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Creativity, Academic Motivation and Achievement Belief as Determinants of Mental Ability of Senior Secondary School Students in Mathematics in Anambra State, Nigeria

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Abstract: The study investigated creativity, academic motivation and achievement belief as determinants of mental ability of senior secondary school students in Mathematics in Anambra state, Nigeria. Four research questions guided the study and four hypotheses were tested at 0.05 level of significance. The predictive correlation design was adopted for the study. The population of the study comprised 21,204 senior secondary two SS2 students in Anambra State, out of which 720 students obtained using random and purposive sampling techniques were involved in the study. The instruments for data collection were validated by three experts from the Departments of Science Education and Educational Foundations (Measurement and Evaluation), Nnamdi Azikiwe University, Awka. The reliability of creativity inventory, academic motivation scale and achievement beliefs scale was established using Cronbach Alpha while that of Mental Ability Test (MAT) was established using KR-20 which yielded coefficient value of .72 for Creativity inventory, .73 for academic motivation scale, .71 for achievement beliefs scale and .73 for Mental Ability Test. Creativity inventory, academic motivation scale, achievement beliefs scale and mental ability test were administered on the students with the help of six research assistants. Data obtained were analyzed using simple and multiple linear regressions. The findings of the study among others revealed that creativity, academic motivation, and achievement beliefs jointly made significant contribution to the prediction of students' mental ability. Among the predictors, academic motivation showed the highest beta weight, indicating that motivated students tend to exhibit higher mental ability in Mathematics. Creativity also positively influenced mental ability in Mathematics, while achievement beliefs enhanced students' mental ability in Mathematics. Based on the above findings. It was recommended among others that teachers and school administrators design instructional strategies that foster creativity, sustain academic motivation and strengthen positive achievement beliefs to improve students' mental ability.

Keywords: *Mathematics, Creativity, Academic Motivation, Achievement Beliefs and Mental Ability.*

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Introduction

Mathematics is a compulsory credit subject for admission to science and technology programs in Nigerian tertiary institutions, reflecting its essential role in national scientific and technological advancement. It functions as a foundational tool, akin to protein for the human body, underpinning understanding and application in science and technology (Obafemi, 2021). The subject is a gateway to technological progress, serving as a precursor and harbinger of development for developing nations. Globally, mathematics remains pivotal in science and technology, unlocking pathways to national advancement (Obafemi, et. al., 2023). Yet, widespread poor achievement in mathematics is a growing concern, not limited to Nigeria but worldwide. Addressing this endemic requires urgent, targeted efforts in teaching and learning, as evidenced by yearly examination results (in primary, secondary, and tertiary levels).

The Chief examiner's reports in Mathematics from 2019 to 2023 show that students' achievement in senior school certificate examination (SSCE May/June) in Mathematics has improved in Nigeria in general and Anambra State in particular but more need to be done considering the role of mathematics in scientific and technological advancement. Also in Nigeria, from 2018 to 2023 the percentage pass with credit and above in mathematics were 52.36%, 65.24%, 81.7%, 76.35% and 79.81 % (WAEC 2019 - 2023). In Anambra State, the percentage pass from 2019 to 2023 with credit and above in mathematics were 70.02%, 72.97%, 91.23%, 86% and 81.73 % respectively (WAEC, 2023). Though good performances were recorded in the reviewed years, excellent performance needs to be maintained especially in Anambra State where more of her populations are business minded and need the basic knowledge of mathematics to drive their businesses. Many factors were pointed out for this fluctuating performances in mathematics. These factors include parental attitude towards mathematics, inadequate number or quality teachers to handle the subject particularly at the secondary school level and more importantly, most students dislike and have anxiety of mathematics (Obafemi, 2021). Apart from the aforementioned variables that affect academic achievement in mathematics. Other variables like creativity, academic motivation and academic beliefs could also be among the determinant of students' mental ability in Mathematics since many of these graduates with good performance cannot perform in line with their record performance.

Creativity is the driving force behind new creations and innovations, encompassing the ability to bring something into existence that is novel and valuable. Penick (2022) frames creativity as a dynamic process: from noticing problems, gaps in knowledge, and disharmonies to seeking solutions, forming hypotheses, testing ideas, and communicating results. This view highlights creativity as a systemic capability, not a single moment of inspiration, and underscores its essential role in learners' success. When learners engage creatively, they transform experiences and resources into actionable ideas, new concepts, and opportunities, while innovation adds value to these outcomes. Li, et. al. (2024) define creativity as generating ideas that are both novel and valuable, a multidimensional construct shaped by internal and external factors. They identify four core dimensions fluency, flexibility, originality, and elaboration that collectively capture the richness of creative thought.

Fluency measures the capacity to generate numerous ideas in response to a challenge, reflecting cognitive breadth. Guilford (2019) notes that higher fluency corresponds to a greater ability to produce diverse solutions. Flexibility, by contrast, reflects cognitive adaptability the capacity to shift between categories or perspectives, enabling students to approach problems from multiple angles (Runco & Jaeger, 2018). This flexibility is particularly crucial for breaking free from conventional thinking and exploring novel possibilities. Originality, valued across disciplines, captures the novelty and uniqueness of ideas, a hallmark of advanced creative work in fields ranging from the arts to the sciences (Csikszentmihalyi, 2019). Finally, elaboration refers to the depth and refinement of ideas, requiring students to expand initial concepts into coherent, well-supported arguments or designs, a skill vital for scholarly work and professional practice.

Without creativity, individuals risk remaining confined by entrenched habits, structures, and perceptions, limiting access to information and resources. Akinboye (2013) argues that creativity, generative perception, constructive and design thinking, and innovation should form the educational core for sustainable development. Creativity emerges from the interplay of intellect, knowledge, motivation, thinking styles, personality, and environment, suggesting that nurturing creativity demands attention to multiple interacting factors. Supporting this view, Rahmawati (2020) found that students' creative abilities significantly predicted mathematical performance, with a variance of 27.6%, indicating a meaningful link between creativity and achievement in mathematics in Anambra State. This association implies that fostering creativity could enhance learning outcomes in mathematics, while recognizing that motivation also shapes academic success.

Academic motivation, defined as the drive to achieve and sustain effort toward goals, is a foundational element of effective learning. Tucker et.al. (2012) describe academic motivation as task-oriented behavior, a lens through which performance and achievement are interpreted. The concept has evolved since Atkinson (1964), who framed motivation as a comparison of performance against others and standards. Subsequent work by Atkinson and Feather (2014) emphasizes a blend of success-oriented and failure-avoidant tendencies, illustrating the complexity of motivational drivers. Klose (2018) elaborates that motivation encompasses factors shaping students' perceptions of their relationship to the learning environment. Motivation dimensions include intrinsic factors, which arise from internal satisfaction, and extrinsic factors, which derive from external rewards, with amotivation representing a lack of driving force.

Several interrelated elements shape academic motivation in the classroom. Internal and external factors influence how students perceive effort, ability, rewards, and the appropriate difficulty of tasks. These dynamics shift with developmental stage: younger children tend to be intrinsically motivated to build competence, while adolescents often display greater extrinsic motivation as they strive to demonstrate achievement and meet social expectations. Stapleton (2011) encapsulates motivation as the triad of personal capability stimulation, sustained effort, and the satisfaction that accompanies success. This framework helps explain how motivation translates into persistent engagement, achievement belief with challenging material, including Mathematics.

Achievement beliefs students' convictions about their capacity to succeed also significantly impact performance. Nwaukwa (2019) and Yarin et.al. (2022) describe achievement beliefs as beliefs about one's ability to perform tasks successfully, which influence cognitive, motivational, affective, and selection processes. High achievement beliefs are associated with greater commitment, perseverance, and better outcomes, while low beliefs correlate with reduced effort and underachievement. Synder and Lopez (2017) and Ofole and Okopi (2012) further argue that individuals with strong academic beliefs are more likely to engage in demanding tasks and excel, whereas those with weaker beliefs are at greater risk of underperforming.

These psychological constructs creativity, motivation, and achievement beliefs intersect with mental ability, another determinant of academic success. Onukwufor (2012) explains mental ability as the capacity to learn, reason, remember, and apply information across contexts. In mathematics, mental ability supports problem solving, abstract reasoning, and the integration of new concepts with prior knowledge. Together, these factors suggest that a holistic approach to education one that cultivates creativity, sustains intrinsic motivation, nurtures robust achievement beliefs, and strengthens cognitive abilities can promote deeper learning and higher achievement in Mathematics and related subjects.

In linking these threads, a coherent vision emerges: education should move beyond procedural mastery to cultivate creative thinking, motivational resilience, and confident self-belief. Designing curricula, pedagogy, and assessment that foreground creative problem-solving, adaptive thinking, and meaningful engagement can unlock students' potential. Such an approach not only enhances Mathematics achievement but also equips learners with the competencies required for innovation-driven economies. By attending to the dynamic interplay among creativity, motivation, achievement beliefs, and mental ability, educators can foster richer, more meaningful learning experiences that prepare students to navigate complex problems and contribute to sustainable development.

Mental ability refers to a person's capacity to learn, reason, remember, recognize concepts, and apply information across different situations. It underpins abstract thinking, problem-solving, and adaptive behavior. In individual learning, higher mental ability supports quicker grasp of new concepts, more effective transfer of knowledge, and robust cognitive strategies for planning metacognition and creativity. No wonder, Eyan (2022), in his Structure of Intellect Theory, proposed that creativity involves divergent thinking a fundamental aspect of cognitive ability.

Similarly, Okoli (2022) and Umeh (2023) emphasized that creativity and intelligence share overlapping cognitive processes, such as ideation, reasoning, and adaptive problem-solving. Moreover, Okonkwo (2024) argued that creativity and intelligence are interdependent constructs that jointly contribute to successful thinking, motivation and learning.

Osadelor (2022) asserted that motivation is a key driver of learning, influencing how much effort and persistence students invest in cognitive tasks such as mental ability. Similarly, Ekereseri (2022) Self-Determination Theory posits that intrinsically motivated learners engage more deeply in academic activities, thereby developing higher mental ability. But Okon (2022) observed that motivated students employ more effective learning strategies and demonstrate better problem-solving and analytical skills.

In another theory, Bandura's (1997) Social Cognitive Theory, emphasizes that self-beliefs influence motivation, effort, and cognitive engagement. Also in Dweck's (2017) Mindset Theory proposes that individuals with a growth mindset believing that intelligence and ability can be developed through effort are more likely to exhibit higher cognitive achievement. This could be the reason Claro *et al.* (2022) found that achievement-oriented beliefs are positively related to cognitive flexibility and problem-solving abilities among students. Similarly, Bostwick et al. (2023) reported that positive achievement beliefs foster greater mental effort and performance across cognitive tasks, especially when learners perceive tasks as attainable and meaningful. With the above assertion it could be that students with weak or negative achievement beliefs often display low academic self-efficacy, diminished persistence and reduced engagement, all of which hinder the development and expression of mental ability (Ahmed *et al.*, 2021).

From the above scholars' reports and observations, it could be deduced that they all worked singly on the variables under study. Also, none of the scholars was specific with a subject matter or senior secondary school subject interest. On this premise the researchers investigated creativity, academic motivation and achievement belief as determinants of mental ability of senior secondary school students in Mathematics in Anambra state, Nigeria.

Purpose of the Study

The purpose of this study was to determine students' creativity, academic motivation and achievement belief as determinants of mental ability of senior secondary school students in Mathematics in Anambra state, Nigeria. Specifically, the study sought to determine the;

- 1. predictive value of creativity on mental ability scores of senior secondary school students in Anambra State.
- 2. predictive value of academic motivation on mental ability scores of senior secondary school students in Anambra State.
- 3. predictive value of achievement beliefs on mental ability scores of senior secondary school students in Anambra State.
- 4. predictive value of creativity, academic motivation and achievement beliefs combine on mental ability scores of secondary school students in Anambra State.

Research Questions

The following research questions guided the study:

- What is the predictive value of creativity on mental ability scores of senior secondary school students in Anambra State?
- What is the predictive value of academic motivation on mental ability scores of senior secondary school students in Anambra State?
- What is the predictive value of achievement beliefs on mental ability scores of senior secondary school students in Anambra State?
- What are the predictive value of creativity, academic motivation, achievement beliefs combine on mental ability scores of secondary school students in Anambra State?

Hypotheses

In line with the research questions, the following null hypotheses were tested at .05 level of significance:

- Creativity is not a significant predictor of mental ability scores of senior secondary school students in Anambra State.
- Academic motivation is not a significant predictors of mental ability scores of senior secondary school students in Anambra State.
- Achievement beliefs is not a significant predictor of mental ability scores of senior secondary school students in Anambra State.
- Creativity, academic motivation and achievement beliefs combine do not significantly predict mental ability scores of secondary school students in Anambra State.

Methodology

This study adopted predictive correlation research design. The area of study was Anambra State, Nigeria. The population of senior secondary two SS2 Mathematics students is 21,204 students of Mathematics in the 263 public secondary schools in the six education zones in Anambra State. The sample of the students used in the study was 720 students which was drawn using a three-stage random sampling process. First, names of the state's education zones were written on folded papers, then the first three were drawn with replacement to ensure equal representation of zones in the sample. In the second stage, two local government areas (LGAs) were selected from each education zone using simple random sampling: again, names were written on folded papers, with the first three drawn with replacement to give each LGA an equal chance of selection. In the third stage, eight public secondary schools were chosen from each selected LGA by writing each school's name on folded papers and drawing the first eight with replacement, ensuring each school had an equal probability of inclusion. In total, 24 public secondary schools were sampled. From these, 30 Senior Secondary Two (SS2) students in the sampled schools participated in the study. The approach emphasizes equal-probability sampling at each stage to enhance representativeness.

Instrument

Four instruments namely: Creativity Inventory, Academic Motivation, Achievement Belief scale and General mental ability

test were used for data collection. Creativity Inventory developed by Epstein et. al. (2024) was used to measure students' creativity. It measured students' creativity with 20 items on a 5-point scale. Factor analysis yielded four dimensions fluency, flexibility, originality, elaboration each with five items. Total scores range 20–100; higher scores indicate greater creativity.

Academic Motivation Scale by Ogundokun and Odofin (2017) was used. The academic motivation scale with 16 items across three factors Intrinsic (0.72), Amotivation (0.70), Extrinsic (0.73) uses a 5-point Likert scale (16–80 range); higher scores indicate greater motivation.

Achievement Belief scale developed by Frysten, Nurmi and Lyytinen (2006) was used to measure students' achievement belief. The inventory contained 31 items used a 1–5 scale; two factors helplessness (8 items) and mastery orientation (6 items) yield total 14–56; higher scores show stronger achievement beliefs.

General mental ability test by Mainali (2021) was used to measure mental ability of the students. The instrument was a multiple choice test of 30 questions. The items were dichotomously scored with 0 as wrong answer and 1 as correct answer. Total score ranged from 0 to 30 marks. Maximum score was 30 while minimum score was 0. Higher scores indicates high level of mental ability.

The four instruments were validated by three experts, two from Department of Science Education and one from Department of Educational Foundation all from Nnamdi Azikiwe University, Awka. Creativity Inventory, Academic Motivation and Achievement Belief scale generated .73, .71 and .73 consistency values after trial testing the instruments in another area that is not the place of the study using Cronbach alpha. While General mental ability test generated .72 using KR 20

Data generated from the study was analysed using r and R^2 to answer research questions while regression ANOVA was used to test the hypotheses. In interpreting the correlation coefficients, the rule posited by Nworgu (2015) about the interpretation was adopted for the interpretation of the study using the range of scores as thus: ±0.80 to ± 1.00 was assigned to high positive or negative predictive value, ±0.31 to ± 0.79 was assigned to moderate positive or negative predictive value, ±0.00 to ± 0.30 was assigned to low positive or negative predictive value. In interpreting the null hypotheses, the decision rule is that when P-value is less than or equal to 0.05 ($P \leq 0.05$) the null hypotheses was rejected. On the other hand, when P-value is greater than the alpha level 0.05 ($P \geq 0.05$), the null hypotheses was not rejected.

Results

Research question 1: What is the predictive value of creativity on mental ability of senior secondary school students in Anambra State?

Table 1: Regression analysis of Predictive value of Students' score in Mental Ability by creativity

Model	R	R^2	Adjusted R^2	Unstandardized coefficients (B)	Std. Error
Constant	.174[a]	.030	.029	6.620	5.646
creativity				.340	

a. Predictors: (Constant), creativity

Table 1 shows that the predictive value of creativity on mental ability of senior secondary school students is 0.174. This indicates that there exists a low positive predictive value of creativity on mental ability of senior secondary school students. The data in the table also reveal that the coefficient of determination R^2 0.030 indicates that 3 percent of the variance in Mental Ability scores is predicted by creativity. The unstandardized coefficient *B* of 0.340 shows that a unit rise in creativity increases mental ability scores by 0.340.

Hypothesis 1: Creativity is not a significant predictor of mental ability of senior secondary school students in Anambra State.

Table 2: ANOVA Regression analysis of the Prediction of Mental Ability score by Students' Creativity

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	693.269	1	693.269	21.746	.000[b]
	Residual	22252.461	698	31.880		
	Total	22945.730	699			

a. Dependent Variable: Mental Ability Score

b. Predictors: (Constant), Creativity

Table 2 shows that creativity is a significant predictor of mental ability scores, F (1, 698) = 21.746, $p < 0.05$. The null hypothesis is therefore rejected meaning that creativity is a significant predictor of students' mental ability scores. Since creativity is a significant predictor of mental ability scores, the regression model (Y= a + bX) for the prediction of mental ability scores as derived from Table 1, where constant = 6.620 and b value = .340 is: ASB = 6.620 + .340(C) Where, MAS = Mental Ability Score and C = Creativity.

Research Question 2: What is the predictive value of academic motivation on mental ability of senior secondary school students in Anambra State?

Table 3: Regression analysis of the Prediction of Students' score in Mental Ability by academic motivation

Model	R	R^2	Adjusted R^2	Unstandardized coefficients (B)	Std. Error
Constant	.197 [a]	.039	.037	4.317	5.622
Academic Motivation				.482	

a. Predictors: (Constant), academic motivation

Table 3 shows that the predictive value of academic motivation on mental ability of senior secondary school students is 0.197. Indicating a low positive predictive value. Also, R-Square value of .039 indicates that 3.9 percent of the variance in Mental Ability scores is predicted by creativity. The unstandardized coefficient *B* of 0.482 shows that a unit rise in creativity increases mental ability score by 0482.

Hypothesis 2: Academic motivation is not a significant predictors of mental ability of senior secondary school students in Anambra State.

Table 4: ANOVA Regression analysis of the Prediction of Mental Ability score by Students' Academic Motivation

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	886.979	1	886.979	28.066	.000[b]
	Residual	22058.751	698	31.603		
	Total	22945.730	699			

a. Dependent Variable: Mental Ability Score (MAS)

b. Predictors: (Constant), motivation

Table 4 shows that academic motivation is a significant predictor of mental ability scores, F (1, 698) = 28.066, p < 0.05. The null hypothesis was therefore rejected meaning that academic motivation is a significant predictor of students' mental ability scores. Since academic motivation is a significant predictor of mental ability scores. The regression model (Y= a + bX) for the prediction of mental ability score in as derived from Table 9, where constant = 4.317 and b value = .482 is: MA = 4.317 + .482 (AM) Where, MAS = Mental Ability Score and AM = Academic Motivation

Research Question 3: What is the predictive power of achievement beliefs on mental ability of senior secondary school students in Anambra State?

Table 5: Regression analysis of the Prediction of Students' score in Mental Ability by achievement beliefs

Model	R	R^2	Adjusted R^2	Unstandardized coefficients (B)	Std. Error
Constant	.294 [a]	.086	.085	17.211	17.211
Achievement Beliefs				.596	

a. Predictors: (Constant), achievement beliefs

Table 5 shows that the predictive power of achievement beliefs on mental ability of senior secondary school students is 0.294 indicating a low positive predictive value. Also from the table, R-Square value of 0.086 indicates that 8.6 percent of the variance in Mental Ability scores is predicted by achievement beliefs. The unstandardized coefficient *B* of 0.596 shows that a unit rise in achievement beliefs increases mental ability score by 0.596.

Hypothesis 6: Achievement beliefs is not a significant predictor of mental ability of senior secondary school students in Anambra State

Table 6: ANOVA Regression analysis of the Prediction of Mental Ability score by Students' Achievement Beliefs

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1977.926	1	1977.926	65.843	.000[b]
	Residual	20967.804	698	30.040		
	Total	22945.730	699			

a. Dependent Variable: Mental Ability Score

b. Predictors: (Constant),Achievement Beliefs

Table 6 shows that achievement beliefs is a significant predictor of mental ability scores, F (1, 698) = 65.843, p < 0.05. The null hypothesis is therefore rejected meaning that achievement beliefs is a significant predictor of students' mental ability scores. Since achievement beliefs is a significant predictor of mental

ability scores, the regression model (Y= a + bX) for the prediction of mental ability score as derived from Table 16, where constant = 17.211 and b value = 0.596 is: MAS = 17.211 + 0.596(AB) Where, MAS = Mental Ability Score, AB=Achievement Beliefs.

Research Question 4: What are the predictive value of creativity, academic motivation, achievement belief on mental ability of secondary school students in Anambra State?

Table 7: Prediction of Students' score in Mental Ability by creativity, academic motivation, achievement beliefs in Anambra State

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
R=.326	(Constant)	13.907	1.952		7.125	.000
R^2=.106	motivation	.372	.111	.152	3.341	.001
Adjust R^2=.103	Creativity	.145	.042	.140	3.455	.001
Std. Error=5.427	Belief	.477	.083	.235	5.760	.000

a. Dependent Variable: MAS

a. Predictors: (Constant), creativity, academic motivation, achievement beliefs

Table 7 shows that the R-Square value of .106 indicates that 10.6 percent of the variance in mental ability scores is predicted by creativity, academic motivation, achievement belief combined. The unstandardized coefficient *B* of .145 shows that a unit rise in creativity increases mental ability score by .145, again, when academic motivation increases by a unit, mental ability increases by .372. While achievement beliefs increases by a unit, mental ability score increases by .477. Thus, the order of relative contribution to mental ability score is from the highest to lowest by each variable is; Achievement beliefs, followed by academic motivation and creativity.

Hypothesis 4: Creativity, academic motivation, achievement beliefs are not significant predictors of mental ability of secondary school students in Anambra State.

Table 8: ANOVA Regression analysis of the Prediction of Mental Ability score by Students' creativity, academic motivation, achievement beliefs

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2443.551	3	814.517	27.651	.000[b]
	Residual	20502.179	696	29.457		
	Total	22945.730	699			

a. Dependent Variable: MAS

b. Predictors: (Constant), Belief, creativity, motivation

In order to test hypothesis 4, multiple regression analysis was used. The result in Table 26 shows that the obtained F-value is F(3, 696) = 27.651, with an associated probability value of .000. This probability value of .000 is compared with 0.05 and it is found to be significant. The null hypothesis is therefore rejected and inference drawn was that, combined creativity, academic motivation, and achievement beliefs significantly predict of mental ability of secondary school students in Anambra State. However, since the joint prediction of all the independent variables on Mental ability is significant, the regression model (Y= a + bX1 +cX2 + dX3) for the prediction of mental ability scores can be derived from Table 25 is: MAS = 13.907 + .145 (C) + .372 (AM) + .477 (AB). Where, MAS = Mental Ability scores, C= creativity, AM= Academic Motivation and AB = Achievement Beliefs.

Discussion

The discussion of the findings was done in line with the research questions and hypotheses that guided the study:

Predictive value of creativity on mental ability of senior secondary school students

The study found that creativity significantly predict mental ability scores among the respondents. The finding of this study aligns with prior researches that established creativity as an integral component of intellectual functioning. Eyan (2022), in his Structure of Intellect Theory, proposed that creativity involves divergent thinking a fundamental aspect of cognitive ability. Similarly, Okoli (2022) and Umeh (2023) emphasized that creativity and intelligence share overlapping cognitive processes, such as ideation, reasoning, and adaptive problem-solving. Moreover, Okonkwo (2024) argued that creativity and intelligence are interdependent constructs that jointly contribute to successful thinking and learning. In line with these scholars, the present study confirms that creativity enhances an individual's capacity for analytical reasoning and cognitive adaptability, which are essential indicators of mental ability.

Predictive value of academic motivation on mental ability of senior secondary school students

The study also found that a positive and significant predictive influence of academic motivation on mental ability. This suggests that students who are more motivated academically are likely to exhibit greater cognitive engagement, perseverance and learning effectiveness all of which contribute to higher mental ability. The findings of this study are consistent with the conclusions of several previous researchers who emphasized the positive impact of motivation on cognitive functioning and academic outcomes. Osadelor (2022) asserted that motivation is a key driver of learning, influencing how much effort and persistence students invest in cognitive tasks. Similarly, Ekereseri (2022) Self-Determination Theory posits that intrinsically motivated learners engage more deeply in academic activities, thereby developing higher mental ability. In line with this study's findings, Okon (2022) observed that motivated students employ more effective learning strategies and demonstrate better problem-solving and

analytical skills. This suggests that motivation not only energizes students but also enhances their cognitive capacity to process and retain information.

Predictive value of achievement beliefs on mental ability of senior secondary school students

The study found that achievement beliefs made a significant contribution to the prediction of mental ability scores. This indicates that achievement beliefs are a meaningful predictor of mental ability. The study showed that approximately 8.6% of variance in mental ability is explained by achievement beliefs. Stronger beliefs modestly but significantly relate to higher mental ability and cognitive outcomes. This supports the theoretical position of Bandura's (1997) Social Cognitive Theory, which emphasizes that self-beliefs influence motivation, effort, and cognitive engagement. When students believe in their academic competence, they approach intellectual tasks with greater persistence and strategic thinking, which in turn enhances mental ability performance.

Furthermore, the findings align with Dweck's (2017) Mindset Theory, which proposes that individuals with a growth mindset believing that intelligence and ability can be developed through effort are more likely to exhibit higher cognitive achievement. Students with strong achievement beliefs typically demonstrate resilience, curiosity, and adaptive learning behaviors, all of which contribute to improve mental functioning.

The findings were also supported by the result of Claro *et al.* (2022) who found that achievement-oriented beliefs are positively related to cognitive flexibility and problem-solving abilities among students. Similarly, Bostwick et al. (2023) reported that positive achievement beliefs foster greater mental effort and performance across cognitive tasks, especially when learners perceive tasks as attainable and meaningful. These findings emphasize the interdependence between belief systems and cognitive outcomes.

In contrast, students with weak or negative achievement beliefs often display low academic self-efficacy, diminished persistence and reduced engagement, all of which hinder the development and expression of mental ability (Ahmed *et al.*, 2021). Thus, fostering positive achievement beliefs may be a crucial pathway to enhancing students' mental ability and overall academic potential.

Conclusions

The study concludes that creativity, academic motivation, and achievement beliefs are significant predictors of senior secondary school students' mental ability in mathematics. Students who demonstrate higher levels of creative thinking, possess stronger motivation toward learning, and hold positive achievement beliefs tend to perform better cognitively. This indicates that cognitive development is not determined by intellectual ability alone but is also shaped by psychological and affective factors. Therefore, enhancing creativity, motivation and self-belief is essential for improving mathematical understanding and overall academic success among students.

Recommendations

- Creative Mathematics instruction enhances engagement: interactive games, puzzles, projects, and collaboration transform learners from passive to active participants.
- Motivational programs should be implemented by schools and policymakers: reward systems, academic clubs, and peer mentoring sustain interest in Mathematics.
- Guidance counselors should run workshops to build positive achievement beliefs, resilience, and self-efficacy among students.
- Parents and guardians must reinforce effort, provide emotional support, and back academic growth at home.

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