RELATIONSHIP BETWEEN EMOTIONAL INTELLIGENCE AND CRITICAL THINKING SKILLS IN NORTH CENTRAL NIGERIA

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Abstract
This work evaluated relationship between emotional intelligence and critical thinking skills in Northcentral Nigeria. Two objectives, two research questions and one hypothesis guided the study. The study adopted correlational research design. The population for this study was pre-service science educators in federal universities in Northcentral Nigeria. The sample for this study was 274 using proportional sampling technique. The instrument for this study were emotional intelligence questionnaire and critical thinking skills questionnaire which were developed by researcher and validated by three experts across universities in Northcentral Nigeria. These instrument were pilot-tested on Pre-service science educators of University of Ilorin three hundred level and evaluated yielding 0.78 which believed reliable for the study. These instruments were used to collect data and the data were analyzed using Special package for social sciences (SPSS). The research questions were answered using descriptive statistics (mean, standard deviation and scatterplot while the hypothesis was tested using linear regression analysis. The results show that pre-service science educators possessed medium level of both critical thinking skills and emotional intelligence and strong relationship between emotional intelligence and critical thinking skills were also established. The study concluded that there is strong relationship between emotional intelligence and critical thinking skills based on this the study recommended that Teacher education institutions and colleges should embed structured emotional intelligence (EI) development programmes such as workshops on self-awareness, emotion regulation, empathy, and social skills into their curricula. Doing so may enhance critical thinking skills, which are central to effective teaching and learning, continuous professional development (CPD) for teachers should include modules on fostering both EI and critical thinking among students. Teachers with higher EI are better equipped to model reflective thinking and create emotionally supportive learning environments that promote critical inquiry.

Keywords: ***Critical thinking skills, Emotional Intelligence, Pre-service Science Educators***

Introduction
in recent decades, emotional intelligence (EI) has emerged as a significant construct in educational psychology, organizational behaviour, and social sciences. Broadly, EI refers to the capacity to recognize, understand, regulate and utilize emotions effectively in oneself and others (Salovey & Mayer, 1990; Goleman, 1995). Unlike cognitive intelligence, which emphasizes analytical and problem-solving skills, EI underscores the non-cognitive abilities that contribute to interpersonal effectiveness, resilience and overall well-being. The increasing recognition of EI highlights its pivotal role in shaping academic performance, workplace success, leadership and personal development.

In educational contexts, EI has been linked to improved motivation, stress management, classroom relationships and enhanced learning outcomes (Sánchez-Álvarez *et al.,* 2020). Students with higher EI demonstrate stronger adaptability, better problem-solving skills, and greater

collaboration with peers, all of which are crucial in an era of learner-centered and blended pedagogies. Similarly, teachers with higher EI are better equipped to manage classroom challenges, foster inclusive learning environments, and support students' socio-emotional growth (Alrajhi *et al.*, 2021). These findings suggest that EI is not only complementary to cognitive ability but also essential in developing holistic learners who can thrive in diverse academic and social settings.

Moreover, the relevance of EI extends beyond the school environment. In the workplace, emotionally intelligent individuals show stronger leadership potential, conflict resolution ability and teamwork (Miao *et al.*, 2018). In today's rapidly changing and technologically driven society, where collaboration and adaptability are highly valued, EI has become indispensable. This has led to an increasing demand for integrating EI training into curricula at various educational levels to prepare students for both academic success and life beyond the classroom.

Despite its growing relevance, the incorporation of EI in education and training remains inconsistent, particularly in developing contexts where academic performance is often prioritized over socio-emotional learning. This gap underscores the need for empirical research to examine the effectiveness of EI in enhancing not only academic achievement but also critical skills such as motivation, resilience, and social adjustment. A deeper understanding of EI as a psychological and educational construct can provide useful insights for curriculum developers, educators, and policymakers.

Critical thinking (CT) has become one of the most essential skills in education and knowledge-based economies of the 21st century. It refers to the ability to actively and skillfully conceptualize, analyze, synthesize, evaluate, and apply information gathered from observation, experience, or reasoning as a guide to belief and action (Facione, 2020). Unlike rote memorization, CT emphasizes reflective judgment, problem-solving, creativity and the capacity to make sound decisions in complex situations. As global challenges become increasingly interconnected, education systems are shifting from the mere transmission of facts to cultivating higher-order thinking skills, among which CT is central.

In educational settings, critical thinking skills (CTS) are strongly associated with deeper learning, improved problem-solving ability, and greater academic achievement (Choy & Oo, 2021). Students with well-developed CTS can evaluate evidence, detect inconsistencies, and approach problems from multiple perspectives, thereby enhancing their independence and lifelong learning capacities. For educators, fostering CT enables them to create inquiry-driven learning environments where learners are encouraged to question, reflect, and engage in meaningful dialogue (Widyastono, 2022).

Globally, curriculum reforms emphasize the integration of CTS as part of 21st-century competencies. The UNESCO Education 2030 Agenda underscores CT as vital for preparing learners to become active, responsible citizens capable of addressing social, environmental, and technological challenges. In line with this, researchers have argued that the infusion of CT into teaching and learning processes not only strengthens academic knowledge but also equips learners with the resilience, adaptability, and innovation skills needed in modern workplaces (Rizwan *et al.*, 2023).

Despite its recognized importance, developing CT among learners remains a challenge. Many instructional practices, especially in developing countries, are still dominated by teacher-centered approaches that prioritize memorization and recall over inquiry and reasoning (Adeyemi & Adesoji, 2020). This pedagogical gap often results in learners lacking the ability to apply knowledge beyond examinations. Consequently, there is an increasing call for instructional innovations such as problem-based learning, blended learning, inquiry-based strategies, and the use of technology to foster CTS in diverse learning contexts.

Thus, the study of CT is not only timely but also essential for bridging the gap between traditional instructional practices and the demands of 21st-century education. By examining how CTS can be cultivated within specific disciplines, educators and policymakers can design strategies that promote active, reflective, and meaningful learning.

The 21st-century learning landscape emphasizes not only cognitive competencies but also socio-emotional capacities that collectively shape holistic education. Emotional intelligence (EI) and critical thinking skills (CTS) are two interrelated constructs that have gained prominence in education, psychology and leadership research. EI refers to the ability to recognize, regulate, and utilize emotions constructively (Goleman, 1995), while CT involves the disciplined process of analyzing, evaluating, and synthesizing information to make informed decisions (Facione, 2020). Though often treated as separate domains, emerging studies show that EI and CTS are closely connected and mutually reinforcing in enhancing learners' academic and life outcomes.

Emotional intelligence provides the affective foundation upon which critical thinking can be effectively exercised. For example, individuals who can manage stress, control impulsivity and regulate emotional biases are better positioned to engage in reflective judgment and rational decision-making (Hasanzadeh & Shahmohamadi, 2021). Similarly, empathy and social awareness components of EI foster open-mindedness and tolerance for diverse perspectives, which are critical dispositions for engaging in higher-order thinking (Tican & Deniz, 2019). In this way, EI enhances learners' readiness to apply CTS in problem-solving and inquiry.

Conversely, strong critical thinking enables individuals to evaluate emotional responses, question assumptions and apply logic to emotionally charged situations. This balance between affect and cognition is essential in contemporary education, where learners must navigate complex academic tasks and social challenges. Research has suggested that students with higher EI and CTS not only achieve better academically but also demonstrate improved teamwork, resilience and adaptability in changing learning environments (MacCann et al., 2020).

In educational practice, the integration of EI and CTS has significant implications. Learners equipped with both constructs are more likely to manage academic stress, engage in collaborative inquiry and sustain motivation in blended and inquiry-based classrooms. Yet, in many developing contexts, instructional methods remain predominantly teacher-centered, with limited attention to socio-emotional learning. This gap highlights the need to foster both EI and CTS simultaneously to prepare learners for the cognitive and emotional demands of 21st-century education and beyond.

Purpose of the Study

The aim of this study is to determine relationship between emotional intelligence and critical thinking skills in northcentral Nigeria: The following objectives will guide the study:

1. Determine the level of emotional intelligence of pre-service science educators in the Northcentral Nigeria
2. Determine the relationship between emotional intelligence and critical thinking skills

Research Questions

1. What is the level of emotional intelligence of pre-service science educator in Northcentral Nigeria
2. What is the relationship between emotional intelligence and critical thinking skills

Research Hypothesis

$H0_1$; There is no significant difference in relationship between emotional intelligence and critical thinking skills

Methodology

This work adopted correlational research design. The population for this study is all science educators in North-Ccentral Nigeria which comprises of seven state that is Benue State, Kwara State, Kogi State, Nasarawa State, Platuea State and Federal Capital Territory Abuja (FCT, Abuja). The sample for this work was 274 using slovin formular. The instrument used to collect data are five likert scale emotional intelligence questionnaire and critical questionnaire rated strongly agreed (SA), Agreed (A), Disagreed (D), Strongly Disagreed (SD) and Neutral. The instruments were validated by three experts one from department of Education foundation Ibrahim Babangida University, one from Industrial Technology Education, Federal University of Technology and Department of science education federal university of technology Minna Niger State. The reliability of these have been determined using cronbach alpha which yielded 0.72 and 0.89. The data was collected using these instruments. The data collected were analyzed using descriptive and inferential statistics. The research questions were answered using mean, standard deviation, scatterplots and hypotheses was tested using regression analysis.

Results:

Research Question One: What is the level of emotional intelligence of university pre-service science educators in Northcentral Nigeria

Table 1.1 Mean and Standard Deviation of Emotional Intelligence of Pre-service Science Educators in Northcentral

Items	Mean	STD	Decision
I always I understand my feeling during class lectures	2.90	.62	Moderate
I realize the links between my feeling and what I think, do , and say	2.71	.49	Moderate
I am aware of my values and goals in the school	2.74	.49	Moderate

I cannot explain why I feel anxious in the school	2.97	.49	Moderate
I do not realize the links between feeling and what I think, do and say	2.76	.48	Moderate
I guide the performance of other while holding them accountable	2.58	.49	Moderate
I consciously change my mood to adjust in the school environment	2.74	.47	Moderate
I continuously learn in order to improve my performance	2.94	.47	Moderate
I adept well to unexpected changes in my academic schedule	2.81	.48	Moderate
I cannot guide the performance of others while holding them accountable	2.70	.46	Moderate
Motivation has been the key to my academic success	2.80	.49	Moderate
I derive joy in pursuing my school goals	2.74	.49	Moderate
I derive joy in planning my school activities	2.62	.49	Moderate
I can motivate myself even when I failed my exams	2.92	.49	Moderate
I do not derive joy in pursuing my school goal	2.59	.49	Moderate
	2.77	.51	Moderate
I read the signs if my classmate are upset	2.82	.49	Moderate
I can change my mood to adjust in the school environment	2.88	.50	Moderate
I am aware of unspoken rules and social dynamic within my department	2.79	.50	Moderate
I can sense the mood in the lecture hall or study group	2.78	.50	Moderate
I cannot change my mood to adjust in the school environment			

The table 1.1 shows the descriptive statistics of (EI) among university pre-service science educators in Northcentral Nigeria. Based on the descriptive statistics, the respondents' emotional intelligence is uniformly situated at a moderate level across all measured indicators (grand mean = 2.77, SD = 0.51).

The moderate means for items such as "I always understand my feeling during class lectures" (M = 2.90, SD = 0.62) and "I realize the links between my feeling and what I think, do, and say" (M

= 2.72, SD = 0.49) suggest that participants possess fair self-awareness but may not consistently engage in deep reflection on emotional experiences. Their awareness of values and goals in the school context (M = 2.74, SD = 0.50) similarly points to a middling degree of emotional insight into their professional aspiration.

In the domain of self-regulation, items such as "I consciously change my mood to adjust in the school environment" (M = 2.74, SD = 0.48) and "I adapt well to unexpected changes in my academic schedule" (M = 2.81, SD = 0.49) again fall within the moderate range. This indicates that while the respondents do attempt to regulate their emotional states, their flexibility and consistency in doing so may be limited under pressure or unfamiliar contexts.

Regarding motivation, statements like "I can motivate myself even when I failed my exams" (M = 2.92, SD = 0.50) and "Motivation has been the key to my academic success" (M = 2.80, SD = 0.49) reflect a comparatively stronger but still moderate disposition toward intrinsic drive. Their ability to sustain efforts despite setbacks seems one of the relatively stronger facets of their emotional intelligence.

When it comes to social awareness (empathy), pre-service educators responded at moderate levels on items such as "I read the signs if my classmate are upset" (M = 2.82, SD = 0.49) and "I can sense the mood in the lecture hall or study group" (M = 2.78, SD = 0.50). This suggests some ability to detect emotional cues among peers, though not with strong consistency or confidence.

Finally, in relationship management, the relatively lower means recorded (e.g. "I guide the performance of others while holding them accountable," M = 2.58, SD = 0.49; "I do not realize the links between feeling and what I think, do and say," M = 2.76, SD = 0.48) imply that participants are less comfortable or adept in influencing others' emotional states and holding them responsible in a relational context. Overall, no dimension of the emotional intelligence scale reached a high (strong) level; all are solidly in the medium band. This uniformity suggests that pre-service science educators in this region maintain an average emotional intelligence profile characterized by fair self-insight, regulation, empathy, motivation, and relational competence.

In answer to the research question "What is the level of emotional intelligence of pre-service science educators in Northcentral Nigeria"? the current study demonstrates that their emotional intelligence is at a moderate (medium) level across all measured dimensions. While their self-motivation and social sensitivity are neither poor nor exceptional, the modest levels in self-regulation and relationship management suggest areas for targeted development. To optimize their future professional effectiveness, teacher preparation programmes should integrate structured emotional intelligence-building components.

Research Question Two: What is the relationship between emotional intelligence and critical thinking skills To test the relationship emotional intelligence and critical thinking skills scatterplot was carried out as shown in figure 1.1

Scatterplot of Emotional Intelligence and Critical Thinking Skills

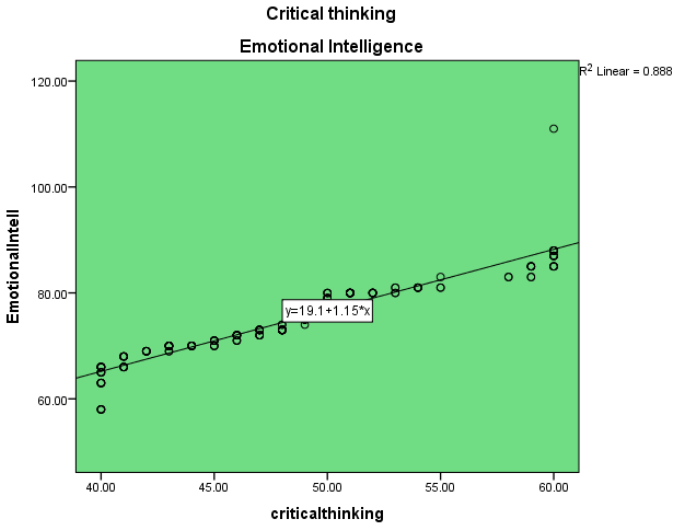

Figure 1.1: Scatterplot of Emotional Intelligence and Critical Thinking Skills

The scatterplot figure 1.1 shows a strong positive linear relationship between critical thinking and emotional intelligence. The regression equation is:{Emotional Intelligence} = 19.1 + 1.15{Critical Thinking}) This means that for every 1-unit increase in critical thinking, emotional intelligence increases by about1.15 units. The $R^2 = 0.888$, indicating that about 88.8% of the variance in emotional intelligence is explained by critical thinking a very strong relationship.

The data points are tightly clustered around the regression line, showing a very strong and consistent trend. The spread looks fairly even across the range of critical thinking scores, which suggests homoscedasticity (no major changes in spread as values increase). This supports the reliability of the regression model. Most points follow the upward trend, but there is one potential outlier at the upper-right corner: a case where emotional intelligence is unusually high compared to the predicted value. While it does not distort the overall pattern significantly, it is worth checking if this case represents a special condition or measurement anomaly. The scatterplot reveals a strong positive linear relationship between critical thinking and emotional intelligence. As critical thinking increases, emotional intelligence also increases substantially, with an R^2 of 0.888 showing that nearly 89% of the variation in emotional intelligence is explained by critical thinking. The distribution of points is tightly aligned with the regression line, suggesting a robust model. However, one outlier exists with exceptionally high emotional intelligence, which may need further investigation.

Hypothesis

There is no significant relationship between emotional intelligence and critical thinking skills
To test this hypothesis, linear regression analysis was carried out as shown in table 1.1, 1.2 and 1.3

Table 1.1 Model Summary of Linear Regression Analysis

Model	R	R SQUARE	Adjusted R SQUARE	Std Error of Estimate	R Square Change	F Change	Df1	Df2	Sign F change	Durbin Watson
1	.942	.888	.887	1.93928	.888	1560.051	1	270	.000	.505

A simple linear regression was conducted to examine whether emotional intelligence significantly predicts critical thinking. Results revealed that the model was statistically significant, $F(1, 270) = 1560.05$, $p < .001$, with emotional intelligence accounting for approximately 88.8% of the variance in critical thinking ($R^2 = .888$, Adjusted $R^2 = .887$). The regression coefficient indicated a strong positive relationship ($R = .942$), suggesting that higher levels of emotional intelligence are associated with higher levels of critical thinking. The standard error of the estimate was 1.94, indicating relatively small prediction errors. However, the Durbin–Watson statistic was .505, which falls below the acceptable range of 1.5 to 2.5. This suggests the presence of positive autocorrelation among residuals, potentially violating the assumption of independence of errors.

Table 1.2 ANOVA Table Linear Regression Analysis of Emotional Intelligence and Critical Thinking Skills

Model	Sum of Squares	df	Mean Square	F	Sign
Regression	5867.077	1	5867.077	1560.051	.000[b]
Residual	740.882	197	3.761		
Total	6607.960	198			

An ANOVA was performed to assess whether the regression model significantly predicted critical thinking from emotional intelligence. Results indicated that the model was statistically significant, $F(1, 197) = 1560.05$, $p < .001$, accounting for a substantial portion of the variance in critical thinking. This suggests that emotional intelligence is a significant predictor of critical thinking.

Table 1.3 Linear Regression Coefficients of Emotional Intelligence and Critical Thinking Skills

Predictor Partial | Part |	B (Unstd.)	Std. Error	Beta (Std.)	T	Sig.	95% CI for B	Zero-order
Constant (Intercept)	-9.311	1.463		-6.366	.000	-12.195, -6.427	
EmotionalIntell	.771	0.020	.942	39.497	.000	0.732, 0.809	.942

The regression coefficients indicated that emotional intelligence was a significant predictor of critical thinking. Specifically, emotional intelligence had a strong positive effect, $B = 0.77$, $SE = 0.02$, $\beta = .94$, $t(197) = 39.50$, $p < .005$, with a 95% confidence interval[0.73, 0.81]. This suggests that for each one-unit increase in emotional intelligence, critical thinking scores increased by approximately 0.77 units. The regression equation is: $\{Y\} = -9.31 + 0.77X$

Where Y represents critical thinking and X represents emotional intelligence.

A simple linear regression was conducted to examine whether emotional intelligence significantly predicts critical thinking.

The model was statistically significant and demonstrated a very strong predictive relationship between emotional intelligence and critical thinking. The results showed that emotional intelligence accounted for approximately 88.8% of the variance in critical thinking, $R^2 = .888$, Adjusted $R^2 = .887$, with a strong correlation coefficient ($R = .942$). The standard error of the estimate was 1.94, indicating relatively small prediction errors. However, the Durbin–Watson statistic was .505, suggesting positive autocorrelation of residuals,

The ANOVA test further confirmed the statistical significance of the regression model, $F(1, 197) = 1560.05$, $p < .001$, indicating that emotional intelligence provides a significant improvement in predicting critical thinking compared to a model without predictors. The coefficients table revealed that emotional intelligence was a significant positive predictor of critical thinking, $B = 0.77$, $SE = 0.02$, $\beta = .94$, $t(197) = 39.50$, $p < .001$, with a 95% confidence interval [0.73, 0.81]. This means that for every one-unit increase in emotional intelligence, critical thinking increased by approximately 0.77 units. The regression equation can be expressed as: {Y} = -9.31 + 0.77X where {Y}represents the predicted critical thinking score and X represents emotional intelligence. Therefore this hypothesis is rejected and alternate hypothesis is retain which say there is significant relationship between emotional intelligence and critical thinking skills of science educators in Northcentral of Nigeria.

The present study examined whether emotional intelligence (EI) predicts critical thinking (CT). The regression model showed a very strong positive association: emotional intelligence significantly predicted critical thinking, $B = 0.77$, $SE = 0.02$, $\beta = .94$, $t(197) = 39.50$, $p < .001$$, and the model accounted for 88.8% of the variance in critical thinking (R{2} = .888$). These results indicate that higher EI scores were associated with substantially higher CT scores in this sample.

This finding is consistent with recent empirical evidence that emotional competencies are closely tied to cognitive outcomes. Meta-analytic and review-level evidence indicates that EI is positively related to academic and cognitive performance, although effect sizes vary by context and measure (Sánchez-Álvarez *et al.,* 2020; Quílez-Robres *et al.,* 2023). In more targeted studies, researchers have reported positive correlations between EI (or its facets) and CT disposition among students in applied fields such as nursing and teacher education (Hasan *et al.,* 2024; Quílez-Robres *et al.,* 2021).

Mechanistically, the link between EI and CT can be interpreted in light of theories suggesting that emotion regulation and affective awareness free up cognitive resources for higher-order reasoning, individuals who recognize and manage emotions can better sustain attention, evaluate alternative perspectives and engage in reflective thinking processes central to CT. Empirical studies support this mechanism by showing that EI, especially emotion-management branches, predicts wise or reflective reasoning and other cognitive outcomes (Iqbal *et al.,* 2021; Schneider *et al.,* 2021). Thus, the present strong effect ($\beta = .94$) aligns with theoretical expectations that EI facilitates complex cognitive processing in educational contexts.

Implications: Practically, the results suggest that interventions aimed at developing EI may have beneficial downstream effects on students' CT skills important for curricula in teacher education, nursing, and other professional programmes where both affective and cognitive competencies are essential. This supports calls for integrated training that simultaneously targets emotion regulation, reflective practice and analytical reasoning to strengthen clinical judgment and educational outcomes (Quílez-Robres *et al.,* 2023; Hasan *et al.,* 2024).

Conclusion. In sum, the regression results demonstrate a robust positive association between EI and CT. The finding aligns with recent empirical and meta-analytic work suggesting EI contributes to academic and cognitive outcomes. However, the low Durbin–Watson statistic and the cross-sectional design counsel caution. Addressing model diagnostics and testing causal mechanisms should be priorities for subsequent research and for translating these findings into effective educational practice.

Recommendations: Based on the findings that emotional intelligence strongly and positively predicts critical thinking, the following recommendations are proposed:

1. Teacher education institutions and colleges should embed structured emotional intelligence (EI) development programmes such as workshops on self-awareness, emotion regulation, empathy, and social skills into their curricula. Doing so may enhance critical thinking skills, which are central to effective teaching and learning

2. Continuous professional development (CPD) for teachers should include modules on fostering both EI and critical thinking among students. Teachers with higher EI are better equipped to model reflective thinking and create emotionally supportive learning environments that promote critical inquiry.

3. Education policymakers should recognize the importance of EI as a determinant of cognitive outcomes. Policy frameworks could mandate the inclusion of EI-focused pedagogical strategies in teacher education programs to improve overall educational quality and student outcomes

4. School counselors and psychologists should design interventions that simultaneously target emotional regulation and cognitive development. Such dual interventions could foster resilience, enhance decision-making, and strengthen critical reasoning skills in learners.

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