Be clear
		Attainable
	Aimlessness	Ambiguity
		Unconsciousness

When Table 11 is examined, it is seen that 3 different themes are reached as a result of student interviews. Within the theme of academic success, two different categories have been reached as the reasons that increase success and the reasons for failure.

In the qualitative dimension of the research, observation was made by the researcher in the lessons of the practicing mathematics teacher. During the observation period, the observation

form was filled out by the researcher. According to observation data, it is possible to say that feedback is given by the implementing teacher to the students in mathematics lessons, in case of effort, encouraging discourses are made and constructive feedback is used. However, during the observation, it was observed that the practitioner teacher used inaccurate communication expressions that showed that he had high expectations from the students and did not act adequately with the feedback tool shared with the teacher at the beginning of the process.

Discussion

This study examined the effect of educational practice including mindset development strategies on self-efficacy, self-regulation, academic success and mindset development scores of 8th grade students who are continuing their secondary school education in Turkey. It is concluded that while growth-mindset intervention is effective on academic achievement mindset development, it is not effective on self-efficacy and self-regulation. The qualitative data carried out throughout the process support the positive change tendency of the experimental group.

The findings obtained in terms of mindset scores showed that there is a significant difference between the pre-test and post-test scores of the experimental group students in favor of the post-test. The mindset scores of the students have increased from range that can be defined as fixed mindset to the range that can be defined as growth-mindset.

Conclusion

According to the conclusion reached as a result of the research, mindset can influence behavior. Research findings support the positive impact of evolving mindset interventions on academic achievement. Growth mindset interventions take place at various school levels. Growth mindset interventions are recommended especially for students in transition (Yeager et al., 2019). In addition, it is said that the effect of this intervention is high for disadvantaged students and students with low academic achievement. As a result of this research, it was concluded that academic success was positively affected in line with the literature.

Recommendations

In the current research, it is concluded that while growth-mindset intervention is effective on academic achievement mindset development, it is not effective on self-efficacy and self-regulation. It should be investigated why there is no effect on these two skill areas.

Based on the researches showing that growth-mindset interventions affect academic achievement positively, growth-mindset strategy training can be given especially for students in transition period.

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