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Impact of a Growth Mindset Programme on Academically Underachieving Adolescents' Beliefs about Intelligence

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Abstract

We adopted a mixed-method research design using an explanatory sequential approach to investigate the potential of a growth mindset intervention programme to enhance beliefs about intelligence among academically underachieving students in Nigeria. Academically underachieving students are likely to hold fixed mindsets about intelligence, which may hinder their intellectual growth. Our study was anchored on Carol Dweck's growth mindset theoretical framework. Seventy underachieving students were identified using a discrepancy method from two schools in Anambra State, Nigeria; using purposive sampling, all identified students were selected for the intervention. These students were assigned to two groups for a quasi-experimental quantitative study: an experimental group (N = 37) and a control group (N = 33). Data were collected using a validated scale for adolescents' beliefs about intelligence and a focus group discussion to explore the mechanisms through which the intervention enhanced these beliefs. The intervention programme spanned a school term of 13 weeks. Quantitative data were analyzed using mean, standard deviation, and ANCOVA, while qualitative data underwent thematic content analysis. Findings indicated that the experimental group (M = 3.14, SD = 0.25) showed a non-significant improvement in their beliefs about intelligence compared to the control group (M = 3.05, SD = 0.32), $F(1, 69) = 1.752$, $p > 0.05$. Focus group insights revealed that while some students embraced brain malleability and shifted toward a growth mindset, others retained fixed beliefs about intelligence as innate, limiting the programme's overall impact. Sessions on neuroplasticity and resilience proved transformative for many, yet ingrained views underscore the need for extended reinforcement to achieve widespread change. Implications of these findings were discussed.

Keywords: Intelligence, mindset, poor performance, secondary school, underachievement, under-resourced context

Introduction

Academic underachievement among adolescents remains a global challenge, with significant consequences for individual and societal development. A study by Welmond and Gregory (2021) revealed that nearly 15% of students worldwide are classified as underachieving, failing to reach their full potential in education. In Nigeria, where education plays a critical role in national growth, many students perform below grade level, particularly in core subjects (Owan, Ukam, & Egame, 2023). While systemic and socio-economic factors contribute to underachievement, psychological barriers such as a fixed mindset about intelligence exacerbate the issue. Students with fixed mindsets perceive intelligence as innate and unchangeable, resulting in reduced effort, persistence, and resilience in academic pursuits (Dweck, 2006; Burnette *et al*., 2013). In contrast, a growth mindset, which emphasizes the malleability of intelligence, has been associated with enhanced academic outcomes and greater adaptability (Claro, Paunesku, & Dweck, 2016; Yeager *et al*., 2019).

Growth mindset interventions have demonstrated significant success in diverse educational contexts. For instance, a meta-analysis by Sisk *et al*. (2018) found that mindset interventions showed particular promise for academically high-risk students. Large-scale studies have shown that brief mindset interventions can yield lasting academic improvements, particularly among underperforming students (Yeager *et al*., 2019; Rattan & Georgeac, 2017). Despite such evidence, research on mindset interventions in Nigeria seems to be limited. This gap is significant given the unique cultural, educational, and socio-economic challenges faced by underachieving students in this context. Existing interventions in Nigeria primarily focus on systemic issues, often neglecting the psychological underpinnings of academic motivation and resilience.

Growth Mindset Interventions in Different Contexts

Research on growth mindset interventions has consistently demonstrated their potential to enhance academic outcomes across diverse educational and cultural

settings. In secondary schools, large-scale studies have shown that these interventions effectively improve students' beliefs about intelligence, motivation, and academic performance. For instance, Yeasmin (2021) conducted a systematic review of multiple studies, highlighting the significant impact of growth mindset interventions on fostering adaptive learning behaviors and improving academic outcomes. Similarly, Qin *et al*. (2021) found that mindset interventions were most effective in schools with moderate resources, where low-achieving 9th-grade students exhibited notable improvements in challenge-seeking behavior and GPA. Porter *et al*. (2022) further emphasized the role of teacher beliefs, showing that teacher-delivered mindset programs significantly improved grades, particularly in classrooms where educators initially held fixed mindsets.

Cultural contexts also play a crucial role in determining the effectiveness of growth mindset interventions. He and Zhang (2024) demonstrated that cultural values such as long-term orientation positively influenced the relationship between growth mindset and self-efficacy, while hierarchical norms and uncertainty avoidance weakened this relationship. Dong and Kang (2022) reported that growth mindset programs were highly effective in achievement-oriented cultures but required substantial adaptation in settings with entrenched fixed-mindset beliefs. In African contexts, Mohamoud (2024) found that growth mindset interventions improved motivation, resilience, and engagement among Somali students but noted challenges in sustaining these programs due to limited resources and inadequate teacher training. Similarly, Rissanen and Kuusisto (2023) emphasized the role of growth mindset in shaping teachers' intercultural competencies, highlighting how Finnish teachers with growth-oriented beliefs were better equipped to address equity and diversity in increasingly heterogeneous classrooms.

The effectiveness of growth mindset interventions has also been demonstrated in addressing the challenges associated with socioeconomic disparities. Harrison (2024) explored their impact on students from disadvantaged backgrounds, finding significant improvements in academic performance and engagement. These

interventions were particularly effective in narrowing achievement gaps by fostering motivation and persistence among students who initially held fixed mindsets. Similarly, King and Trinidad (2021) examined the interaction between growth mindset and socioeconomic status (SES) in influencing learning outcomes. Their study found that while growth mindset interventions improved motivation and engagement across all SES levels, their effects on academic achievement were more pronounced for wealthier students.

Emerging evidence also points to the potential of delivering growth mindset interventions through digital platforms. Burnette *et al*. (2018) investigated an online program targeting rural adolescent girls, finding significant improvements in intrinsic motivation and persistence. These outcomes were linked to fostering growth mindsets, which encouraged students to value education and aspire to higher learning. Montagna *et al*. (2021) evaluated a computerized intervention, reporting reductions in cognitive stress and improvements in beliefs about intelligence malleability, demonstrating the scalability and accessibility of digital platforms for implementing mindset interventions in resource-constrained settings.

Special education contexts further illustrate the impact of growth mindset programs. Rhew (2017) examined the effects of a growth mindset program on middle school students receiving reading support for learning disabilities. The study found significant improvements in motivation among the intervention group, although no notable changes were observed in self-efficacy. These findings suggest that while growth mindset strategies can effectively foster motivation, additional interventions may be required to directly address self-efficacy challenges for students with learning disabilities.

Academic Underachievement in Nigerian Secondary Schools

Academic underachievement is a persistent and complex issue in Nigerian secondary schools, with far-reaching implications for the nation's educational and socio-economic development. The 2024 West African Senior School Certificate Examination (WASSCE) results indicate a decline in student performance, with

only 72% of candidates achieving credits in at least five subjects, including English and Mathematics. This marks a drop from the 79.81% achievement rate recorded in 2023 (Nnaike, 2024).

Research highlights a range of psychological and institutional factors contributing to this underachievement. Isiguzo and Isukwem (2024) conducted a comprehensive study in Akwa Ibom State, identifying key psychological variables such as locus of control, motivation, and self-efficacy as significant predictors of academic outcomes. Their findings underscored the critical role of parental and teacher encouragement in fostering academic success, particularly among students struggling with persistent underperformance. Similarly, Pur *et al*. (2019) found that environmental factors, including irregular school attendance, lack of learning materials, and the prevalence of depression and anxiety, further exacerbate the issue. These challenges are often compounded by negative teacher attitudes, which hinder the academic progression of underachieving students.

Deep-rooted problems within the educational sector have also been shown to play a key role. Obomanu and Adaramola's (2011) seminal work on science, technology, and mathematics (STM) education in Rivers State highlighted a lack of qualified teachers, insufficient funding, and limited parental engagement as significant barriers. More recent findings by Nwosu *et al*. (2018) revealed that poor study habits, procrastination, and socio-economic pressures are additional factors contributing to underachievement, particularly in disadvantaged regions. These shortcomings highlight the pressing need for policy reforms aimed at improving teacher training, resource allocation, and parental involvement.

Another critical aspect of underachievement in Nigerian schools involves students with special educational needs. Olubakin (2023) investigated academic performance among students with hearing impairments in Ibadan, finding that peer influence, self-concept, and the school environment significantly impacted their outcomes. These findings underscore the importance of inclusive educational

strategies that address the diverse learning needs of students, particularly those requiring additional support.

Relationship between Mindset and Academic Performance

A growing body of research highlights the critical role of mindset in shaping academic performance. Dweck's mindset theory posits that students with a growth mindset (believing that intelligence can be developed) are more likely to embrace challenges, persist after setbacks, and achieve higher academic outcomes than those with a fixed mindset, who perceive intelligence as static and immutable (Dweck, 2006). This relationship is evident across diverse educational settings, though the magnitude and consistency of its effects have been debated.

Studies have extensively investigated the impact of growth mindset on academic achievement across diverse settings. Altikulaç *et al*. (2024) identified four distinct profiles among secondary school students, distinguishing fixed-mindset students from growth-mindset students with varying levels of performance goals. Their findings revealed that students with growth mindsets and low or moderate performance goals outperformed others in mathematics, intrinsic motivation, and school burnout, while fixed-mindset students exhibited the least favorable outcomes. These results underscore the importance of considering goal orientations and effort beliefs alongside mindset.

International research further highlights the universal implications of growth mindset. Claro, Paunesku, and Dweck (2016) demonstrated that growth mindset buffers against the negative effects of poverty, with low-income students in Chile who held a growth mindset performing on par with wealthier fixed-mindset peers. Similarly, a 2018 global analysis of 600,000 students found that those with a growth mindset not only excelled academically but also reported higher levels of well-being (OECD, 2018). McKinsey & Company's (2017) study emphasized that mindset often outweighs socioeconomic background in predicting success, with significant benefits for students in disadvantaged contexts.

The role of mindset extends beyond traditional classroom environments to digital learning platforms. Kizilcec and Goldfarb (2019) studied Kenyan high school students using an SMS-based educational tool and identified growth mindset as a strong predictor of assessment performance. Students with growth mindsets spent more time on tasks, increasing their accuracy, despite not showing greater persistence after adversity. This aligns with the view that growth mindset fosters productive learning behaviors, particularly in resource-constrained environments.

Despite widespread enthusiasm for growth mindset interventions, their efficacy has been challenged by recent reviews. Macnamara and Burgoyne (2023) conducted a systematic review and meta-analysis of 63 studies involving over 97,000 participants, finding that the average effect size of growth mindset interventions on academic achievement was small ($\bar{d}$ = 0.05) and became non-significant after correcting for publication bias. The authors highlighted methodological weaknesses and potential biases in existing research, calling for more rigorous study designs to substantiate the claimed benefits of growth mindset programs.

This study aims to examine the differential impacts of a growth mindset intervention program on academically underachieving secondary school students in Nigeria. It builds on substantial evidence that growth mindset interventions can improve students' academic outcomes (Yeager *et al*., 2019; Dweck, 2006). While prior studies have demonstrated the efficacy of these interventions in diverse contexts, little research has explored their application within Nigerian schools, where socio-economic disparities and educational challenges persist.

Specifically, researchers in Nigeria have yet to investigate how growth mindset programs influence students' beliefs about intelligence and their academic behaviors, particularly among underachieving adolescents. Although previous studies have highlighted the significance of psychological interventions for enhancing resilience and academic effort (Paunesku *et al*., 2015), evidence is still lacking on how mindset interventions impact this demographic in the Nigerian context. This study seeks to address these gaps by evaluating the effectiveness of a

structured growth mindset program tailored to the unique cultural and educational environment of Nigerian schools.

The intervention program integrates sessions on neuroplasticity, resilience, and strategies for overcoming academic challenges to foster adaptive beliefs about intelligence. By targeting academically underachieving students, the program seeks to equip them with the mindset needed to enhance their effort and persistence in learning. Using a quasi-experimental design, the study compares the outcomes of students in the experimental group who participated in the growth mindset program with those in the control group exposed to conventional instruction. Additionally, qualitative insights are derived from focus group discussions to understand the mechanisms through which the intervention influences students' beliefs and behaviors.

The hypothesis states that:

1. There will be no significant difference in post-intervention scores for beliefs about intelligence between students in the experimental and control groups after adjusting for pre-test scores.
2. The focus group findings will reveal that a majority of students in the experimental group will embrace brain malleability and shift toward a growth mindset, demonstrating an understanding of intelligence as malleable, with a minority retaining fixed beliefs.

Methods

This study adopted an explanatory sequential mixed-method design to investigate the impact of a growth mindset intervention on adolescents' beliefs about intelligence. The quantitative phase was conducted first, using a quasi-experimental pretest-posttest control group design, followed by a qualitative phase to explore the mechanisms underlying the observed outcomes.

The study population comprised 70 academically underachieving secondary school students in Nigeria, aged 12 to 16 years. These participants were sourced from three intact classes at two secondary schools in Anambra State, Nigeria. Using

purposive sampling, all 70 identified underachievers were selected and assigned to either the experimental group (N = 37), which participated in a growth mindset intervention programme, or the control group (N = 33), which continued with the regular academic curriculum without additional support.

The experimental group participated in a growth mindset intervention programme, while the control group continued with their regular academic curriculum without additional support.

Participant Identification Process

Participants were identified using a two-step process:

1. **Teacher Evaluations:** Subjective assessments were conducted by teachers to identify students who exhibited signs of underachievement, such as low motivation, inconsistent effort, and academic struggles despite evident potential.
2. **Discrepancy Method:** A quantitative approach was used to objectively confirm underachievement. The Common Entrance Exam scores served as a measure of students' academic potential, while their current Grade Point Averages (GPAs) in Mathematics and English represented their actual performance. The discrepancy score was computed as:

Discrepancy=Converted Aptitude Test GPA−Current GPA

Students with a discrepancy score greater than 0.5 were classified as underachievers.

Group Composition

The experimental group (N = 37) comprised 19 males and 18 females, while the control group (N = 33) included 12 males and 21 females.

This rigorous selection process ensured that all participants met the criteria for academic underachievement, thereby enhancing the validity of the study.

Instrumentation

Two primary tools were employed for data collection:

1. **Quantitative Instrument**: Theories of Intelligence Questionnaire (TOI) was used to measure participants' fixed and growth mindset beliefs before and

after the intervention. The TOI is an 8-item scale adapted for adolescents to assess their beliefs about intelligence. Responses are rated on a 5-point Likert scale, ranging from "Strongly Disagree" (1) to "Strongly Agree" (5), with higher scores indicating a stronger growth mindset. The instrument was validated by experts in measurement and evaluation as well as educational psychology. Its reliability was tested using Cronbach's alpha, yielding a coefficient of 0.79.

2. **Qualitative Instrument:** A semi-structured Focus Group Discussion (FGD) Guide was developed to explore participants' experiences with the intervention. Questions focused on how the programme influenced their perceptions of intelligence, reflections on effort and resilience, and shifts in beliefs or attitudes. The guide was validated by three educational psychologists to ensure content relevance and clarity. A pilot FGD was conducted with a small group of students outside the study sample, leading to minor refinements. Reliability was enhanced through inter-coder agreement, where independent raters analyzed transcripts and achieved an 85% agreement rate.

Procedure

The study involved three main phases:

1. Pre-Intervention:

- **Briefing Session**: Both experimental and control group participants, alongside their parents, were briefed about the study's purpose, procedures, and confidentiality measures. Informed consent was obtained.
- **Pre-Test Administration**: All participants completed the TOI Scale under standardized conditions.

2. Intervention:

- **Experimental Group**:

After identifying underachieving students, the researchers initiated the growth mindset intervention with the experimental group. The sessions took place during break time to avoid disruptions to regular school activities.

The first session involved a hands-on activity to illustrate growth and effort. Students brought empty cans, which were filled with nutrient-rich soil from the school's garden. Each student received maize seeds to plant, water, and nurture over the coming weeks. This activity symbolized growth as a process requiring time, effort, and care, setting the foundation for future lessons on perseverance and self-improvement.

By the second session, some students began to show signs of disengagement. To sustain commitment, the researchers, with the support of the school principal and form teachers, established the intervention group as an official school club called The Resilience and Growth Club. This revitalized student enthusiasm, as participants took pride in their membership, and other students expressed interest in joining. Club IDs were distributed, and students wore them proudly, fostering a sense of belonging and accountability.

Throughout the intervention, lessons were reinforced through reflection and real-life applications:

- Students whose maize seeds failed to germinate were encouraged to replant and not give up, reinforcing persistence in learning.
- Others recognized the importance of consistent effort by watering their plants daily, demonstrating the link between effort and progress.

Building on this hands-on learning experience, the subsequent lessons introduced:

1. **Neuroplasticity and Brain Malleability:** Interactive brain models helped students understand that intelligence is not fixed but can develop through effort and learning.
2. **Problem-Solving Scenarios:** Real-life case studies and stories were used to teach students how to **embrace challenges** rather than avoid them.

3. **Growth Journals:** Students received personal growth journals to document their experiences, challenges, and lessons learned throughout the programme.
4. **SMART Goal Setting:** Participants learned to set specific, measurable, achievable, relevant, and time-bound (SMART) goals to develop future-oriented thinking.
5. **Collaborative and Peer Mentoring Activities:** Activities such as "My Growth Story" Sharing Circles, "You vs. You" Challenge, and Accountability Partnerships encouraged teamwork, support, and peer motivation.
6. **Reflection and Self-Assessment:** Students evaluated their progress, identified areas of improvement, and discussed how they applied growth mindset strategies in daily life.

The intervention lasted for thirteen weeks, culminating in a graduation ceremony where students received certificates recognizing their participation and commitment to embracing a growth mindset. The celebration reinforced self-efficacy and motivation, ensuring that the lessons learned extended beyond the programme.

Fidelity Protocol

To ensure consistency and quality throughout the 13-week growth mindset intervention, facilitators adhered to a structured manual that detailed the content and delivery of each weekly session. As the facilitator, this manual was a vital tool, guiding the delivery of activities designed to instill growth mindset principles—such as illustrating effort through experiential tasks or exploring the brain's adaptability. It provided explicit instructions, enabling the facilitator to present these concepts uniformly to the 37 participants in the experimental group, aligning with the study's goals of enhancing resilience and hope in a resource-constrained Nigerian context.

A comprehensive monitoring system bolstered the intervention's fidelity, comprising session observations, self-reports, and video recordings. Observers periodically attended sessions, evaluating whether the facilitator adhered to the manual's framework—for instance, ensuring problem-solving activities or goal-setting exercises were conducted as planned. These observations confirmed that the

delivery stayed true to the intended design, keeping the facilitator aligned with the programme's objectives. Additionally, the facilitator completed self-reports after each session, documenting adherence to the manual and reflecting on challenges, such as maintaining student engagement during reflective tasks. This self-assessment reinforced accountability and helped identify areas needing adjustment.

Video recordings offered detailed oversight, capturing the facilitator's execution of key components—like reinforcing effort or celebrating progress. Reviewed post-session, these recordings ensured consistency in delivering critical messages, such as the malleability of intelligence. The combination of these tools facilitated ongoing feedback, which proved essential in maintaining alignment with the intervention's aims. For example, video reviews once revealed that discussions during a problem-solving scenario were rushed, prompting the facilitator to slow down in subsequent sessions to foster deeper engagement—an adjustment that enhanced students' grasp of viewing challenges as growth opportunities. Another instance of feedback, derived from observer notes, encouraged the facilitator to clarify neuroplasticity concepts with simpler analogies after noticing initial confusion, strengthening students' understanding of brain adaptability.

This feedback loop was instrumental in keeping the facilitator on course, ensuring that the significant improvements in intelligence beliefs

Control Group: Students followed their regular academic routines. Periodic meetings addressed general academic topics unrelated to the intervention to minimize potential Hawthorne effects.

Post-Intervention: After the intervention, both groups completed the same instruments under identical conditions.

Method of Data Analysis

Our data were analyzed using both quantitative and qualitative approaches to comprehensively evaluate the intervention's impact. For the quantitative analysis, pre-test and post-test scores were subjected to ANCOVA to assess the effect of the intervention on beliefs about intelligence while controlling for pre-test differences.

Descriptive statistics, including mean and standard deviation, were calculated to compare the experimental and control groups. This analysis was conducted using statistical software to ensure precision and reliability.

The qualitative data, derived from focus group discussions, were analyzed using thematic content analysis. The process involved coding participants' responses, categorizing themes, and identifying patterns that reflected changes in mindset beliefs and personal experiences during the intervention. These findings were triangulated with quantitative results to provide a richer and better understanding of the intervention's outcomes.

Control for Extraneous Variables

v. *Class Interactions*: Separate schedules were maintained for experimental and control groups.

vi. *Experimental Mortality:* Attrition rates were tracked, and intent-to-treat analysis was conducted if necessary.

vii. *Hawthorne Effect:* Periodic meetings with control group students ensured equitable facilitator interaction across groups.

RESULTS

Quantitative Findings

Descriptive and inferential statistics for the experimental and control groups are presented in Table 1 and 2. While the experimental group showed slightly higher mean scores in most variables, the differences between the groups were statistically non-significant for certain outcomes, such as beliefs about intelligence.

Table 1: Descriptive and Inferential Statistics for Beliefs about Intelligence

Group	*N*	Pretest mean	Pretest *SD*	Posttest Mean	Posttest SD	Mean Gain
Experimental	37	3.045	0.220	3.135	0.249	0.090
Control	33	3.030	0.280	3.046	0.315	0.016

Table 2: ANOVA for Significant Differences between the Experimental and Control Groups on Beliefs about Intelligence

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	.143[a]	2	.071	.884	.418	.026
Intercept	7.346	1	7.346	90.972	.000	.576
TOIpretotal	.002	1	.002	.030	.863	.000
Group	.141	1	.141	1.752	.190	.025
Error	5.410	67	.081			
Total	675.156	70				
Corrected Total	5.553	69				

a. R Squared = .026 (Adjusted R Squared = -.003)
b. Computed using alpha = .05

The table shows that while the experimental group had a slightly higher mean belief about intelligence (M = 3.135, SD = 0.249) compared to the control group (M = 3.046, SD = 0.315), the difference was not statistically significant, $F(1, 67) = 1.752$, $p = .190$, partial $\eta^2 = 0.025$. The null hypothesis is retained, indicating that the growth mindset programme did not significantly affect intelligence beliefs in this sample.

Qualitative Findings

Thematic analysis of the focus group discussions revealed key themes related to the intervention's impact:

Shifts Towards Growth Mindset: Participants frequently referenced a new understanding of intelligence as malleable.

Evidence: *"I used to think my brain was fixed, but now I know I can improve if I keep practising."*

Linked Sessions: Neuroplasticity sessions were impactful in reshaping these beliefs.

Persisting Fixed Beliefs: Despite the intervention, some students maintained fixed beliefs about their abilities, attributing success to innate talent.

Evidence: *"Those who take first do so because they are blessed with wisdom."*

Interpretation: This highlights the difficulty of shifting entrenched views in a short timeframe.

Impact of Specific Sessions: Activities like the neuroplasticity session and maize planting emerged as transformative.

Neuroplasticity Session: Students expressed amazement at the brain's ability to grow and adapt.

"Learning about neuroplasticity changed how I think about learning."

Maize Planting Activity: This provided a tangible metaphor for persistence and effort.

"Planting seeds showed me growth needs time and care."

Discussion and Limitation

The findings of this study reveal that while the growth mindset programme produced positive shifts for some participants, the overall impact on beliefs about intelligence was not statistically significant. This aligns partially with Carol Dweck's (2006) theory of intelligence, which posits that beliefs about intelligence as malleable can enhance academic achievement and personal growth. However, the persistence of fixed beliefs among some students underscores the challenges of shifting deeply ingrained mindsets, especially in a culturally specific context like Nigeria.

Similar to findings by Qin *et al*. (2021), the mixed outcomes may reflect the interplay between individual and contextual factors. Qin *et al*. observed that growth mindset interventions were more effective in environments with medium-achieving students, where resource constraints were less of a hindrance. Additionally, cultural dimensions such as power distance and uncertainty avoidance, as noted by He and Zhang (2024), may have limited the programme's effectiveness in this study.

In contrast, studies like Yeasmin (2021) demonstrated significant improvements in intelligence beliefs among younger students in systematic reviews. Such discrepancies might be attributed to programme differences, including duration, instructional methods, and participant characteristics. This study's 13-week intervention may have been insufficient to disrupt entrenched beliefs, as noted in qualitative findings where some students retained the perception that intelligence is innate.

Focus group discussions provided rich insights into the mechanisms of mindset change. Sessions on neuroplasticity were particularly transformative for students who embraced the idea of brain malleability, reflecting shifts toward a growth mindset. However, deeply ingrained cultural narratives, such as attributing success to innate talent, limited the intervention's reach. This finding parallels the work of King and Trinidad (2021), who found that socioeconomic and cultural factors moderate the efficacy of mindset interventions.

The qualitative data collected during the focus group discussions provided critical insights into the persistence of fixed mindsets among students, despite the growth mindset intervention. For instance, Student 1 remarked, *"Before the programme, I used to think my brain was just fixed. But learning about neuroplasticity helped me understand that my brain can actually grow and change."*

Similarly, Student 5 acknowledged a prior belief that academic success was tied to innate blessings: *"I used to believe that those who always took first, second, and third do it because God blessed them with more wisdom than me. Now I believe that I too am blessed, but I need to read to bring it out."* Meanwhile, Student 6 highlighted the transformative nature of the neuroplasticity session, stating, *"The session about how our brain works was amazing. It made me see that I can change the way I learn and understand things if I put in more effort and practise consistently."*

These qualitative reflections demonstrate that some students began to shift their beliefs towards a growth mindset. However, the overall quantitative results, which showed no significant improvement in intelligence beliefs suggest that deeply ingrained fixed mindsets limited the programme's impact. One reason for this limited impact could be the persistence of pre-existing fixed mindsets. Many students entered the intervention with long-standing beliefs that intelligence is a static trait tied to innate ability. For example, cultural and personal beliefs attributing success to being "blessed with wisdom" reflect a worldview that inherently resists change. As Dweck's (2006) theory posits, altering such entrenched perspectives requires sustained exposure and reinforcement, which may not have been fully achievable within the 13-week intervention.

Additionally, while some students internalised the concept of brain malleability, as evidenced by their reflections on neuroplasticity, this understanding may not have been fully consolidated. Students like Student 1 and Student 5 recognised the potential for growth, but others struggled to translate this awareness into meaningful shifts in self-perception or academic confidence. This aligns with findings from Qin *et al*. (2021), who noted that mindset interventions often produce limited immediate effects, especially in contexts with deeply rooted fixed beliefs.
The programme's emphasis on practical activities, such as maize planting and SMART goal setting, may also explain the lack of significant improvement in intelligence beliefs. While these activities successfully promoted resilience and strategic planning, they may not have directly addressed the fixed views of intelligence held by many participants. Porter *et al*. (2022) similarly observed that the alignment between intervention activities and targeted beliefs is crucial for achieving measurable outcomes.

Finally, we believe that cognitive resistance within the group might have diluted the potential for a significant quantitative change. While qualitative data revealed that some students began to embrace growth-oriented perspectives, others retained fixed beliefs, resulting in mixed progress at the group level. This is

consistent with King and Trinidad's (2021) findings that contextual and socioeconomic factors play a moderating role in the efficacy of mindset interventions.

This study adds to the understanding of growth mindset by emphasizing how the effectiveness of interventions can vary depending on the context. While Dweck's (2006) framework remains foundational, this research underscores the importance of integrating cultural and ecological perspectives, as emphasised by Zhang and He (2024). The findings highlight the importance of using mixed method designs to explore the detailed effects of interventions, offering a deeper and more complete understanding of their outcomes.

To make similar programs more effective in the future, several adjustments could be considered. Extending the intervention beyond 13 weeks would give students more time to absorb and apply growth-oriented ideas. Regularly reinforcing these concepts—for instance, by integrating lessons on neuroplasticity into daily classroom activities—could help challenge fixed beliefs more consistently. Training teachers to use growth mindset strategies, as suggested by Porter *et al*. (2022), could also create a more supportive environment for these programs. Additionally, adapting the interventions to address cultural beliefs, such as the idea that intelligence is innate, could make them more meaningful and impactful in the Nigerian context.

This study's findings must be interpreted with caution due to several limitations. The small sample size (N = 70) and lack of randomisation may have reduced the generalisability of results. Furthermore, the intervention's relatively short duration may have constrained its ability to shift entrenched beliefs. Future studies should consider adopting longitudinal designs to evaluate the sustainability of mindset shifts over time and explore the impact of culturally tailored interventions in diverse educational contexts.

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