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Exploring Students' Attributions for Success and Failure in Algebra

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Abstract

Attribution Theory posits that how students explain their academic successes and failures profoundly shapes their motivation, behaviors, and future performance. This study explored students' attributions in the context of Algebra, using Weiner's Attribution Theory (1985) as the guiding framework. Employing a quantitative descriptive-correlational design, the research investigated the internal and external factors that students believe contribute to either their success or failure in Algebra. A total of 54 Environmental Science students from Bohol Island State University – Bilar Campus participated in the study through a validated, researcher-made questionnaire that captured attribution patterns across six key dimensions: ability, effort, task difficulty, support, emotional states, and growth mindset. Findings revealed that students primarily credited their success in Algebra to controllable factors such as sustained effort, instructional quality, and curriculum structure. They strongly endorse growth mindset beliefs, particularly that Algebra skills can improve through practice and strategic learning. In contrast, failure was most commonly attributed to procrastination, poor study habits, and math-related anxiety, rather than an unchangeable lack of ability. Statistical analyses showed no significant difference in attribution patterns based on sex ($p = 0.081$) or academic strand ($p = 0.741$). Moreover, the correlation between attribution scores and actual Algebra performance was very weak and not statistically significant ($r = -0.107$, $p = 0.441$), suggesting that beliefs alone may not directly predict outcomes without the presence of consistent academic behaviors. Overall, the results highlight the importance of nurturing adaptive attributions and emotional resilience in Algebra instruction. Interventions that strengthen effort regulation, address anxiety, and reinforce students' belief in their capacity to improve could bridge the gap between attributional beliefs and academic performance.

Keywords: Attribution Theory, Algebra, academic performance, growth mindset, internal and external attributions

INTRODUCTION

Mathematics education, especially in algebra, poses unique cognitive and emotional hurdles for students at all levels. Algebra is a foundational part of math and a crucial stepping stone to more advanced math and STEM fields. However, it often comes with high rates of student struggles, anxiety, and disengagement (Kundu & Ghose, 2016). While much research has focused on the cognitive aspects of learning algebra, a growing body of evidence highlights the importance of psychological factors, particularly how students perceive and explain their successes and failures. These perceptions can significantly influence their academic outcomes and persistence in math (Matthews & Rivera, 2022). Attribution theory, which was first introduced by Weiner (1985), offers a solid framework for understanding how the way students explain their performance can significantly affect their motivation, self-confidence, and future success in challenging subjects like algebra.

Recent research has shown that students' attribution styles in math are flexible and are shaped by teaching methods, feedback, and the overall classroom environment (Johnson et al., 2022). Students who see their failures as something they can control and change (like not putting in enough effort or using the wrong strategies) rather than as fixed traits (like their natural ability) tend to show more resilience, higher motivation, and better performance over time (Zhang & Williams, 2023). This connection between how students attribute their successes and failures and their achievement in math is powerful in algebra, where the demands of abstract thinking and problem-solving can challenge their beliefs about their math abilities (Ramírez-Uclés et al., 2023).

The current study explores the unique attribution patterns among first-year college students in algebra settings. It looks into how these patterns relate to performance outcomes, levels of engagement, and persistence behaviors. By gaining insight into the attribution landscape of algebra learning, educators can create tailored interventions that encourage adaptive attribution styles, ultimately fostering resilience and success in mathematics. This research is designed to add to the expanding knowledge base on the psychological factors influencing mathematics education and to guide teaching practices that consider both the cognitive and motivational aspects of learning algebra.

LITERATURE REVIEW

Theoretical Foundations of Attribution in Mathematics. Attribution theory provides the central lens through which students' interpretations of success and failure in algebra can be understood. Weiner's Attribution Theory (1985) identifies six dimensions. These are internal ability, internal effort, task difficulty, external support, emotional states, and attribution flexibility that shape how learners explain academic outcomes. These dimensions determine whether students perceive success as controllable, such as through effort and strategies, or uncontrollable, such as innate ability or poor instruction. When learners attribute success to controllable factors, they tend to show greater motivation and resilience in mathematics. This perspective aligns with Dweck's (2006) growth mindset, which emphasizes that intelligence can be developed through persistence and learning from mistakes. In contrast, a fixed mindset leads students to interpret failure as evidence of limited talent, often resulting in disengagement. Bandura's (1997) theory of self-efficacy complements this framework by highlighting the importance of believing in one's capacity to achieve specific tasks. Students with high math self-efficacy are more likely to view setbacks as challenges rather than deficiencies. Similarly, Zimmerman's (2002) theory of self-regulation underscores the role of metacognitive awareness and effort regulation, reinforcing Weiner's emphasis on controllable attributions such as study habits and time management.

Together, these theoretical perspectives establish a strong foundation for understanding how attributional beliefs influence algebra learning. They converge on the idea that students' interpretations of their experiences, whether they see effort, strategies, or ability as the cause of outcomes, directly affect their persistence and achievement. This theoretical groundwork is supported by empirical evidence, such as Heyder et al.'s (2023) longitudinal study, which demonstrated that attribution mechanisms significantly shape students' engagement and success in mathematics. By integrating attribution theory with growth mindset, self-efficacy, and self-regulation, scholars highlight a coherent framework that explains why some students persist in algebra despite challenges while others withdraw. These theories collectively emphasize that fostering adaptive attributional patterns is not only a matter of psychological resilience but also a critical pathway to improving mathematics education outcomes.

Attributions, Math Anxiety, and Emotional Experiences. The relationship between attributional patterns and math anxiety has

been illuminated by recent empirical and neurocognitive studies. Ramirez et al. (2023) demonstrated through neuroimaging that students who consistently attribute their failures in algebra to stable internal factors, such as a perceived lack of ability, exhibit heightened amygdala activation when confronted with mathematical tasks. This neurological response suggests that maladaptive attribution styles intensify anxiety and hinder performance. Similarly, Chang et al. (2020) found that first-year college students with high levels of math anxiety often relied on unhelpful attributional explanations, such as blaming their struggles on innate deficiencies, which reinforced negative emotional experiences. These findings underscore the cyclical nature of attribution and anxiety, where maladaptive beliefs about ability perpetuate emotional distress and disengagement. Intervention studies by Schaeffer et al. (2021) provide further evidence, showing that attribution retraining significantly reduced math anxiety among undergraduates, particularly those who initially displayed the most maladaptive attribution styles. This highlights the potential of targeted interventions to reshape students' explanatory frameworks and alleviate anxiety.

Theoretical perspectives also clarify how attribution processes interact with emotional experiences in mathematics classrooms. Pekrun and Marsh (2023) expanded the control-value theory of achievement emotions, emphasizing that students' attributions regarding their performance directly influence feelings such as pride, shame, or anxiety, which in turn affect engagement and achievement. Goetz et al. (2021) supported this framework by examining real-time emotional states in math lessons, finding that immediate attributional judgments strongly shaped students' emotional responses and participation behaviors. Together, these studies reveal that attribution patterns are not merely cognitive interpretations but are deeply intertwined with emotional regulation and classroom engagement. By fostering adaptive attributional beliefs, educators can help students experience emotions that promote persistence and resilience, thereby breaking the cycle of anxiety and disengagement that often undermines success in algebra.

Cultural and Equity Perspectives in Attribution. Cultural contexts play a significant role in shaping how students interpret their successes and failures in mathematics. Li et al. (2021) examined students from China, the United States, and Germany and found that Chinese learners often emphasized effort as the primary cause of both success and failure. This cultural orientation toward effort may help explain their strong performance in algebra, as it fosters persistence and resilience. Kumar and Jagacinski (2021) extended this perspective by studying immigrant students in the United States. Their findings revealed that these learners frequently adopted healthier attributional patterns, crediting success to hard work and viewing failure as insufficient effort rather than lack of ability. These results highlight how cultural values and family backgrounds influence attributional beliefs and, in turn, academic outcomes.

Equity-focused research has further demonstrated that systemic issues such as stereotyping and discrimination can distort attributional orientations. Shah et al. (2022) conducted qualitative interviews with students from underrepresented groups in mathematics and found that many attributed their struggles to a perceived lack of ability rather than contextual factors such as inadequate preparation or biased learning environments. This tendency reflects how negative social experiences can reinforce maladaptive attribution patterns, ultimately limiting achievement and persistence. Such findings underscore the importance of addressing equity concerns when analyzing attributional beliefs in mathematics education.

Encouragingly, interventions that incorporate culturally responsive teaching have shown promise in reshaping attributional patterns. Zavala and Aguirre (2023) demonstrated that instructional practices designed to affirm

students' cultural identities and challenge deficit-based thinking significantly improved both achievement and persistence in mathematics. By reframing attributions toward controllable factors such as effort and strategies, these approaches not only enhance learning outcomes but also promote equity across diverse student populations. Collectively, these studies emphasize that cultural and equity perspectives are essential for understanding how attributional beliefs develop and for designing interventions that foster inclusive and adaptive learning environments.

Teacher and Parental Influence on Attribution Development. Teachers play a pivotal role in shaping how students interpret their mathematical abilities and experiences. Dweck and Yeager (2019) emphasized that teachers' underlying beliefs about intelligence strongly influence their instructional practices and feedback, which in turn affect students' attributional orientations. When teachers adopt a growth mindset, they tend to highlight effort and strategies in their feedback, encouraging students to view challenges as opportunities for learning rather than as indicators of fixed ability. Sun (2022) provided observational evidence that algebra teachers who normalized mistakes, encouraged diverse problem-solving approaches, and responded positively to difficulties helped students develop constructive attributional beliefs. These practices foster resilience and persistence, reinforcing the idea that success in mathematics is attainable through controllable factors such as effort and strategy use. The evidence suggests that teacher beliefs and classroom practices are central to promoting adaptive attributional patterns that sustain student achievement in algebra.

Parental influence also significantly contributes to the development of students' attributional beliefs. Berkowitz et al. (2021) demonstrated that interventions encouraging parents to communicate positive attributional messages to their children led to improvements in both attributional orientations and mathematics performance. This finding highlights the importance of parental reinforcement in shaping how children interpret success and failure. Similarly, Muenks et al. (2023) examined parent-child interactions during math homework and found that parental comments about effort and strategies predicted changes in children's attributional patterns over time. These results underscore the role of parents as active agents in fostering adaptive beliefs about learning. Together, the studies on teacher and parental influence reveal that attribution development is not solely an individual cognitive process but is deeply embedded in the social contexts of classrooms and homes. By aligning teacher practices and parental communication with growth-oriented perspectives, students are more likely to adopt constructive attributional frameworks that enhance their persistence and success in mathematics.

Interventions and Long-Term Outcomes. Research on attribution interventions has consistently demonstrated their effectiveness in improving students' engagement and achievement in mathematics. Yeager et al. (2022) conducted a large-scale study involving more than twelve thousand students and found that short interventions encouraging learners to view challenges as part of the learning process significantly improved algebra performance and course completion. Brez et al. (2020) provided further evidence through a semester-long program with middle school students that reframed math difficulties as opportunities for growth. This intervention not only enhanced problem-solving skills but also reduced math anxiety, with effects lasting for a year after the program. Burnette et al. (2020) synthesized findings from thirty-nine growth mindset and attribution interventions and concluded that the most effective approaches combined explicit teaching of positive attribution patterns with structured opportunities for students to apply these beliefs in mathematics contexts. These studies collectively highlight the practical value of attribution-focused interventions in fostering persistence and resilience.

METHODOLOGY

Research Design. This study employed a quantitative descriptive-correlational design, which allowed for both description and analysis of relationships. The descriptive aspect focused on understanding how students explained their successes and failures in Algebra, specifically, what factors they attributed their performance to. Meanwhile, the correlational aspect examined whether there was a meaningful connection between these attribution beliefs and the students' actual academic results. This design was chosen because it offers an objective way to examine students' thought patterns and how these thoughts might influence their learning outcomes.

Environment and Respondents. The research was carried out at Bohol Island State University – Bilar Campus, a higher education institution located in Bohol, Philippines. The study respondents were 54 first-year Environmental Science students who were enrolled in an Algebra course during the 2024–2025 academic year. The sampling method combined cluster sampling, using the first-year students as the cluster with purposive sampling to ensure that only students meeting specific inclusion requirements participated. This approach helped focus the research on a relevant and manageable group for examining attribution patterns related to Algebra performance.

Research Instrument. The study used a researcher-constructed questionnaire to assess students' attributions for success and failure in Algebra using a 5-point Hedonic Likert Scale. Each item was thoughtfully crafted based on Bernard Weiner's Attribution Theory (1985), which frames causes of success and failure through three key dimensions: locus of control (internal or external), stability (whether the cause remains constant or changes over time), and controllability (whether the cause can be influenced by the individual). To ensure the validity of the instrument, the questionnaire was reviewed and evaluated by experts in mathematics education and research professionals, who provided insights on the relevance, clarity, and appropriateness of the items for the target respondents. The questionnaire was pilot-tested with Mathematics major students who had already taken Algebra prior to the formal administration of the study. The aim of the pilot test was to assess the reliability of the instrument and determine whether the items consistently measured students' attributions across different contexts. Internal consistency was assessed using statistical measures, including Cronbach's Alpha, to ensure that the instrument reliably captured the intended constructs prior to administration to the actual respondents.

Data Gathering Procedures. After distributing the questionnaires and collecting the responses, the researcher meticulously checked each to make sure they were fully completed and free from inconsistent answers. Any surveys with missing or ambiguous data were excluded to maintain the accuracy and reliability of the analysis. This step was crucial because the study's goal was to genuinely understand how students attribute success or failure in Algebra, which required high-quality data free from errors or gaps.

Statistical Treatment. Once the data was cleaned, descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize how students attributed their results in Algebra across different categories, as defined by Weiner's Attribution Theory. These included internal factors like ability and effort, external factors like difficulty and support, emotional elements such as anxiety and confidence, and beliefs related to growth mindset.

The mean scores helped identify general attribution trends, while standard deviations showed how varied or consistent students' responses were.

To explore differences between groups, the researcher used the Mann–Whitney U test to compare male and female students, and the Kruskal–Wallis H test to assess differences across Senior High School strands (GAS,

HUMSS, STEM, TVL). These non-parametric tests were appropriate because the data came from Likert scales and were not normally distributed.

Lastly, correlation analysis examined the link between students' attribution scores and their actual Algebra grades. All tests adhered to a significance level of 0.05, meaning only results with a p-value less than 0.05 were considered meaningful. The researcher interpreted the results in the context of established educational theories and prior studies related to attribution and math performance.

RESULTS

This study explored students' attributions for success and failure in Algebra, considering demographic factors such as sex and senior high school (SHS) strand to contextualize their perspectives.

Table 1 shows that out of 54 respondents, 68.52% were female and 31.48% were male. This distribution reflects the actual enrollment in the Algebra subject during data collection and was not due to sampling bias. The higher number of female respondents was simply a result of more females enrolling in the class.

Table 1
Profile of the Respondents

SEX	f	Percentage (%)
Male	17	31.48
Female	37	68.52
Total	54	100
STRAND		
GAS	18	33.33
HUMSS	14	25.93
TVL	18	33.33
STEM	4	7.41
Total	54	100

The data also show the SHS academic strands from which students graduated. The largest groups came from the General Academic Strand (GAS) and the Technical-Vocational-Livelihood (TVL) strand, comprising 33.33% of the respondents. The Humanities and Social Sciences (HUMSS) strand accounted for 25.93%, while only 7.41% of respondents came from the Science, Technology, Engineering, and Mathematics (STEM) strand.

This distribution reflects the academic backgrounds of students enrolled in the Algebra subject, not their current academic program. The low representation from STEM was coincidental and mirrors actual class enrollment. Because students from STEM typically receive more intensive training in mathematics during SHS, their attributions for success or failure in Algebra may differ from those in non-STEM strands. Non-STEM students might be likelier to emphasize effort, task difficulty, or teaching quality over innate ability or prior knowledge.

Attributions Associated by Respondents with Their Successes in Algebra. Understanding how students explain their success in Algebra reveals their beliefs about learning and informs educators about how to support and develop their mathematical potential. The results in Table 2, categorized according to Weiner's Attribution Theory (1985), examine attributions across six dimensions: internal ability, internal effort, task difficulty, external support, emotional states, and attribution flexibility.

Internal Attributions – Effort (Internal, Unstable, Controllable). Within this category, students moderately to highly attributed their success in Algebra to controllable internal factors like effort and persistence. The time spent practicing Algebra problems (M=3.70; SD=0.71) received a high attribution rating and was relatively consistent across participants. In contrast, consistent effort (M=3.06; SD=0.83) and persistence in problem-solving (M=2.76; SD=0.98) garnered more moderate responses with slightly broader variation. These findings reveal a healthy degree of self-awareness among learners about the role of effort in academic achievement. While not every student may perceive themselves as persistent or consistently dedicated, most recognize the link between practice and success. It reflects Bandura's (1997) theory of self-efficacy, where

belief in one's ability to influence outcomes plays a crucial role in sustained effort.

Table 2
Attributions of Success in Algebra, (n = 54)

Statements	Mean	Standard Deviation (SD)	Description	Interpretation
1. I succeed in Algebra because I naturally have strong mathematical abilities.	2.80	0.68	Neutral and Moderately homogenous	Moderate
2. My innate logical thinking skills help me succeed in Algebra.	3.43	4.05	Agree and Highly heterogenous	High
3. I understand algebraic concepts better than most of my peers.	2.50	1.05	Neutral and Highly heterogenous	Low
4. I succeed in Algebra because I put in consistent effort to understand the material.	3.06	0.83	Neutral and Moderately heterogenous	Moderate
5. The time I spend practicing Algebra problems leads to my success.	3.70	0.71	Agree and Moderately homogenous	High
6. My success in Algebra comes from my persistence when solving difficult problems.	2.76	0.98	Neutral and Moderately heterogenous	Moderate
7. I succeed in Algebra because the material is presented in a clear, understandable way.	3.70	0.60	Agree and Moderately homogenous	High
8. The Algebra curriculum builds on previous knowledge, making new topics easier to grasp.	3.72	0.85	Agree and Moderately heterogenous	High
9. The teaching style of my Algebra instructor contributes to my success.	4.33	0.58	Strongly Agree and Moderately homogenous	Very High
10. Having access to good textbooks and resources helps me succeed in Algebra.	3.70	0.85	Agree and Moderately heterogenous	High
11. The classroom environment facilitates my understanding of algebraic concepts.	3.74	0.72	Agree and Moderately homogenous	High
12. I perform well in Algebra when I feel confident about the material.	3.57	0.93	Agree and Moderately heterogenous	High
13. My interest in the practical applications of Algebra motivates me to succeed.	3.30	0.63	Neutral and Moderately homogenous	Moderate
14. I succeed because I enjoy solving algebraic problems.	2.89	0.74	Neutral and Moderately homogenous	Moderate
15. I believe I can improve my Algebra skills with enough practice.	4.52	0.63	Strongly Agee and Moderately homogenous	Very High
16. When I succeed in Algebra, I recognize both my effort and effective learning strategies.	4.38	0.65	Agree and Moderately homogenous	Very High

External Attributions – Task Difficulty (External, Stable, Uncontrollable). Students strongly agreed that external, task-related features significantly support their success in Algebra. Both clarity of the material (M=3.70; SD=0.60) and the sequential structure of the curriculum (M=3.72; SD=0.85) received high attribution scores with moderate agreement in responses. This indicates that learners perceive Algebra as more manageable when the content is well-organized and logically connected to prior knowledge. The findings emphasize how instructional design can shape student experiences, reaffirming prior studies highlighting the importance of scaffolded curriculum in mathematical understanding (Boaler, 2016).

External Attributions – Support (External, Unstable, Uncontrollable). Support systems emerged as one of the strongest contributors to students' perceived success. Among all the items, the instructor's teaching style (M=4.33; SD=0.58) received the highest mean rating and was categorized as a very high attribution, suggesting widespread and strong agreement that effective teaching makes a critical difference. Access to quality learning resources (M=3.70; SD=0.85) and a conducive classroom environment (M=3.74; SD=0.72) were also highly rated. Responses in this category were relatively consistent, pointing to a shared experience of supportive academic surroundings. These findings affirm the well-established role of teacher effectiveness and institutional support in promoting mathematics achievement (Hattie, 2009).

Emotional States (Internal, Unstable, Partially Controllable). The emotional dimension of learning was another significant attribution area. Students largely agreed that confidence in the material (M=3.57; SD=0.93) enhances their performance, suggesting that affective states directly influence academic outcomes. While interest in practical applications (M=3.30; SD=0.63) and enjoyment in solving algebraic problems (M=2.89; SD=0.74) only drew moderate attributions, they still reflect a notable emotional connection to the Subject. These responses reinforce the idea that emotions, while internal, are dynamic and can be shaped by learning experiences. This is consistent with Pekrun's (2006) Control-Value Theory, which emphasizes the role of emotions in academic achievement.

Attribution Flexibility and Growth Mindset. Notably, the strongest expressions of attribution came from this category. The belief that one can improve Algebra skills through

practice (M=4.52; SD=0.63) and that success results from a combination of effort and effective strategies (M=4.38; SD=0.65) garnered very high attributions. These findings strongly reflect a growth mindset, where students believe that abilities can be developed through effort and strategy. The consistency of responses also shows that this belief is widespread among the participants. Such perspectives are foundational to fostering resilience and long-term success in mathematics learning (Dweck & Leggett, 1988).

In summary, students largely attribute their success in Algebra not to innate talent but to controllable and supportive factors such as effort, quality teaching, structured curriculum, and self-confidence. While some innate ability is acknowledged, the stronger focus on instructional support, emotional regulation, and personal effort highlights a constructive attribution style. Most promisingly, students exhibit a clear growth mindset—believing that they can improve with dedication and the right strategies. These findings suggest that reinforcing effort-based feedback, building confidence, and providing consistent instructional support may enhance learners' mathematical success.

The data in Table 3 point to a nuanced and varied attribution profile among students who experience difficulty in Algebra. These attributions span both internal and external factors, reflecting the complexity of how learners perceive their failures.

Internal Attributions – Lack of Ability (Internal, Stable, Uncontrollable). Students tended to express moderate attribution to a perceived lack of innate ability as a cause of their struggles. For instance, the item "I struggle in Algebra because I don't have natural mathematical abilities" had a mean of 3.33 with a standard deviation of 1.12, and the statement "I perform poorly because I can't seem to grasp algebraic thinking" had a mean of 3.35 with standard deviation of 0.93. These scores indicate that many students are uncertain or divided in their beliefs about whether their failures stem from something intrinsic and unchangeable. The relatively high standard deviations further suggest a wide variety of beliefs, with some blaming ability while others reject that notion. This variation reflects how fixed-ability perceptions influence academic self-concept, primarily in math-related subjects (Boaler, 2016).

Internal Attributions – Lack of Effort (Internal, Unstable, Controllable). There is a clear consensus among students that a lack of effort-based behaviors contributes significantly to their Algebra difficulties. Statements such as "I perform poorly in Algebra when I don't study enough" (M=4.04; SD=0.94), "My failure to complete practice problems regularly leads to poor performance" (M=3.81; SD=0.90), and "I don't do well because I procrastinate on Algebra assignments" (M=3.52; SD =0.86) all reflect high attribution levels. These results suggest that students recognize their role in shaping their academic outcomes and view their behaviors, such as not studying, avoiding practice, or delaying assignments, as important and controllable causes of failure. This is encouraging from an educational standpoint, as it supports the notion that self- regulation and motivation training could be effective interventions (Zimmerman, 2002).

External Attributions – Task Difficulty (External, Stable, Uncontrollable). Students also attributed their struggles to the inherent nature of Algebra. They agreed that "Algebra is inherently complex and abstract" (M=3.69; SD=0.86) and were moderately neutral about whether the pacing of lessons makes it harder to learn (M=3.07; SD=0.79). These responses suggest that many students feel the Subject presents a real challenge, regardless of effort or instruction. Algebra's abstractness is well-documented as a barrier to understanding (Kieran, 2007), and this data supports that some learners perceive these challenges as stable and difficult to overcome without intervention.

External Attributions – Lack of Support (External, Unstable, Uncontrollable). Students showed mixed levels of attribution when it came

to support- related factors. The belief that poor teaching methods affected their learning received a low attribution rating (M=2.37; SD=0.70), implying that most students do not blame the instructor for their difficulties. However, they were more neutral regarding inadequate textbook explanations (M=2.96; SD=0.74) and limited feedback (M=3.02; SD=0.85). These results highlight a moderate perception that support resources could be improved, though students are not overwhelmingly critical. This nuanced finding may indicate a general acceptance of the learning environment and openness to improved scaffolding.

Emotional States (Internal, Unstable, Partially Controllable). Finally, students acknowledged that emotions and psychological factors have a noticeable effect on their Algebra performance. Feeling anxious about the material (M=3.78; SD=0.68) and having a fear of making mistakes (M=3.67; SD=0.90) were both attributed with high agreement, while frustration and demotivation had a moderate attribution level (M=3.02; SD=0.87). These findings align with decades of research indicating that math anxiety and emotional disengagement strongly influence performance, often creating a feedback loop of failure and avoidance (Ashcraft & Moore, 2009). Importantly, these emotional states are internal yet potentially manageable through targeted interventions like stress-reduction techniques, growth mindset instruction, and classroom climate improvements.

Generally, students see their failures in Algebra as a complex interplay of internal behaviors, emotional responses, and the inherent difficulty of the Subject. At the same time, some believe in fixed limitations (like natural ability), students predominantly attribute their struggles to controllable factors such as effort, study habits, and emotional regulation. This reflects a hopeful perspective: that with the proper support, mindset, and behavioral change, improvement is not only possible but expected.

Table 3
Attributions of Failure in Algebra, (n = 54)

Statements	Mean	Standard Deviation (SD)	Descriptive	Interpretation
17. I struggle in Algebra because I don't have natural mathematical abilities.	3.33	1.12	Neutral and Highly heterogenous	Moderate
18. My difficulty visualizing abstract concepts leads to my struggles in Algebra.	3.19	0.96	Neutral and Moderately heterogenous	Moderate
19. I perform poorly because I can't seem to grasp algebraic thinking.	3.35	0.93	Neutral and Moderately heterogenous	Moderate
20. I perform poorly in Algebra when I don't study enough.	4.04	0.94	Agree and Moderately heterogenous	High
21. My failure to complete practice problems regularly leads to poor performance.	3.81	0.90	Agree and Moderately heterogenous	High
22. I don't do well because I procrastinate on Algebra assignments.	3.52	0.86	Agree and Moderately heterogenous	High
23. I struggle because Algebra is inherently complex and abstract.	3.69	0.86	Agree and Moderately heterogenous	High
24. The pace at which algebraic concepts are introduced is too fast for proper understanding.	3.07	0.79	Neutral and Moderately homogenous	Moderate
25.I perform poorly because the teaching methods don't match my learning style.	2.37	0.70	Disagree and Moderately homogenous	Low
26. My failure in Algebra relates to inadequate explanations in the textbook.	2.96	0.74	Neutral and Moderately homogenous	Moderate
27. Limited feedback on my work makes it hard to improve in Algebra.	3.02	0.85	Neutral and Moderately heterogenous	Moderate
28. I perform poorly in Algebra when I feel anxious about the material.	3.78	0.68	Agree and Moderately homogenous	High
29. My fear of making mistakes inhibits my performance in Algebra.	3.67	0.90	Agree and Moderately heterogenous	High
30. I struggle because I find Algebra frustrating and demotivating.	3.02	0.87	Neutral and Moderately heterogenous	Moderate

Table 4
Difference Between the Student's Attribution in Algebra and Sex

Variables	Mean Rank	p- value	Interpretation	Decision
Students' attribution and sex	Male - 22 Female - 30.03	0.081	Not Significant	Failed to reject null hypothesis

Table 4 presents the results of a statistical test comparing the attribution of success or failure in Algebra between male and female students. The analysis used mean ranks to assess whether a significant difference exists between the two groups, likely through a non-parametric test such as the Mann–Whitney U test, given the ordinal nature of Likert-scale data and the reporting of mean ranks rather than means.

Based on the data, male students had a mean rank of 22.00, while female students had a slightly higher mean rank of 30.03. This suggests that, on average, female

students showed slightly stronger attributions regarding their Algebra performance than their male counterparts. However, the computed p-value of 0.081 exceeds the standard significance threshold of 0.05. As such, the result is interpreted as not statistically significant, and the null hypothesis, which assumes no difference in attribution based on sex, is not rejected.

This outcome indicates that there is not enough evidence to claim a meaningful difference in how male and female students attribute their success or failure in Algebra. While the slight variation in mean ranks may hint at some differences in perception, these differences are not strong enough to rule out the possibility that they occurred by chance.

The finding aligns with some earlier studies suggesting that while gender differences may exist in mathematical self-beliefs or affective factors (e.g., confidence, anxiety), actual attribution patterns regarding performance are often quite similar across sexes, especially in mixed or inclusive educational settings (Else-Quest et al., 2010; Hyde et al., 2008). It also reinforces the importance of avoiding overgeneralizations based on gender and instead focusing on individual learning needs and experiences.

Table 5
Difference Between the Student's Attribution in Algebra and Strands

Variables	Kruskal-Wallis H	df	p- value	Interpretation	Decision
Students' attribution and their strands	1.972	4	0.741	Not Significant	Failed to reject null hypothesis

Table 5 presents the result of a Kruskal-Wallis H test, a non-parametric statistical method used to determine whether there are statistically significant differences between the medians of three or more independent groups. In this case, the test was applied to examine whether students' attributions of success or failure in Algebra vary depending on their academic strands, presumably referring to tracks such as STEM (Science, Technology, Engineering, and Mathematics), HUMSS (Humanities and Social Sciences), ABM (Accountancy, Business and Management), GAS (General Academic Strand), and TVL (Technical-Vocational-Livelihood).

The computed Kruskal-Wallis H value of 1.972 with 4 degrees of freedom (df) yielded a p-value of 0.741, which is greater than the alpha level of 0.05. This result leads to the interpretation of "not significant" and supports the decision to fail to reject the null hypothesis. In simpler terms, this means there is no statistically significant difference in how students from different strands attribute their performance in Algebra.

Despite the varying curricular focus across strands, with STEM students perhaps more exposed to mathematical content, and others (like HUMSS or TVL) less so, the findings suggest that students across all tracks tend to perceive the causes of their Algebra performance similarly. This implies that attributions such as effort, anxiety, teacher influence, or self-belief are not strongly shaped by a student's academic track but might reflect more universal experiences within the Algebra classroom.

The lack of significant difference also suggests that interventions aiming to improve students' mindset, motivation, or study habits in Algebra need not be strand-specific. Educators may benefit more from implementing general strategies that target effort regulation, practice, and confidence-building, regardless of the learner's academic pathway (Zimmerman, 2002; Dweck, 2006).

Moreover, this result echoes findings from related educational studies, which indicate that while academic achievement levels may vary by strand, students' beliefs about learning and the causes of their academic

performance often follow common patterns (Schunk, Pintrich, & Meece, 2008).

Table 6
Relationship of Students' Attribution in Algebra and their Academic Performance

Variables	R-value	Strength of Correlation	p- value	Interpretation	Decision
Students' attribution and their academic performance	-0. 107	Very weak	0.441	Not Significant	Failed to reject null hypothesis

Table 6 presents a correlation analysis examining the relationship between students' attribution in Algebra, how they explain their success or failure, and their actual academic performance in the Subject. The analysis yielded an R- value of -0.107, which indicates a very weak negative correlation. This means that, in general, as attribution scores slightly increase, academic performance very slightly decreases, but the association is so weak that it is practically negligible.

More importantly, the p-value of 0.441 is well above the conventional threshold of 0.05. As a result, the relationship is considered not statistically significant, leading to the conclusion to fail to reject the null hypothesis. In simpler terms, no strong evidence suggests a meaningful connection between how students attribute their performance in Algebra and their actual academic outcomes.

This result may seem surprising initially, especially considering that attribution theory posits that students' beliefs about the causes of success and failure can influence motivation, learning behaviors, and performance (Weiner, 1985). However, several factors could help explain the absence of a significant relationship here. For instance, students may hold beliefs or make attributions that do not align with their study habits or actual performance outcomes. Some may attribute failure to external factors like difficult instruction or poor textbooks, even if the root cause is effort or engagement.

Other mediating variables, such as test anxiety, self-efficacy, or learning environment, may play a more immediate role in shaping academic performance than attribution alone (Pekrun et al., 2002; Schunk et al., 2008). This suggests that while attributions matter, they may not directly or singularly predict performance, especially in isolation from other emotional and behavioral factors.

In practical terms, this finding points to the need for a holistic approach to improving academic outcomes in Algebra. Educators and school leaders should explore students' belief systems and look into how those beliefs are translated into learning behaviors, such as time spent on practice, participation in class, and willingness to seek help. It also highlights the importance of cognitively and emotionally supporting students, rather than assuming that awareness or attribution alone will drive performance.

DISCUSSION

The findings of this study revealed a detailed profile of students' attributions for both success and failure in Algebra, offering insights into how learners perceive their academic experiences. Overall, students demonstrated a constructive attributional style, predominantly crediting their success to controllable internal and external factors such as personal effort, practice habits, instructional quality, and supportive learning environments. Items that reflected growth mindset beliefs, such as the ability to improve through practice and the importance of learning strategies, received very high ratings. Instructors' teaching style also emerged as a key contributor to perceived success, along with a clearly sequenced curriculum and access to appropriate learning resources. Emotional factors, such as confidence and enjoyment, also played a role, though slightly less.

On the other hand, students showed more nuanced and mixed perceptions when it came to failure. While some attributed difficulty in Algebra to internal, stable traits like a lack of natural ability, the majority identified controllable factors, particularly procrastination, insufficient study habits, and inconsistent practice, as primary contributors to their struggles. Anxiety and fear of making

mistakes also appeared prominently, highlighting students' emotional challenges in math-related subjects. External attributions, such as poor teaching methods or lack of support from learning materials, were generally rated lower, suggesting that students were less likely to externalize blame for their failures.

Moreover, the results showed no statistically significant difference in attributions based on sex or academic strand, indicating that students across demographic groups tend to perceive the causes of their Algebra performance in a generally consistent manner. Additionally, there was no significant correlation between students' attribution scores and their actual Algebra grades. This suggests that while students may be aware of the factors influencing their learning, this awareness does not necessarily guarantee improved academic outcomes.

Conclusions. From these findings, it can be concluded that students, regardless of gender or academic background, predominantly associate their success in Algebra with personal effort, effective instruction, emotional regulation, and belief in growth. This encouraging outcome reflects an attributional mindset conducive to resilience and long-term learning. However, the study also underscored areas of concern, particularly around emotional struggles like anxiety and procrastination, which continue to serve as silent barriers to academic achievement. The moderate attributions toward lack of natural ability suggest that some students may still be influenced by fixed beliefs about intelligence, especially when faced with persistent difficulties in the Subject.

Perhaps most importantly, the lack of significant correlation between attribution and academic performance highlights a critical gap between belief and behavior. While students may hold empowering views about what leads to success or failure, this does not always translate into tangible improvements in performance. This disconnects points to the need for educational interventions that nurture healthy beliefs and reinforce the behaviors and study habits that lead to measurable academic progress. Ultimately, the results of this study call attention to the importance of understanding student perceptions not as static traits but as evolving constructs that can be positively shaped through targeted support and intentional teaching strategies.

Recommendations. In light of the findings and conclusion, several recommendations have been made. First, teachers should continue fostering a growth mindset in their instruction, reinforcing that ability in Algebra is not fixed and that improvement is always possible with effort, feedback, and strategy. This can be done by embedding explicit messages of encouragement, celebrating minor improvements, and designing assessments that promote learning from mistakes rather than simply measuring correctness.

Second, there is a clear need to support students' self-regulatory behaviors. Schools and educators should implement structured opportunities for practice, feedback loops, and time management coaching to help students reduce procrastination and build consistent study habits. Practical interventions such as guided problem-solving sessions, learning journals, and progress tracking tools may reinforce accountability and reflection.

Third, emotional support must be woven into mathematics education. The high levels of anxiety and fear of failure reported by students underscore the importance of creating psychologically safe classrooms. Teachers should be trained in recognizing math anxiety and equipped with strategies to reduce it— such as encouraging open dialogue, minimizing punitive grading, and allowing collaborative work. Workshops on stress management and building academic confidence can also be valuable, particularly for first-year students who are still adjusting to college life.

Fourth, school leaders should invest in teacher development and resource improvement. Since

instructional style was a strong factor in students' perceived success, continuous professional development in learner-centered pedagogies, inclusive teaching methods, and differentiated instruction should be prioritized. Ensuring that textbooks, handouts, and other learning resources are accessible and aligned with student needs is equally important.

Lastly, future research should go beyond attributional beliefs and examine the alignment between student attributions, behaviors, and academic practices. Mixed-method studies that include interviews, classroom observations, and learning analytics could provide richer insights into students' learning journeys. Continuous monitoring and follow-up assessments can also help determine the long-term impact of attributional interventions.

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