

Structural Modeling of Academic Buoyancy Based on Academic Engagement and Perceived Teacher Support: The Mediating Role of Academic Self-Efficacy among Female Upper-Secondary School Students

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ABSTRACT

Objective: The present study aimed to test a structural model of academic buoyancy based on academic engagement and perceived teacher support, with the mediating role of academic self-efficacy among female upper-secondary school students.

Methods and Materials: This applied quantitative study used a descriptive-correlational design and structural equation modeling. The statistical population included all female upper-secondary school students in Babol, Iran, during the 2024 academic year. A sample of 350 students was selected through multistage cluster random sampling. Data were collected using the Academic Buoyancy Questionnaire, Academic Engagement Scale, Perceived Teacher Support Scale, and Self-Efficacy Questionnaire. Data were analyzed using SPSS and AMOS through descriptive statistics, correlation analysis, confirmatory factor analysis, and structural equation modeling.

Findings: The proposed structural model showed acceptable fit to the data: $\chi^2/df = 1.45$, RMSEA = 0.03, CFI = 0.98, NFI = 0.96, GFI = 0.96, and AGFI = 0.94. Academic engagement had a positive and significant direct effect on academic buoyancy ($\beta = 0.12$, $p = .02$). Perceived teacher support also had a positive and significant direct effect on academic buoyancy ($\beta = 0.17$, $p = .001$). Academic self-efficacy had the strongest direct effect on academic buoyancy ($\beta = 0.32$, $p = .001$). In addition, academic self-efficacy significantly mediated the relationship between academic engagement and academic buoyancy ($\beta = 0.138$, $p = .001$) and the relationship between perceived teacher support and academic buoyancy ($\beta = 0.06$, $p = .04$).

Conclusion: Academic buoyancy among female upper-secondary school students is shaped by behavioral engagement, perceived teacher support, and self-efficacy beliefs. The findings suggest that strengthening students' engagement in learning, improving supportive teacher-student relationships, and enhancing academic self-efficacy may help students cope more effectively with everyday academic challenges.

Keywords: academic buoyancy; academic engagement; perceived teacher support; academic self-efficacy; structural equation modeling; female students.

1. Introduction

Students' educational trajectories are shaped not only by major crises or severe disadvantages but also by their responses to the ordinary challenges that repeatedly arise in everyday academic life. Difficult assignments, examination pressure, disappointing grades, competing deadlines, critical feedback, temporary loss of motivation, and difficulties understanding course material are common experiences, particularly during secondary education. Although these challenges may not constitute severe academic adversity, their cumulative effects can undermine students' confidence, engagement, persistence, and psychological adjustment. Students differ considerably in how they respond to such routine pressures. Some recover quickly, modify their strategies, and continue pursuing their academic goals, whereas others become discouraged, withdraw effort, procrastinate, or disengage from school. The construct of academic buoyancy has therefore received increasing attention as an explanatory framework for understanding students' capacity to respond adaptively to the recurring setbacks of ordinary educational life (Raji, 2025; Tammeh et al., 2025; Xiao & Liu, 2025).

Academic buoyancy refers to an individual's ability to manage, overcome, and recover from the routine difficulties and pressures associated with learning. It encompasses adaptive responses to experiences such as poor grades, examination stress, demanding coursework, short-term motivational decline, and negative academic feedback. Academic buoyancy is conceptually distinct from academic resilience. Whereas resilience generally concerns successful adaptation in the context of severe, chronic, or extraordinary adversity, academic buoyancy focuses on the relatively minor but frequent setbacks encountered by most students. This distinction is educationally important because everyday difficulties are far more common than extreme adversities and may progressively influence students' academic development. Research has shown that academic buoyancy is associated with adaptive motivation, persistence, engagement, perceived support, and the capacity to maintain achievement despite minor academic setbacks (Bostwick et al., 2022).

Academic buoyancy is particularly relevant during upper-secondary education. Students at this stage are confronted with increasing curricular demands, high-stakes examinations, intensified social comparison, decisions regarding future education, and expectations from teachers and families. Adolescence is also characterized by important

cognitive, emotional, and social changes that may heighten sensitivity to success, failure, evaluation, and interpersonal feedback. Consequently, routine academic setbacks can affect not only achievement but also students' perceptions of competence and their willingness to remain involved in schoolwork. Students with greater academic buoyancy are more likely to perceive academic problems as temporary, controllable, and manageable. They may respond to difficulty by increasing effort, revising learning strategies, seeking assistance, and regulating negative emotions. In contrast, students with low academic buoyancy may interpret setbacks as evidence of enduring inability and may respond through avoidance, helplessness, procrastination, or reduced participation.

The educational importance of academic buoyancy has led researchers to investigate the personal, motivational, and contextual resources that contribute to its development. Evidence suggests that buoyancy is not simply a fixed personality characteristic; rather, it can be shaped by students' beliefs, learning experiences, emotional capacities, motivational orientations, and relationships within the educational environment. For example, growth mindset and emotional intelligence have been identified as psychological resources that enable students to reinterpret academic difficulties constructively, regulate emotional reactions, and sustain adaptive effort (Liu, 2025). Similarly, intrapersonal strengths and interpersonal support may foster academic buoyancy through psychological capital and growth-oriented beliefs, indicating that the capacity to recover from academic setbacks emerges from the interaction of internal and environmental resources (Xiao & Liu, 2025).

Among the variables likely to contribute to academic buoyancy, academic engagement occupies a central position. Academic engagement refers to students' active, sustained, and purposeful involvement in learning and school-related activities. It is commonly conceptualized as a multidimensional construct involving behavioral, emotional, cognitive, and agentic components. Behavioral engagement concerns participation, attention, effort, persistence, and compliance with academic activities. Emotional engagement refers to students' interest, enjoyment, enthusiasm, sense of belonging, and affective connection to learning. Cognitive engagement involves the use of deep learning strategies, self-regulation, planning, monitoring, and investment in understanding academic content. Agentic engagement refers to students' constructive contribution to the learning process through asking questions, expressing preferences, seeking

clarification, and attempting to influence instructional conditions.

Engagement may promote academic buoyancy because engaged students maintain closer psychological and behavioral contact with academic tasks, even when those tasks become difficult. Behavioral participation and persistence increase students' opportunities to practice skills, correct errors, and experience improvement. Cognitive engagement enables them to adopt more effective strategies when their initial approach is unsuccessful. Emotional engagement sustains interest and reduces the likelihood that temporary frustration will lead to withdrawal. Agentic engagement facilitates help-seeking and allows students to obtain additional guidance or clarification when facing academic obstacles. Thus, academic engagement may provide students with a repertoire of adaptive responses that helps them remain involved in learning despite routine setbacks.

Empirical research supports a close relationship between engagement and academic buoyancy. Academic hope has been found to predict academic engagement partly through students' buoyancy, suggesting that students who remain adaptive under academic pressure are better able to sustain their involvement in school activities (Feizi Shirabadi et al., 2024). In university settings, academic buoyancy has also been identified as a mediator between growth mindset and both academic engagement and psychological well-being, indicating that students' capacity to recover from academic difficulty may translate constructive beliefs into sustained educational participation (Suharsono, 2024). Research on students learning English as a foreign language similarly emphasizes that academic motivation and interest are closely related to academic buoyancy, because motivated and interested learners are more willing to persist when learning becomes difficult (Xu & Wang, 2022). Collectively, these findings suggest that engagement and buoyancy may reinforce one another through reciprocal motivational and behavioral processes.

Academic buoyancy may also protect students against maladaptive academic behaviors. Procrastination, for example, frequently develops when students perceive academic demands as overwhelming, doubt their competence, or attempt to avoid anticipated failure. Training focused on academic buoyancy has been shown to reduce academic procrastination among female high-school students, demonstrating that strengthening students' ability to manage ordinary setbacks may help them approach academic responsibilities more adaptively (Emami

Khotbesara et al., 2024). This finding is especially relevant to female secondary-school students, who may experience simultaneous academic, interpersonal, and future-oriented pressures. When students acquire the capacity to interpret academic difficulty as manageable, they may be less inclined to postpone tasks and more likely to maintain active engagement.

Although engagement reflects students' active participation, academic functioning is also substantially shaped by the social environment in which learning occurs. Within schools, teachers are among the most influential sources of academic and emotional support. Perceived teacher support refers to students' beliefs that teachers care about them, respect them, remain accessible, provide instructional guidance, communicate appropriate expectations, recognize effort, and assist them when difficulties arise. The influence of teacher support depends not only on teachers' actual behavior but also on how students interpret that behavior. When students perceive teachers as supportive, they are more likely to experience the classroom as psychologically safe, predictable, and conducive to learning.

Perceived teacher support may strengthen academic buoyancy through several mechanisms. First, supportive teachers can help students reinterpret mistakes and disappointing outcomes as normal components of learning rather than definitive evidence of inability. Second, they can provide instrumental assistance, such as clarification, feedback, strategy instruction, and guidance regarding academic tasks. Third, emotional encouragement from teachers may reduce fear of evaluation and protect students against discouragement. Fourth, clear expectations and constructive feedback can increase students' sense of direction and control. Through these processes, teacher support may reduce the emotional impact of academic setbacks and help students resume effective academic behavior.

Cross-national research has demonstrated that teachers' instrumental and emotional support contributes to students' academic buoyancy, engagement, and academic skills across different educational levels and cultural contexts (Granziera et al., 2022). Instrumental support provides students with the practical resources needed to solve academic problems, whereas emotional support communicates care, acceptance, and confidence in students' capacities. Both forms of support can be particularly influential during adolescence, when students may be highly sensitive to evaluation and interpersonal recognition. When teachers respond

constructively to mistakes and maintain confidence in students' potential, they create conditions in which academic challenges become less threatening and more manageable.

The relationship between social support and engagement may also operate through academic buoyancy and emotional processes. Research among university students has shown that perceived social support can influence academic engagement through the sequential mediating roles of academic buoyancy and academic emotions, with personal characteristics such as proactive personality further shaping these relationships (Hou & Phromphithakul, 2024). Although social support may originate from different sources, teachers constitute a particularly immediate and academically relevant source of assistance in secondary schools. Their support is directly connected to classroom demands, assessment, feedback, and learning strategies. Therefore, students who perceive stronger teacher support may be more capable of managing negative academic emotions and remaining engaged after difficulty.

In addition to engagement and teacher support, academic self-efficacy is a fundamental psychological resource in explaining academic buoyancy. Academic self-efficacy refers to students' beliefs in their capability to organize and execute the actions necessary to complete academic tasks and attain desired educational outcomes. It includes confidence in understanding lessons, solving problems, completing assignments, preparing for examinations, using effective strategies, and overcoming academic difficulties. Self-efficacy does not merely reflect actual skill; rather, it concerns how students judge their ability to use their skills under particular conditions. These judgments influence the goals students select, the amount of effort they invest, the strategies they use, their emotional reactions, and how long they persist when confronted with obstacles.

Students with high academic self-efficacy are more likely to approach difficult tasks as challenges that can be mastered. They tend to sustain effort, seek feedback, regulate negative emotions, and modify ineffective learning strategies. By contrast, students with low self-efficacy may avoid challenging tasks, become anxious, reduce effort, and abandon academic activities when success is not immediate. These contrasting responses are directly relevant to academic buoyancy. To recover from an everyday setback, students must believe that their actions can improve the situation. Without such a belief, poor performance may generate withdrawal rather than adaptive problem solving.

Research consistently supports the association between self-efficacy and academic buoyancy. Among secondary-

school students, academic self-efficacy has been found to play an important role in the relationship between academic buoyancy and mathematics achievement, indicating that confidence in academic capability may help translate adaptive responses to setbacks into improved performance (Weißenfels et al., 2023). Academic buoyancy has also been predicted by academic self-efficacy and assertiveness, suggesting that students who trust their academic abilities and can express their needs effectively are better equipped to manage routine educational pressures (Raji, 2025). Similarly, research among gifted students has shown that academic self-efficacy mediates the relationship between critical thinking and academic buoyancy, emphasizing the importance of efficacy beliefs in converting cognitive capacities into adaptive responses to academic challenges (Rezaei Oshiani et al., 2024).

The relevance of self-efficacy extends across educational populations. Among doctoral students, academic motivation, academic buoyancy, and academic self-efficacy have been identified as mediating mechanisms associated with academic performance, illustrating that perceived capability remains important even among advanced learners facing complex academic demands (Guo et al., 2024). Studies of teachers have likewise demonstrated that academic buoyancy and self-efficacy predict work engagement, suggesting that the combination of adaptive coping and efficacy beliefs supports sustained involvement in demanding educational roles (Zhi et al., 2023). These findings indicate that self-efficacy and buoyancy represent closely connected resources across different stages and contexts of education.

Emotional processes also contribute to the development of efficacy and buoyancy. In language-learning contexts, academic emotion regulation has been shown to influence learners' core self-evaluations and academic buoyancy, demonstrating that students' capacity to manage emotional reactions may support both confidence and adaptive academic functioning (Heydarnejad et al., 2022). Related scholarship has emphasized associations among academic buoyancy, ambiguity tolerance, and hopelessness, particularly in educational contexts characterized by uncertainty and recurring professional or instructional challenges (Huang, 2022). Students who can tolerate uncertainty and regulate negative affect may be better able to preserve self-efficacy when outcomes are disappointing or unclear.

Academic self-efficacy may not only predict buoyancy directly but may also explain how engagement and perceived

teacher support are converted into adaptive academic responses. Engaged students participate more actively, practice academic skills more frequently, receive additional feedback, and accumulate mastery experiences. These experiences can strengthen their belief that they are capable of handling schoolwork. Once self-efficacy develops, students may become more persistent and less vulnerable to discouragement. Thus, academic engagement may contribute to academic buoyancy partly by increasing students' confidence in their ability to manage academic demands.

A similar mediating process may occur in the relationship between perceived teacher support and academic buoyancy. Teachers influence self-efficacy by providing credible encouragement, constructive feedback, manageable learning opportunities, instructional scaffolding, and recognition of improvement. When teachers communicate that difficulties can be overcome and demonstrate confidence in students' abilities, students may gradually internalize these evaluations. Perceived support can therefore be transformed into stronger personal efficacy beliefs, which subsequently help students cope with failure, pressure, and temporary declines in performance. Accordingly, teacher support may affect academic buoyancy both as an external coping resource and as a contextual foundation for developing internal confidence.

More comprehensive models of academic buoyancy increasingly emphasize the interaction of motivational, cognitive, emotional, and personality-related resources. A structural model based on motivational factors has shown that grit, mental toughness, and perceived control can mediate the development of academic buoyancy, suggesting that sustained effort and perceived agency are central to students' adaptive responses (Tammeh et al., 2025). These findings support the view that buoyancy emerges through interconnected processes rather than from a single isolated characteristic. Engagement provides active involvement, teacher support supplies relational and instructional resources, and self-efficacy gives students the confidence needed to use those resources when they encounter difficulty.

Despite growing interest in academic buoyancy, several gaps remain. Much previous research has examined its associations with motivation, achievement, psychological capital, growth mindset, emotional intelligence, or social support separately. Fewer studies have integrated students' active engagement, perceived teacher support, and academic self-efficacy within a single structural model. Moreover,

evidence from female upper-secondary school students in Iran remains limited, even though this population faces important developmental, educational, and future-oriented pressures. Examining these variables simultaneously can clarify whether engagement and teacher support influence buoyancy directly, whether their effects operate through self-efficacy, and which factor has the strongest association with students' ability to manage everyday academic setbacks.

Understanding these pathways has important implications for educational practice. If engagement contributes to buoyancy, schools can promote active learning, student participation, strategic learning, and agentic classroom behavior. If perceived teacher support is influential, professional development can help teachers provide more consistent emotional encouragement, constructive feedback, accessibility, and guidance. If academic self-efficacy serves as a mediating mechanism, interventions should not only provide external support but also ensure that students internalize successful experiences and develop confidence in their capability to overcome academic challenges. An integrated model can therefore offer a more precise basis for school counseling, teacher education, and programs designed to prevent disengagement and maladaptive responses to routine academic pressure.

Accordingly, the present study aimed to test a structural model of academic buoyancy based on academic engagement and perceived teacher support, with the mediating role of academic self-efficacy among female upper-secondary school students.

2. Methods and Materials

2.1. Study Design and Participants

The present study was an applied, quantitative, descriptive-correlational study conducted using structural equation modeling. The purpose of the study was to test a structural model of academic buoyancy based on academic engagement and perceived teacher support, with the mediating role of academic self-efficacy among female upper-secondary school students. In the proposed model, academic engagement and perceived teacher support were considered exogenous variables, academic self-efficacy was considered the mediating variable, and academic buoyancy was considered the endogenous variable. The study was cross-sectional, and all variables were measured at one point in time using self-report questionnaires.

The statistical population consisted of all female students enrolled in upper-secondary schools in Babol, Iran, during the 2024 academic year. According to the records of the Department of Education, the population included 8,612 female upper-secondary school students. The final sample consisted of 350 students. This sample size was considered appropriate for structural equation modeling because models with latent variables and multiple observed indicators require a sufficiently large sample to obtain stable parameter estimates and reliable model fit indices.

Participants were selected using multistage cluster random sampling. First, among the four educational districts of Babol, district two was selected randomly. Then, among 13 public female upper-secondary schools in this district, four schools were selected. Finally, all students in the selected schools were invited to participate in the study and complete the research questionnaires. This sampling method was appropriate because the target population was distributed across different schools and educational districts. Cluster sampling made it possible to access a large and diverse group of students while maintaining the feasibility of data collection in a school-based setting.

The inclusion criteria were: being a female upper-secondary school student in Babol during the 2024 academic year, studying in one of the selected schools, willingness to participate in the study, and ability to understand and complete the questionnaires. The exclusion criteria were: unwillingness to continue participation, incomplete questionnaires, careless or patterned responses, and failure to complete one or more of the main research instruments. Questionnaires with substantial missing data or invalid response patterns were excluded from the final analysis.

After approval of the research proposal by the academic supervisors and the university research council, the researcher obtained the necessary permission from the Department of Education in Babol. A list of female upper-secondary schools in Babol was then obtained. Among the four educational districts of Babol, district two was randomly selected. Then, four public female upper-secondary schools were selected from among 13 schools in this district. After coordination with school administrators, the questionnaires were administered to students in the selected schools. Before data collection, the purpose of the study was explained to students. They were informed that participation was voluntary, that their responses would remain confidential, and that the data would be analyzed only at the group level. The questionnaires were completed individually in the school setting. Students were asked to

answer all items honestly and carefully. After the questionnaires were collected, they were reviewed for completeness. Questionnaires with incomplete responses, missing data, or invalid response patterns were excluded from the dataset. The final data were then entered into statistical software for analysis.

2.2. Measures

Academic buoyancy was assessed using the Academic Buoyancy Questionnaire developed by Martin and Marsh (2008). This questionnaire includes 6 items and measures students' ability to successfully deal with everyday academic setbacks and routine school-related challenges. The items are scored on a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. The total score is obtained by summing all items. Scores range from 6 to 30, and higher scores indicate higher academic buoyancy. In the original study, the Cronbach's alpha coefficient of the questionnaire was reported as .89. In the present study, the reliability of the scale was .71 based on Cronbach's alpha.

Academic engagement was measured using the Academic Engagement Scale developed by Reeve (2013). This instrument includes 17 items and four subscales: behavioral engagement, agentic engagement, cognitive engagement, and emotional engagement. The behavioral engagement subscale includes items 1 to 4, the agentic engagement subscale includes items 5 to 9, the cognitive engagement subscale includes items 10 to 13, and the emotional engagement subscale includes items 14 to 17. The items are scored on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. The questionnaire has no reverse-scored items. The total score is obtained by summing all items, with scores ranging from 17 to 119. Higher scores indicate greater academic engagement. Reeve (2013) reported Cronbach's alpha coefficients of .86 for behavioral engagement, .86 for agentic engagement, .84 for cognitive engagement, and .90 for emotional engagement. In the present study, the Cronbach's alpha coefficient for the total academic engagement scale was .84.

Perceived teacher support was assessed using the Teacher Support Scale developed by Metheny et al. (2008). This self-report instrument includes 21 items and measures students' perceptions of support received from teachers. The scale includes four subscales: guidance, positive regard, expectations, and accessibility. The guidance subscale assesses students' perception of teachers' academic guidance and instructional support. The positive regard

subscale measures the extent to which students perceive teachers as caring and respectful. The expectations subscale assesses students' perceptions of teachers' academic expectations, and the accessibility subscale measures students' perception of teachers' availability. The items are scored on a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. Total scores range from 21 to 105, and higher scores indicate greater perceived teacher support. Metheny et al. (2008) reported a Cronbach's alpha coefficient of .96 for the total scale. In the present study, the reliability of the scale was .71 based on Cronbach's alpha.

Academic self-efficacy was assessed using the Self-Efficacy Questionnaire developed by Muris (2001). This questionnaire is designed for children and adolescents aged 7 to 18 years and includes 23 items. The questionnaire includes three subscales: social self-efficacy, academic self-efficacy, and emotional self-efficacy. Social self-efficacy includes items 1 to 8, academic self-efficacy includes items 9 to 16, and emotional self-efficacy includes items 17 to 23. The items are scored on a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. Scores range from 23 to 115, and higher scores indicate higher self-efficacy. Muris (2001) reported a Cronbach's alpha coefficient of .70 for the total scale, .78 for social self-efficacy, .87 for academic self-efficacy, and .80 for emotional self-efficacy. In the present study, the Cronbach's alpha coefficient for the total scale was .79.

2.3. Data Analysis

Data were analyzed using SPSS and AMOS. First, descriptive statistics, including frequency, percentage, mean, standard deviation, skewness, and kurtosis, were used to describe participants' demographic characteristics and the main research variables. Before testing the structural model, data screening was conducted. Missing data were identified and managed. Outliers were examined. The assumptions of structural equation modeling were also assessed, including univariate and multivariate normality, linearity of relationships among variables, and absence of multicollinearity among predictor variables.

Pearson correlation coefficients were used to examine the bivariate relationships among academic buoyancy, academic engagement, perceived teacher support, and academic self-efficacy. Then, structural equation modeling was used to test the proposed model. The structural model examined the direct effects of academic engagement and perceived teacher support on academic buoyancy, the direct effects of

academic engagement and perceived teacher support on academic self-efficacy, and the direct effect of academic self-efficacy on academic buoyancy. The mediating role of academic self-efficacy in the relationships between academic engagement and academic buoyancy and between perceived teacher support and academic buoyancy was also examined. Model fit was evaluated using multiple fit indices, including chi-square divided by degrees of freedom, goodness-of-fit index, comparative fit index, Tucker-Lewis index, root mean square error of approximation, and standardized root mean square residual. The significance of direct and indirect paths was evaluated at the .05 level.

3. Findings and Results

The sample consisted of 350 female upper-secondary school students in Babol, Iran. The mean age of the participants was 16.40 years with a standard deviation of 0.935. The youngest participant was 15 years old and the oldest participant was 18 years old. Regarding mothers' educational level, 52 mothers (14.9%) had elementary education, 68 (19.4%) had a diploma, 109 (31.1%) had an associate degree, 72 (20.6%) had a bachelor's degree, and 49 (14%) had a master's degree or higher. Regarding fathers' educational level, 35 fathers (10%) had elementary education, 77 (22%) had a diploma, 91 (26%) had an associate degree, 95 (27.1%) had a bachelor's degree, and 52 (14.9%) had a master's degree or higher. Regarding mothers' occupation, 156 mothers (44.6%) were homemakers, 71 (20.3%) were employees, 72 (20.6%) worked in educational occupations, and 51 (14.6%) were classified in other occupational categories. Regarding fathers' occupation, 63 fathers (18%) were workers, 81 (23.1%) were employees, 63 (18%) were self-employed, 81 (23.1%) worked in educational occupations, and 62 (17.7%) were classified in other occupational categories.

Descriptive statistics were calculated for academic engagement, perceived teacher support, academic self-efficacy, academic buoyancy, and their subscales. The mean score of total academic engagement was 67.90 with a standard deviation of 16.30. Among the components of academic engagement, emotional engagement had the highest mean score, and behavioral engagement and agentic engagement had similar mean scores. The mean score of total perceived teacher support was 62.90 with a standard deviation of 13.60. Among its components, guidance had the highest mean score, followed by expectations, positive regard, and accessibility. The mean score of total academic

self-efficacy was 69.00 with a standard deviation of 15.80. The mean score of academic buoyancy was 17.90 with a standard deviation of 4.57. The skewness and kurtosis values of all variables were within the acceptable range of -3 to +3,

indicating that the distributions of the variables were approximately normal and appropriate for subsequent parametric analyses and structural equation modeling.

Table 1

Descriptive Statistics of the Main Variables and Subscales

Variable	Mean	SD	Skewness	Kurtosis
Behavioral engagement	15.90	4.46	0.189	-0.135
Agentic engagement	19.90	5.74	0.090	-0.301
Cognitive engagement	16.05	4.43	-0.040	-0.329
Emotional engagement	15.90	4.44	-0.020	-0.050
Total academic engagement	67.90	16.30	0.110	0.070
Guidance	23.90	5.78	0.060	-0.315
Positive regard	14.90	3.87	-0.191	-0.286
Accessibility	8.97	3.77	-0.107	-0.344
Expectations	15.04	2.39	0.028	-0.253
Total perceived teacher support	62.90	13.60	-0.030	-0.388
Social self-efficacy	23.90	6.06	0.090	-0.263
Academic self-efficacy	24.03	6.06	0.020	0.040
Emotional self-efficacy	21.00	5.39	-0.030	-0.596
Total academic self-efficacy	69.00	15.80	0.070	-0.157
Academic buoyancy	17.90	4.57	0.030	-0.060

Before testing the structural model, data screening was conducted. Missing data were identified in several subscales, including academic engagement, perceived teacher support, academic self-efficacy, and academic buoyancy. Missing values were replaced using the median replacement method. Outliers were also examined using standardized Z scores. Values outside the acceptable range were identified and replaced with the mean of the corresponding variable. After data screening, the dataset was considered appropriate for structural equation modeling. The assumption of multicollinearity was examined using tolerance and variance inflation factor values. The tolerance values ranged from 0.344 to 0.459, and the VIF values ranged from 2.17 to 2.90. Since all VIF values were below 10, there was no evidence of severe multicollinearity among the predictor variables.

The proposed structural model was tested using structural equation modeling. The results showed that the model had an acceptable fit to the data. The chi-square divided by degrees of freedom was 1.45, which was below the recommended threshold of 3. The root mean square error of approximation was 0.03, indicating a favorable approximation error. The comparative fit index was 0.98, the normed fit index was 0.96, the goodness-of-fit index was 0.96, and the adjusted goodness-of-fit index was 0.94. Since all these indices were above 0.90, the overall model fit was considered acceptable. Therefore, the structural model of academic buoyancy based on academic engagement and perceived teacher support, with the mediating role of academic self-efficacy, was supported.

Table 2

Fit Indices of the Structural Model

Fit index	Obtained value	Acceptable criterion	Interpretation
χ^2/df	1.45	< 3	Acceptable
RMSEA	0.03	< 0.10	Acceptable
CFI	0.98	> 0.90	Acceptable
NFI	0.96	> 0.90	Acceptable
GFI	0.96	> 0.90	Acceptable
AGFI	0.94	> 0.90	Acceptable

The results of the measurement model showed that all observed indicators had significant factor loadings on their corresponding latent variables. The standardized factor loading of behavioral engagement was 0.82, agentic engagement was 0.79, cognitive engagement was 0.79, and emotional engagement was 0.81. These results showed that the components of academic engagement adequately represented the latent construct. For perceived teacher support, the standardized factor loading of guidance was

0.84, positive regard was 0.79, accessibility was 0.80, and expectations was 0.78. These findings indicated that the components of teacher support had adequate and significant loadings. For academic self-efficacy, the standardized factor loading of social self-efficacy was 0.83, academic self-efficacy was 0.83, and emotional self-efficacy was 0.87. All factor loadings were significant at the .001 level. These results confirmed the adequacy of the measurement model.

Table 3

Standardized Factor Loadings of the Measurement Model

Latent variable	Indicator	Standardized loading	p
Academic engagement	Behavioral engagement	0.82	.001
Academic engagement	Agentic engagement	0.79	.001
Academic engagement	Cognitive engagement	0.79	.001
Academic engagement	Emotional engagement	0.81	.001
Perceived teacher support	Guidance	0.84	.001
Perceived teacher support	Positive regard	0.79	.001
Perceived teacher support	Accessibility	0.80	.001
Perceived teacher support	Expectations	0.78	.001
Academic self-efficacy	Social self-efficacy	0.83	.001
Academic self-efficacy	Academic self-efficacy	0.83	.001
Academic self-efficacy	Emotional self-efficacy	0.87	.001

The first direct path examined the effect of academic engagement on academic buoyancy. The results showed that academic engagement had a positive and significant direct effect on academic buoyancy, $\beta = 0.12$, $t = 2.22$, $p = .02$. Therefore, students with higher academic engagement reported higher academic buoyancy. This finding supported the first hypothesis. The second direct path examined the effect of perceived teacher support on academic buoyancy. The results showed that perceived teacher support had a positive and significant direct effect on academic buoyancy, $\beta = 0.17$, $t = 3.40$, $p = .001$. Therefore, students who

perceived greater support from their teachers showed higher academic buoyancy. This finding supported the second hypothesis. The third direct path examined the effect of academic self-efficacy on academic buoyancy. The results showed that academic self-efficacy had a positive and significant direct effect on academic buoyancy, $\beta = 0.32$, $t = 4.98$, $p = .001$. Therefore, students with stronger self-efficacy beliefs showed greater ability to deal with everyday academic setbacks. This finding supported the direct effect of self-efficacy on academic buoyancy.

Table 4

Direct Effects on Academic Buoyancy

Criterion variable	Predictor	Effect type	β	t	p
Academic buoyancy	Academic engagement	Direct	0.12	2.22	.02
Academic buoyancy	Perceived teacher support	Direct	0.17	3.40	.001
Academic buoyancy	Academic self-efficacy	Direct	0.32	4.98	.001

The mediating role of academic self-efficacy was examined using the Sobel test. The results showed that academic self-efficacy significantly mediated the relationship between academic engagement and academic buoyancy. The standardized indirect effect of academic

engagement on academic buoyancy through academic self-efficacy was $\beta = 0.138$, $z = 2.84$, $p = .001$. Therefore, the indirect effect was significant, and the mediating role of academic self-efficacy in the relationship between academic engagement and academic buoyancy was confirmed. The

results also showed that academic self-efficacy significantly mediated the relationship between perceived teacher support and academic buoyancy. The standardized indirect effect of perceived teacher support on academic buoyancy through

academic self-efficacy was $\beta = 0.06$, $z = 2.01$, $p = .04$. Therefore, perceived teacher support influenced academic buoyancy both directly and indirectly through academic self-efficacy.

Table 5

Indirect Effects through Academic Self-Efficacy

Criterion variable	Predictor	Mediator	Effect type	β	z	p
Academic buoyancy	Academic engagement	Academic self-efficacy	Indirect	0.138	2.84	.001
Academic buoyancy	Perceived teacher support	Academic self-efficacy	Indirect	0.06	2.01	.04

The findings supported the proposed structural model. The model fit indices showed that the structural model had acceptable fit. The measurement model also showed that all observed indicators had significant factor loadings on their corresponding latent variables. The direct effects showed that academic engagement, perceived teacher support, and academic self-efficacy positively and significantly predicted academic buoyancy. Among these predictors, academic self-efficacy had the strongest direct effect on academic buoyancy, followed by perceived teacher support and academic engagement.

The indirect effects showed that academic self-efficacy played a significant mediating role in the relationship between academic engagement and academic buoyancy and also in the relationship between perceived teacher support and academic buoyancy. These findings indicate that students who are more engaged in academic activities and perceive greater support from their teachers are more likely to develop stronger self-efficacy beliefs, and these beliefs, in turn, increase their academic buoyancy. Overall, the results suggest that academic buoyancy among female upper-secondary school students is shaped by the interaction of behavioral, relational, and cognitive factors. Academic engagement and perceived teacher support contribute to students' ability to cope with everyday academic challenges, and academic self-efficacy functions as an important psychological mechanism in this process.

4. Discussion

The present study aimed to test a structural model of academic buoyancy based on academic engagement and perceived teacher support, with the mediating role of academic self-efficacy among female upper-secondary school students. The results supported the proposed model and demonstrated an acceptable fit between the hypothesized structural relationships and the empirical data.

Specifically, academic engagement and perceived teacher support had positive and significant direct effects on academic buoyancy, while academic self-efficacy also positively predicted academic buoyancy and showed the strongest direct effect among the variables included in the model. Furthermore, academic self-efficacy significantly mediated both the relationship between academic engagement and academic buoyancy and the relationship between perceived teacher support and academic buoyancy. These findings indicate that students' ability to cope successfully with routine academic setbacks is shaped by the combined contribution of their active involvement in learning, their perceptions of supportive teacher behavior, and their beliefs about their own academic capabilities.

The first finding showed that academic engagement had a positive and significant direct effect on academic buoyancy. This result indicates that students who participate more actively in educational activities, invest greater cognitive and emotional energy in learning, and exercise greater agency in classroom interactions are more capable of dealing with ordinary academic pressures. The finding is consistent with research showing that academic buoyancy and engagement are closely interconnected motivational and behavioral processes. Bostwick et al. demonstrated reciprocal relationships among academic buoyancy, motivation, engagement, and perceived school support, suggesting that students' ability to recover from routine difficulties can sustain engagement, while continued engagement may also strengthen their capacity to respond adaptively to subsequent challenges (Bostwick et al., 2022). The present finding extends this evidence by showing that academic engagement directly contributes to buoyancy among female upper-secondary school students.

The positive effect of academic engagement on buoyancy can be explained by the opportunities that engagement provides for mastery, feedback, self-regulation, and corrective action. Behaviorally engaged students attend to

classroom activities, complete assignments, persist in difficult tasks, and remain involved even when immediate success is not achieved. Cognitive engagement enables students to analyze problems, monitor their understanding, employ alternative learning strategies, and adjust ineffective approaches. Emotional engagement preserves interest, enjoyment, and a sense of connection to learning, thereby reducing the likelihood that frustration will lead to withdrawal. Agentic engagement also allows students to seek clarification, communicate their needs, and influence the instructional process. Together, these dimensions make students less passive in the face of difficulty and increase the probability that they will respond to setbacks through problem solving rather than avoidance.

This interpretation is aligned with the findings of Feizi Shirabadi et al., who showed that academic buoyancy plays an important role in the association between academic hope and academic engagement. Students who expect desirable academic outcomes and believe that they can identify pathways toward their goals are more likely to remain involved in educational activities, particularly when they can manage daily setbacks effectively (Feizi Shirabadi et al., 2024). Similarly, Suharsono found that academic buoyancy mediated the effects of growth mindset on academic engagement and psychological well-being. Students who believe that their abilities can improve through effort may interpret difficulty as an opportunity for development, and academic buoyancy enables this belief to be translated into sustained participation (Suharsono, 2024). Although the direction examined in these studies differs from the direct pathway tested in the present research, the collective evidence supports a dynamic relationship in which engagement and buoyancy reinforce one another.

The finding is also consistent with research emphasizing the roles of motivation and interest in academic buoyancy. Xu and Wang argued that motivated and interested students are more willing to invest effort and maintain their participation when academic tasks become demanding (Xu & Wang, 2022). Engagement can therefore be regarded as the observable and psychological expression of students' motivational investment. Students who remain interested, effortful, and strategically involved in learning are more likely to encounter successful experiences after setbacks. These experiences teach students that academic problems can be managed through persistence and strategy modification. Over time, such experiences may develop a more buoyant academic orientation.

The second finding showed that perceived teacher support had a positive and significant direct effect on academic buoyancy. Thus, students who perceived their teachers as accessible, respectful, encouraging, guiding, and appropriately demanding demonstrated a greater ability to cope with routine academic difficulties. This finding is consistent with the results of Granziera et al., who found that teachers' instrumental and emotional support contributed to students' academic buoyancy, engagement, and academic skills across different national and educational contexts (Granziera et al., 2022). Teacher support therefore appears to provide both practical resources for addressing academic difficulties and emotional resources for maintaining confidence and persistence.

Instrumental support may enhance buoyancy by helping students identify effective responses to difficult lessons, disappointing results, and demanding assignments. Teachers can clarify course content, offer corrective feedback, model appropriate strategies, break complex tasks into manageable components, and direct students toward useful resources. These behaviors increase students' actual capacity to resolve academic problems. Emotional support, in contrast, may reduce the threat associated with mistakes and poor performance. When teachers communicate respect, patience, care, and confidence, students are more likely to interpret failure as a temporary learning experience rather than as a judgment of their personal worth or fixed ability.

The role of teacher support is particularly important during upper-secondary education because students encounter increasing performance expectations and greater concern about future academic and occupational pathways. In such circumstances, teacher feedback can strongly influence students' interpretations of success and failure. Supportive teachers can normalize mistakes, encourage renewed effort, and communicate that competence can develop over time. Consequently, students may become more willing to attempt challenging work, seek assistance, and persist after disappointing outcomes. By contrast, when teachers are perceived as unavailable, overly critical, or indifferent, students may experience routine academic problems as more threatening and may be less inclined to seek help.

The present finding also corresponds with research showing that social support is related to academic engagement through buoyancy and emotional processes. Hou and Phromphithakkul found that perceived social support influenced students' academic engagement through the sequential mediating roles of academic buoyancy and

academic emotions (Hou & Phromphithakkul, 2024). Although their study addressed broader social support among university students, its findings reinforce the proposition that supportive relationships provide psychological security and emotional resources that help students remain adaptive under academic pressure. Within secondary schools, teachers are particularly salient providers of such support because they directly control many aspects of instruction, assessment, feedback, and classroom interaction.

The direct contribution of teacher support is also compatible with research emphasizing the interaction between interpersonal support and students' intrapersonal strengths. Xiao and Liu showed that interpersonal support predicted academic buoyancy through psychological capital and growth mindset (Xiao & Liu, 2025). This suggests that external support is not merely a situational resource; it can also contribute to the development of internal capacities such as confidence, hope, optimism, and adaptive beliefs about personal growth. The present findings similarly indicate that perceived teacher support operates directly on academic buoyancy while also contributing indirectly through academic self-efficacy.

The third finding showed that academic self-efficacy had a positive and significant direct effect on academic buoyancy. Moreover, its standardized direct effect was stronger than the effects of academic engagement and perceived teacher support. This indicates that students' beliefs about their capability to understand lessons, complete assignments, solve academic problems, and attain educational goals constitute a particularly important determinant of their responses to daily academic setbacks. This finding is consistent with Raji's study, in which academic self-efficacy and assertiveness predicted academic buoyancy among secondary-school students (Raji, 2025). Students who believe they possess the necessary capabilities are more likely to respond to difficulty with persistence and active problem solving.

Academic self-efficacy shapes how students interpret academic adversity. Students with strong efficacy beliefs are more likely to view a poor grade, difficult examination, or challenging assignment as a manageable problem that can be addressed through additional effort, improved strategies, or help-seeking. In contrast, students with weak efficacy beliefs may interpret the same event as confirmation that they are incapable of succeeding. Consequently, self-efficacy influences whether academic difficulty produces determination or withdrawal. Because academic buoyancy

involves recovering from routine setbacks, confidence in one's capacity to act effectively is central to this adaptive process.

The finding is supported by Weißenfels et al., who examined the relationship between academic buoyancy and mathematics achievement and highlighted the role of academic self-efficacy among secondary-school students (Weißenfels et al., 2023). Their findings suggest that buoyancy and self-efficacy jointly contribute to effective academic functioning. Rezaei Oshiani et al. likewise found that academic self-efficacy mediated the relationship between critical thinking and academic buoyancy among gifted students (Rezaei Oshiani et al., 2024). Critical thinking may enable students to analyze academic problems, but efficacy beliefs determine whether they trust their ability to apply these skills successfully. The present results similarly confirm that academic self-efficacy is a central explanatory mechanism in academic buoyancy.

Evidence from other educational populations also aligns with this conclusion. Guo et al. found that academic motivation, academic buoyancy, and academic self-efficacy were important mediating mechanisms in explaining doctoral students' academic performance (Guo et al., 2024). Zhi et al. also reported that academic buoyancy and self-efficacy predicted teachers' work engagement, indicating that confidence and adaptive coping remain important across educational roles and developmental levels (Zhi et al., 2023). These studies support the broader conclusion that efficacy beliefs help individuals sustain effort and involvement when confronted with performance-related pressure.

The fourth finding indicated that academic self-efficacy significantly mediated the relationship between academic engagement and academic buoyancy. Academic engagement therefore influenced buoyancy not only directly but also indirectly by strengthening students' beliefs in their academic capabilities. This result can be explained through mastery experiences. Students who participate consistently, apply learning strategies, ask questions, complete challenging tasks, and remain emotionally involved in school have more opportunities to experience progress and success. These experiences provide evidence that their actions can produce desirable academic outcomes and thereby strengthen self-efficacy.

Once self-efficacy is strengthened, students are more likely to interpret future difficulties as manageable and to respond with sustained effort. Engagement thus provides the experiences through which efficacy beliefs develop, while efficacy beliefs transform those experiences into confidence

when subsequent setbacks arise. This interpretation is consistent with evidence showing that academic motivation and interest contribute to buoyancy by encouraging continued investment in learning (Xu & Wang, 2022). It also corresponds with the finding that growth mindset contributes to academic engagement and well-being through buoyancy (Suharsono, 2024). Together, these findings suggest a reciprocal motivational system in which engagement, efficacy, growth-oriented beliefs, and buoyancy support one another.

The mediating role of self-efficacy is also compatible with research on academic emotion regulation. Heydarnejad et al. found that academic emotion regulation influenced learners' core self-evaluations and academic buoyancy (Heydarnejad et al., 2022). Engaged students repeatedly encounter academic emotions, including interest, frustration, anxiety, pride, and disappointment. Through active participation, they have opportunities to learn how to regulate these emotions and maintain effective behavior. Successful emotional and behavioral regulation may strengthen their sense of competence, which subsequently enhances buoyancy. Huang also emphasized the relationships among academic buoyancy, ambiguity tolerance, and hopelessness, indicating that adaptive beliefs are especially important when educational outcomes are uncertain (Huang, 2022).

The fifth finding showed that academic self-efficacy significantly mediated the relationship between perceived teacher support and academic buoyancy. This means that teacher support increased students' buoyancy partly by strengthening their confidence in their academic abilities. Teachers can contribute to efficacy beliefs by offering constructive feedback, expressing confidence in students' potential, recognizing improvement, providing manageable challenges, and creating opportunities for success. When students repeatedly receive messages that they are capable of improvement and are provided with the support needed to succeed, they may gradually internalize these evaluations.

This indirect effect is consistent with Granziera et al.'s finding that instrumental and emotional teacher support contributes to buoyancy, engagement, and academic skills (Granziera et al., 2022). It also aligns with Xiao and Liu's evidence that interpersonal support can promote academic buoyancy through internal psychological resources (Xiao & Liu, 2025). Accordingly, the effect of teacher support is not limited to immediate assistance. Supportive teacher behavior can alter students' self-perceptions, enabling them to

approach future academic problems with greater confidence even when direct assistance is not immediately available.

The overall structural pattern is consistent with models that explain academic buoyancy through multiple interconnected motivational and psychological factors. Tammeh et al. showed that grit, mental toughness, and control mediated relationships between motivational variables and academic buoyancy (Tammeh et al., 2025). Liu similarly demonstrated that growth mindset and emotional intelligence function as important psychological resources for buoyancy (Liu, 2025). The present study adds to this body of evidence by identifying academic self-efficacy as a mechanism linking both an individual learning variable, namely academic engagement, and an environmental variable, namely perceived teacher support, to academic buoyancy.

5. Conclusion

The findings have relevance for preventing maladaptive educational behaviors. Emami Khotbesara et al. showed that academic buoyancy training reduced academic procrastination among female high-school students (Emami Khotbesara et al., 2024). Students who are engaged, supported by teachers, and confident in their abilities may be less likely to postpone difficult tasks because they perceive academic demands as more manageable. The present findings therefore suggest that strengthening engagement, support, and efficacy may enhance buoyancy while simultaneously reducing withdrawal, helplessness, and procrastination.

6. Limitations & Suggestions

The present study had several limitations that should be considered when interpreting its findings. First, the cross-sectional correlational design does not permit definitive causal conclusions, even though the proposed structural model was theoretically coherent and showed acceptable fit. Second, all variables were assessed using self-report questionnaires, which may be affected by social desirability, response styles, inaccurate self-perceptions, or participants' temporary emotional states. Third, the sample was limited to female upper-secondary school students from public schools in one educational district of Babol, which restricts the generalizability of the findings to male students, other educational levels, private schools, and students from different cultural or geographical contexts. Fourth, although the model included important behavioral, relational, and

cognitive predictors, it did not incorporate other potentially relevant variables such as family support, peer relationships, achievement goals, academic anxiety, school climate, socioeconomic status, emotional regulation, or prior academic performance. Finally, replacing missing values and extreme scores may have reduced natural variability in the dataset and should be considered when evaluating the estimates.

Future studies should examine the proposed relationships using longitudinal designs to clarify the temporal ordering and reciprocal effects of academic engagement, perceived teacher support, academic self-efficacy, and academic buoyancy. Experimental and intervention studies could determine whether deliberately increasing engagement, teacher support, or self-efficacy produces measurable changes in buoyancy. Researchers should replicate the model among male students, mixed-gender samples, younger students, university students, and participants from different regions and cultural settings. Multigroup structural equation modeling could be used to compare the model across gender, grade level, academic discipline, socioeconomic status, and school type. Future research should also combine self-report measures with teacher evaluations, classroom observations, academic records, and behavioral indicators of engagement. Including variables such as family support, peer support, academic emotions, growth mindset, psychological capital, grit, school belonging, and achievement goals may provide a more comprehensive explanation of academic buoyancy. Qualitative studies could additionally explore how students personally interpret routine academic setbacks and which teacher behaviors they experience as most supportive.

Schools should develop integrated programs that simultaneously strengthen students' academic engagement, perceptions of teacher support, and academic self-efficacy. Teachers can increase engagement through active learning, meaningful assignments, opportunities for student choice, collaborative activities, constructive questioning, and explicit instruction in self-regulated learning strategies. Supportive classroom environments can be created by responding respectfully to mistakes, providing timely and specific feedback, remaining accessible for academic assistance, communicating realistic expectations, and recognizing effort and improvement. School counselors and educational psychologists can enhance self-efficacy through graded mastery experiences, goal setting, strategy training, peer modeling, progress monitoring, and constructive verbal encouragement. Particular attention should be given to

students who respond to poor grades or difficult tasks through avoidance, procrastination, or rapid disengagement. Coordinated interventions involving teachers, counselors, students, and families may help students interpret academic setbacks as temporary and manageable, sustain their participation in learning, and develop more durable academic buoyancy.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors equally contributed to this article.

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