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The Effect of Transformational Science Teaching on Students' Academic Optimism and Academic Engagement

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ABSTRACT

The present study aimed to investigate the effect of transformational science teaching on students' academic optimism and academic engagement. This study employed a quasi-experimental design with a pretest–posttest control group. The statistical population consisted of all sixth-grade male elementary school students in Khash County during the 2023–2024 academic year. A total of 50 students were selected using cluster random sampling and were then randomly assigned to either the experimental group (n = 25) or the control group (n = 25). Data were collected using a Transformational Teaching Package implemented over eight instructional sessions, the Academic Optimism Questionnaire developed by Tschannen-Moran et al. (2013), and the Student Engagement Questionnaire developed by Fredricks and Blumenfeld (2004). Data were analyzed using one-way multivariate analysis of covariance (MANCOVA) with IBM SPSS software. The findings indicated that transformational science teaching had a positive and statistically significant effect on the posttest mean scores of both academic engagement and academic optimism among sixth-grade male elementary school students. Therefore, it can be concluded that implementing transformational teaching in science education significantly enhances students' academic optimism and academic engagement

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Introduction

Creating an environment that fosters individuals' holistic development and nurturing healthy, competent citizens capable of contributing to various personal and social domains is among the primary responsibilities of educational systems. Achieving this objective depends on numerous factors, among which academic optimism has emerged as an important determinant of students' educational outcomes (Mullis et al., 2016, as cited in Besharatipour et al., 2024). Optimism is generally defined as a tendency or disposition to interpret situations and life events positively and is regarded as a valuable human strength and virtue (Nyonsaba et al., 2024). Academic optimism provides a comprehensive representation of human agency and refers to students' positive beliefs regarding their own learning, their trust in teachers, and their sense of school identity, all of which contribute to academic success (Tschannen-Moran et al., 2013). This construct is considered one of the most prominent personality characteristics because it is rooted in positive cognitions (Carver et al., 2010) that influence individuals' behavioral patterns (Scheier et al., 2001). Furthermore, academic optimism represents one of the latent collective characteristics of schools and has been recognized as an important indicator of school culture (Hoy et al., 2006).

Optimistic individuals tend to attribute negative experiences to external, temporary, and specific causes rather than internal, stable, and global ones, while maintaining confidence in their ability to overcome adversity (Seligman, 1998). Optimism alleviates anxiety and uncertainty in challenging situations and encourages individuals to persist in pursuing their goals (Nes & Segerstrom, 2006). In educational settings, academic optimism reflects an affective and cognitive predisposition through which students evaluate and anticipate future academic outcomes (Hoy et al., 2006).The level of academic optimism may be influenced by several factors, including genetic predisposition, family and environmental experiences, personal attitudes, resilience, social support, personality traits, and self-awareness (Kurniawan et al., 2024). Previous studies have demonstrated that academic optimism is a significant predictor of students' academic engagement. Students with higher levels of academic optimism exhibit greater involvement in learning activities, stronger perceptions of competence, increased persistence, and consequently higher levels of academic engagement (Lohrab-Goleh et al., 2023).

Academic engagement is another key determinant of learning quality and academic achievement. It refers to the amount of energy, effort, and commitment students invest in academic activities and the effectiveness with which these efforts translate into meaningful learning outcomes (Fredricks et al., 2004). Students with high academic engagement demonstrate greater attention and concentration on learning tasks, exert more effort, derive greater enjoyment from academic activities, comply more consistently with school rules, exhibit fewer maladaptive behaviors, and achieve superior academic performance (Maslach et al., 2001). Common indicators of academic engagement include participation in learning activities, academic achievement, the amount of time devoted to coursework, and the completion of assigned tasks (Christenson et al., 2012). Numerous factors influence academic engagement, including academic buoyancy, transformational teaching, and academic self-efficacy (Excavier Mitchell et al., 2013, as cited in Javadi Alami et al., 2020).

Transformational teaching, derived from the theory of transformational leadership, encompasses four core behavioral dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. It is an active, learner-centered instructional approach that shifts the classroom from a teacher-centered to a student-centered environment. This approach emphasizes dynamic interactions between teachers and students, encourages collaborative knowledge construction, and promotes both learning and personal development. Within this framework, teachers function as intellectual mentors who facilitate collaboration and meaningful knowledge exchange among students (Rezaei Sharif, 2014). Transformational teaching has been widely recognized as an effective instructional model for enhancing educational environments (Bass et al., 2006). It involves behaviors that empower and inspire learners beyond their existing capabilities, enabling them to achieve higher levels of performance. Consequently, this approach has attracted considerable attention across diverse educational and organizational contexts (Beauchamp et al., 2010).

The effectiveness of transformational teaching can be explained from several perspectives. First, contemporary leadership theories conceptualize leadership as the process through which an individual

influences members of a group to achieve common goals (Northouse, 2001), making leadership conceptually similar to effective teaching. Second, substantial empirical evidence indicates that transformational teaching enhances learners' self-confidence, intrinsic motivation, and overall personal development. Third, previous intervention studies have shown that transformational teaching behaviors can be successfully cultivated through professional development and educational training programs (Barling et al., 1996).

More broadly, education constitutes the cornerstone of social, economic, political, and cultural development. Evidence consistently demonstrates that the cognitive skills fostered by an effective educational system are powerfully related to individual earnings, income distribution, and national economic growth (Hanushek & Woessmann, 2008). Nevertheless, school dropout remains one of the most pressing challenges confronting educational systems worldwide. According to UNESCO's Global Education Monitoring Report, more than 251 million children and youth worldwide remain out of school, a figure that has continued to rise in recent years (UNESCO, 2024). Given that academic engagement is a multidimensional construct, fostering and strengthening it requires comprehensive and multidimensional educational interventions. In response to this challenge, educational researchers have increasingly focused on academic engagement as a critical determinant of academic achievement, recognizing that students with higher engagement are substantially less likely to leave school prematurely (Archambault et al., 2009). Likewise, academic optimism plays a crucial role in students' learning and academic success and, unlike certain personal characteristics, can be cultivated through educational experiences, thereby contributing to the improvement of the overall learning environment (Tschannen-Moran et al., 2013).

Despite the recognized importance of academic optimism and academic engagement, one of the major challenges facing educational systems is the limited implementation of effective instructional approaches. Innovative teaching methods have yet to achieve widespread adoption in many classrooms. Observational evidence accumulated over several decades indicates that in traditional classrooms teachers spend approximately half of the instructional time speaking, leaving relatively limited opportunities for active student participation (Jafreh, 2026). In contrast, transformational teaching represents a learner-centered instructional approach whose implementation has become increasingly necessary. Effective teaching extends beyond the mere transmission of knowledge and skills; rather, it is a developmental process that progressively guides students toward acquiring more sophisticated competencies and higher-order thinking skills (Hattie, 2009).

Although theoretical and empirical evidence suggests that transformational teaching positively influences various psychological and academic outcomes, relatively few studies have simultaneously examined its effects on both academic optimism and academic engagement. This gap in the literature provided the rationale for the present study. Therefore, the present study sought to answer the following research question:

Does transformational teaching influence students' academic optimism and academic engagement?

Method

Sample and Sampling Method

The present study was applied in terms of its purpose and employed a quasi-experimental design with a pretest–posttest control group. The target population consisted of all sixth-grade male elementary school students in Khash County, Iran, during the 2023–2024 academic year. A cluster random sampling method was employed because access to the complete list of students was not available. Schools were considered as sampling clusters, and one elementary school (Mahdi Mavoud Elementary School) was randomly

selected. Subsequently, 50 sixth-grade male students were recruited from the selected school and randomly assigned to either the experimental group (n = 25) or the control group (n = 25).

Tools Used

Academic Optimism Questionnaire: Academic optimism was measured using the Academic Optimism Questionnaire developed by Tschannen-Moran et al. (2013). The questionnaire consists of 28 items measuring three dimensions: Academic Emphasis (8 items), Students' Trust in Teachers (10 items), and School Identification (10 items). Responses are rated on a five-point Likert scale ranging from 1 (*Very Low*) to 5 (*Very High*). Items 17, 23, and 28 are reverse scored. The total score ranges from 28 to 140, with higher scores indicating higher levels of academic optimism. Previous studies have confirmed the questionnaire's satisfactory validity and reliability.

Academic Engagement Questionnaire: Academic engagement was assessed using the Student Engagement Questionnaire developed by Fredricks and Blumenfeld (2004). The instrument contains 15 items measuring three dimensions: Behavioral Engagement, Emotional Engagement, and Cognitive Engagement. Responses are rated on a five-point Likert scale ranging from 1 (*Never*) to 5 (*Always*), yielding total scores between 15 and 75. Previous research has reported satisfactory psychometric properties for this instrument, with Cronbach's alpha coefficients ranging from .77 to .92, indicating acceptable reliability.

Transformational Teaching Package: The intervention was implemented using a Transformational Teaching Package, which consisted of an instructional guide comprising sixteen teaching principles and strategies based on the transformational teaching approach. The package emphasized key instructional components such as enhancing students' motivation, promoting intellectual stimulation, fostering effective teacher–student interactions, addressing individual differences, encouraging active participation, facilitating collaborative learning, and developing learner autonomy. The teacher implemented these instructional principles with the experimental group, whereas the control group received science instruction through the conventional teaching approach.

Procedure

After obtaining the necessary permissions from the local educational authorities and the school administration, participants were selected and randomly assigned to the experimental and control groups. Before the intervention, both groups completed the Academic Optimism Questionnaire and the Academic Engagement Questionnaire as pretest measures.

The experimental group then participated in an eight-session science course delivered according to the principles of transformational teaching. Throughout the intervention, the teacher implemented the sixteen instructional strategies included in the transformational teaching package, emphasizing student motivation, critical thinking, problem-solving, collaborative learning, continuous teacher–student interaction, constructive feedback, individualized instruction, and students' responsibility for learning. In contrast, the control group received the same science curriculum using the conventional teacher-centered instructional approach without exposure to transformational teaching strategies.

Upon completion of the eight instructional sessions, both groups completed the Academic Optimism Questionnaire and the Academic Engagement Questionnaire as posttest measures. Before conducting the main analyses, the assumptions of multivariate analysis of covariance (MANCOVA), including normality, homogeneity of variances, and homogeneity of covariance matrices, were examined. The collected data were then analyzed using one-way multivariate analysis of covariance (MANCOVA) in IBM SPSS Statistics (Version 24), with the level of statistical significance set at $p < .05$.

Result

To examine the effect of transformational science teaching on sixth-grade students' academic optimism and academic engagement, while controlling for pretest scores, one-way analysis of covariance (ANCOVA) was employed to compare the overall scores of each dependent variable between the experimental and control groups. In addition, multivariate analysis of covariance (MANCOVA), followed by Tests of Between-Subjects Effects, was conducted to examine differences in the subscales of each construct. The results are presented separately for each dependent variable.

First, posttest scores of academic optimism were compared between the experimental and control groups after controlling for pretest scores using one-way ANCOVA. The results are presented in Table 1.

Table 1. Results of the ANCOVA comparing posttest academic optimism scores between the experimental and control groups

Source	Sum of Squares	df	Mean Square	F	*p*	Partial η²
Pretest	25.333	1	25.333	0.419	.520	.009
Group (Academic Optimism)	4602.543	1	4602.543	76.08	< .001	.618
Error	2843.227	47	60.494			
Total	380571.000	50				

As shown in Table 1, the effect of the pretest was not statistically significant, $F(1, 47) = 0.419$, $p = .520$. However, after controlling for pretest scores, a statistically significant difference was observed between the two groups in posttest academic optimism scores, $F(1, 47) = 76.08$, $p < .001$, with a large effect size ($\eta^2 = .618$). This finding indicates that approximately 61.8% of the variance in posttest academic optimism scores was explained by the instructional method. Given the higher mean score of the experimental group, it can be concluded that transformational science teaching had a positive and statistically significant effect on students' academic optimism.

To further examine the effects of the intervention on the dimensions of academic optimism, MANCOVA followed by Tests of Between-Subjects Effects was conducted for the three subscales: Students' Trust in Teachers, Academic Emphasis, and School Identification. The results are reported in Table 2.

Table 2. Tests of Between-Subjects Effects for the dimensions of academic optimism

Variable	Source	Sum of Squares	df	Mean Square	F	*p*	Partial η²
Students' Trust in Teachers	Between Groups	453.755	1	453.755	55.10	< .001	.550
	Within Groups	370.518	45	8.234			
	Total	45532.00	50				
Academic Emphasis	Between Groups	461.773	1	461.773	35.09	< .001	.438
	Within Groups	592.157	45	13.159			
	Total	36556.00	50				
School Identification	Between Groups	475.371	1	475.371	57.15	< .001	.559
	Within Groups	374.299	45	8.318			
	Total	45639.00	50				

As presented in Table 2, statistically significant differences were found between the experimental and control groups across all three dimensions of academic optimism ($p < .001$). The effect sizes for Students'

Trust in Teachers, Academic Emphasis, and School Identification were .550, .438, and .559, respectively, indicating moderate to large intervention effects. Because the experimental group obtained higher posttest mean scores on all three dimensions, transformational teaching was found to have a positive and statistically significant effect on each component of academic optimism.

Next, posttest academic engagement scores were compared between the two groups using one-way ANCOVA while controlling for pretest scores. The findings are presented in Table 3.

Table 3. Results of the ANCOVA comparing posttest academic engagement scores between the experimental and control groups

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.	Effect Size (η^2)
Pretest	56.660	1	56.660	1.760	.190	.036
Academic Engagement	1307.615	1	1307.615	40.620	.001	.464
Error	1512.860	47	32.189			
Total	84368.000	50				

As shown in Table 3, the pretest effect was not statistically significant, $F(1, 47) = 1.760$, $p = .190$. However, after controlling for pretest scores, a statistically significant difference was found between the experimental and control groups in posttest academic engagement scores, $F(1, 47) = 40.62$, $p < .001$, with an effect size of $\eta^2 = .464$. This result indicates that approximately 46.4% of the variance in students' academic engagement was attributable to the transformational teaching intervention. Considering the higher mean score of the experimental group, it can be concluded that transformational science teaching significantly enhanced students' academic engagement.

Finally, to investigate the effects of the intervention on the three dimensions of academic engagement—Behavioral Engagement, Emotional Engagement, and Cognitive Engagement—MANCOVA followed by Tests of Between-Subjects Effects was conducted. The results are presented in Table 4

Table 4. Tests of Between-Subjects Effects for the dimensions of academic engagement

Variable	Source	Sum of Squares	df	Mean Square	F	Sig.	Effect Size (η^2)
Behavioral Engagement	Between Groups	148.984	1	148.984	35.90	.001	.444
	Within Groups	186.709	45	4.149			
	Total	2499.000	50				
Emotional Engagement	Between Groups	197.512	1	197.512	34.61	.001	.435
	Within Groups	256.765	45	5.706			
	Total	10010.000	50				
Cognitive Engagement	Between Groups	144.000	1	144.000	35.26	.001	.439
	Within Groups	145.482	45	3.233			
	Total	9011.000	50				

As shown in Table 4, statistically significant differences were observed between the experimental and control groups across all three dimensions of academic engagement ($p < .001$). The corresponding effect sizes were .444 for Behavioral Engagement, .435 for Emotional Engagement, and .439 for Cognitive Engagement. Given the consistently higher posttest mean scores of the experimental group, the findings indicate that transformational teaching exerted a positive and statistically significant effect on the behavioral, emotional, and cognitive dimensions of students' academic engagement.

Discussion & Conclusion

The present study aimed to investigate the effect of transformational science teaching on the academic optimism and academic engagement of sixth-grade elementary school students. The results of the analysis of covariance indicated that, compared with the conventional teaching approach, transformational teaching had a positive and statistically significant effect on both the overall score of academic optimism and its dimensions (students' trust in teachers, academic emphasis, and school identification), as well as on the overall score of academic engagement and its dimensions (behavioral, emotional, and cognitive engagement). These findings are discussed in light of previous research and relevant theoretical frameworks.

The finding regarding the positive effect of transformational teaching on academic optimism is consistent with the results reported by Amiri (2022) and can be explained within the theoretical framework of academic optimism proposed by Kolofas (2015) and Hoy et al. (2006). According to this framework, academic optimism comprises three interrelated dimensions: students' trust in teachers, academic emphasis, and school identification. In the present study, transformational teaching significantly improved each of these dimensions. By emphasizing individualized consideration and inspirational motivation (Bass et al., 2006; Beauchamp et al., 2010), transformational teaching enables teachers to communicate confidence in students' abilities and to foster positive educational relationships. This interpretation is consistent with the organizational trust model proposed by Tschannen-Moran and Hoy (2000), which highlights the critical role of mutual trust between teachers and students in creating a positive school climate. Furthermore, because academic optimism is grounded in positive cognitive beliefs regarding one's academic capabilities (Carver et al., 2010), the enhancement of students' self-efficacy through transformational teaching—as suggested by Bandura's Self-Efficacy Theory (Bandura, 1997)—may represent one of the primary mechanisms through which this instructional approach strengthens academic emphasis, a finding supported by the significant improvement observed in the present study.

The second major finding demonstrated that transformational teaching significantly enhanced students' academic engagement, consistent with the findings of Samadi et al. (2018). This result can be interpreted based on the three-dimensional model of academic engagement proposed by Fredricks et al. (2004), which conceptualizes engagement as consisting of behavioral, emotional, and cognitive dimensions—the same framework adopted in the present study. According to this model, the intellectual stimulation component of transformational teaching promotes cognitive engagement by encouraging deeper processing of learning materials, whereas individualized consideration strengthens emotional engagement through supportive teacher–student relationships. Likewise, inspirational motivation enhances behavioral engagement by encouraging students' active participation, persistence, and effort. These findings are also consistent with those of Strobel et al. (2011) and Maslach et al. (2001), who emphasized the multidimensional nature of academic engagement and its inverse relationship with academic burnout. Moreover, from the perspective of Self-Determination Theory (Deci & Ryan, 2000) and its application to educational settings by Reeve (2012), teachers who support students' autonomy—a central characteristic of individualized consideration—facilitate the internalization of motivation, thereby promoting greater academic engagement.

An important implication of these findings is that academic optimism and academic engagement may function synergistically rather than independently. As discussed in the literature review (Lohrab-Goleh et al., 2023), academic optimism is itself a significant predictor of academic engagement. Therefore, it can be argued that transformational teaching not only influences academic engagement directly but also strengthens it indirectly through the enhancement of academic optimism, particularly by improving students' trust in teachers and their sense of identification with the school. This interpretation is consistent

with Northouse's (2001) transformational leadership framework, which proposes that leadership first shapes individuals' beliefs and subsequently influences their behaviors. It also aligns with the findings of Barling et al. (1996), who demonstrated that transformational leadership behaviors can be effectively developed through structured educational interventions. Overall, the findings of the present study are consistent with those reported by Bargic et al. (2017), who identified transformational teaching as an effective instructional approach for enhancing learners' psychological and educational outcomes.

From a practical perspective, the findings suggest that transformational teaching can simultaneously enhance students' academic optimism and academic engagement. Accordingly, it is recommended that teacher professional development programs incorporate training on the four core dimensions of transformational teaching—idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration. Such training appears particularly important in educational systems where traditional teacher-centered instructional practices, characterized by extensive teacher talk and limited student participation (Jafreh, 2026), continue to predominate.

Despite its contributions, the present study has several limitations. First, data were collected exclusively through self-report questionnaires, which may be subject to response bias and other limitations associated with self-reported measures. Second, because the sample consisted exclusively of male elementary school students, the generalizability of the findings to female students should be made with caution. Future studies are therefore encouraged to employ multiple data collection methods, such as classroom observations and interviews, and to include both male and female students to improve the external validity and generalizability of the findings.

In conclusion, the findings of the present study demonstrate that transformational science teaching, by fostering dynamic and reciprocal teacher–student interactions and promoting collaborative knowledge construction (Rezaei Sharif, 2014), represents an effective alternative to traditional teacher-centered instructional approaches. By cultivating positive beliefs about school and encouraging students' active involvement in learning across the behavioral, emotional, and cognitive dimensions, transformational teaching can make a substantial contribution to improving both students' academic optimism and academic engagement.

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