GAS Journal of Education and Literature (GASJEL)

Volume 2 | Issue 11, 2025 Homepage: https://gaspublishers.com/gasjel-home/ ISSN: 3048-6777

Enhancing Creative Minds Development in Basic Science Students with Different Intellectual Abilities through Creative Exploration in Gboko

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Received: *20.10.2025* | ***Accepted:*** *23.11.2025* | ***Published:*** *26.11.2025*

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DOI: *10.5281/zenodo.17719046*

Abstract **Original Research Article**

Enhancing Creative Minds Development in Basic Science Students with Different Intellectual Abilities through Creative Exploration in Gboko was studied using pre-test, post-test control group quasi experimental design. Two research questions and two hypotheses guided the study. A multi-stage sampling procedure was used to draw a sample of 70 (39 males and 31 females) students from a population of 1,823 (995 males and 828 female) upper-basic III Science students in 24 government grant-aided schools and was used for the study. Torrance Test of Creative Thinking (TTCT Figural-B) was adapted and used to collect data. The instrument was validated by five experts (including one Physics educationist, one Electrical/Electronic technologist, one education mathematician, one in test measurement from faculty of education, Benue State University Makurdi and a 10-year experienced Basic Science teacher from Benue State Technical College, Makurdi), it was trial-tested by a test retest and yielded a reliability coefficients of 0.992 as was computed using Pearson product moment correlation statistic. Data were analysed using mean and standard deviation to answer research questions and Analysis of Covariance (ANCOVA) to test the null hypotheses at 0.05 α-level. Findings revealed that a significant difference existed in the development of creative-minds of students taught Basic Science using creative exploration and those taught using expository teaching ($F(1,67) = 147.909$; $\rho = 0.001 < 0.05$). The study also revealed that there is no significant difference in the development of creative-minds mean scores among students with different intellectual abilities taught Basic Science using CE, $F(1, 32) = 0.218$; $\rho = 0.644 > 0.05$. The study recommended among others that creative exploration be used for teaching Basic Science at basic education level.

Keywords: Creative Minds Development, Basic Science, Intellectual Abilities and Creative Exploration

Introduction

Education is a vital tool for empowering creative minds, addressing complex sustainable challenges and promoting environmental consciousness for a responsible future. It plays a transformative role in individual's lives and society as a whole, driving progress, innovation and positive change. According to Terhemba (2025) education is a vital process which enables individuals to acquire, knowledge, skills, values and attitudes necessary for personal growth, social mobility and economic development. This explicates why most policy documents on education have advocated for self-reliance and activity-based curriculum in order to encourage minds-on-activities to harness science through science education for sustainable development and stability. Pantiwati, et al. (2023) posit that self-determining curriculum pave way for learners to explore resources creatively and gain creative skills for themselves and the society.

Science is a systematic enterprise that builds and organises knowledge in the form of testable, verifiable and falsifiable explanations and predictions about the universe or natural world's resources. It follows a logical sequence like observation, experimentation, analysis and theory development. Therefore, the teaching and learning of scientific knowledge, skills and values could be imperative in science education for students to be useful to themselves, build the nation and compete globally. Science education is all the processes by which individuals develop interest, abilities, knowledge and skills necessary for the development of the society. This means that science, be it in the aspect of Biology, Physics, Chemistry and Basic Science should be taught with teaching methods that could develop science learners' creative minds, curiosity, problem solving skills, analytical thinking, critical thinking and creative thinking for independent living in the ever-dynamic globe.

Basic Science also known as the elementary science, fundamental or pure science, is the study of fundamental principles and mechanisms underlying natural bodies, objects, or phenomena at basic education level. It encompasses Physics, Chemistry, Biology and Earth Sciences. It focuses on laying the foundation for applied sciences and technology advancements, expanding understanding of the world and the universe, driving breakthroughs and discoveries that can lead to practical applications for survival in the 21st century. Basic Science is designed to build students' scientific understanding while fostering curiosity, creativity, critical thinking, and problem-solving. It serves as the foundation for future scientific pursuits, supporting innovation in medicine, engineering, technology, and agriculture (Agbidye, 2019). In Nigeria, it is considered vital for promoting scientific literacy, preparing students for specialized fields, and equipping them with knowledge and skills to contribute meaningfully, to themselves, the societal and for national development. It is supposed to equip learners to be self-reliance even if they discontinue with formal education. However, Ayua and Agbidye (2020) lament that there is a gap between policy and practice which is occasioned by poor teaching methods, hindering the full potential of skills to be developed in basic science learners. Sagiru (2015) further assert that Basic Science is currently not delivered in a manner that may cultivates students' creative abilities essential for personal and national scientific advancement among different intellectual ability learners.

Poor teaching methods are liken to traditional teaching methods that have been for a long time, often focusing on teacher-centred instruction. Where science learning is passively received by learners without or no practical application. Some examples of poor teaching methods are lectures, textbook-based leaning, rote memorization, chalk-and-talk methods. These methods of teaching can be passive and one-way, may not accommodate different learning styles or needs, and can stifle creativity and critical thinking. Ayua and Eriba (2023) posit that these teaching methods often fail to engage students both practically and intellectually. Though, Terhemba and Ayua (2025) lament that science teachers through science education can develop novel and valuable creative teaching methods such as Torrance Incubation Model of Creative Teaching (TIMCT), 5 and 7es, creative exploration to inculcate these life changing skills. By so doing, creative-minds could be developed and capable of harnessing science leading to eradication of poverty, ending hunger in all forms everywhere, encouraging productivity, economic growth, sustainability and stability. It is therefore, unquestionable that the development of creative minds may be useful in science for achieving lasting functional education when students are taught using creative exploration.

Creative Exploration (CE) is an approach to creative teaching and learning and problem-solving that encourages individuals to explore available resources, investigate and express themselves in creative and innovative novel ways. According to

Terhemba and Ayua (2025) creative exploration involves encouraging students to investigate, discover and learn through an open-ended, curiosity-driven and self-directed approach. This means that creative exploration is curiosity-driven. That is, it may encourage basic education leaners to embrace curiosity and inquiry to explore new ideas and concepts in the natural world. It can help learners to try new approaches, testing hypotheses, and iterating on novel ideas. Using imagination learners could generate novel solutions, products or experiences and by embracing uncertainty and taking calculated risk to explore new possibilities, development of creative minds, critical thinking, innovation, and building confidence for stability may be inevitable. According to Milne et al. (2016) children are naturally curious and explore in order to make sense of their world; exploration is important to their learning and development of their minds. Space and support for children to think, ask questions, make predictions, experiment, look for explanations and draw conclusions are essential in Basic science. This ‘children’s science’ emerges naturally as they seek to learn about the world around them (Milne et al., 2016).

Creative exploration is student-centred and constructivist self-guided in nature that uses self-directed, experiential learning in relationship-driven environments (Archie, 2019). It emphasizes process over product, promoting experimentation and rehearsal. The importance of experiential and interdisciplinary education is the belief that students learn best by immersing themselves into their natural world where they are free to inquire, explore, and reflect (Valarie, 2023). This is invariably anchored on Bruner's (1960) theory of discovery learning which posits that students learn best through active exploration and problem-solving, which enables them to construct new ideas based on their existing knowledge. This theory is consistent with creative exploration since Bruner emphasizes the importance of students being actively involved in the learning process. This active engagement fosters creativity as students explore, experiment, and discover new concepts on their own. Discovery learning stimulates curiosity and encourages students to ask questions and seek out novel answers. This inquisitive approach helps develop creative-minds by promoting a deep and intrinsic motivation to learn and innovate through creative-hands. In this approach, there is a belief that students of different intellectual abilities may have their rights to develop their creative-minds potential (Biermeier, 2015).

Creative-mind tantamount to creative thinking. That is to say that creative minds refer to students who think outside the box, generate new ideas and find new solutions to complex problems. It is a valuable and marketable soft skill in a wide variety of careers. When one’s mind is disposed to creative thinking it becomes a creative mind-set. Creative minds are minds that are imaginative, curiosity-driven, open-mindedness, flexible and risk-taking. That is why Abazov (2022) confirms that one’s creative mind-set can be developed by creating one’s “three ifs” (What would happen if I change it...? What would I change if I wanted to use it in…years? What would I do if money is required?). These are minds that are not afraid to investigate new ideas and try new creative hobbies. Some traits of creative minds are originality, fluence, flexibility, abstractness to titles, and resistance to premature closure (Terhemba, 2022). It is like having a mind without conventional boundaries. This consistent to Sternberg and Lubart's (1995) investment theory of creativity which posits that creativity involves buying low and selling high in the world of ideas, meaning that creative individuals invest in ideas that are initially undervalued but have potential. Relatedly, minds that are open to observe, inquire, explore, criticize, experiment and find all that is beneath resources within an environment, can transform resources into unique and novel products regardless of students’ different intellectual abilities.

Intellectual ability refers to students’ capacity for cognitive functioning including operation, content and product. According to Terhemba, (2025) Intellectual ability is the capability required to convey mental activities. Intellectual abilities refer to the ability to perform cognitive tasks and solve problems effectively. These abilities are often assessed through standardized tests and include domains such as logical reasoning, verbal comprehension, mathematical skills, and spatial ability. Intellectual abilities are about the level of cognitive performance and "how well" individuals can think and learn (Schneider & McGrew, 2018).

Operation learners emphasize understanding processes and procedures essential for task completion and problem-solving. Content learners prioritize the acquisition of knowledge and comprehension of subject matter. While product learners focus on the tangible outcomes of the learning process, aiming to create or demonstrate something concrete (Kolb, 2015). Robbins (2015) states that intellectual abilities are various sets of knowledge that exist, therefore, students need to be checked in a classroom setting to carry out various aspects of activities.

Going by empirical evidence, the reviewed empirical studies explored diverse interventions for developing creative minds but differed in context, participants, and methods. Pournesaei et al. (2020) found that a Neuropsychological Model improved perceptual-motion, spatial-vision, and memory functions among dyscalculic children in Iran, but the study focused on special needs learners rather than Basic Science students and omitted creative exploration. Shaf et al. (2023) demonstrated that mind mapping enhanced creative thinking in Indonesian physics students, though it neglected Basic Science and did not employ creative exploration or advanced analyses such as ANCOVA. Similarly, Ikyernum et al. (2022) and Ayua et al. (2022) in Nigeria revealed that teacher-learner improvised materials and creative teaching methods fostered creative thinking without gender bias among upper-basic Science students, yet both failed to incorporate creative exploration. Abd-Eldayem and Shaheen (2021) linked mindfulness to creative abilities among Egyptian undergraduates, while Op den Kamp et al. (2022) established that proactive vitality management and mindfulness enhanced creativity among employees in Germany; however, both were limited to adult populations and excluded Basic Science learners. Finally, Bereczki and Nagy (2023) found that creative mindsets and domain-specific knowledge predicted creative performance in Hungarian university students, though the study lacked relevance to basic-level education and creative exploration. Collectively, these studies underscore the global interest in creativity enhancement but reveal gaps in applying creative exploration strategies to promote creative-mind development in Basic Science learners, particularly within Gboko, Benue State, Nigeria.

The reviewed empirical studies also examined the relationship between creative thinking and intellectual ability across diverse educational contexts but differ from the present study in population, instruments, and analytical methods. Johnson and Smith (2021) found a positive correlation between creative thinking and intellectual ability among U.S. college students, while Brown and Davis (2022) revealed that creative problem-solving skills predicted intellectual abilities in Canadian middle school students; however, both studies excluded Basic Science learners and creative exploration. White and Martinez (2020) confirmed that creative thinking trajectories influenced intellectual growth among London high school students, and Harris and Clark (2023) showed that higher intellectual abilities enhanced creative problem-solving in Australian elementary schools, yet neither examined creative-mind development in Nigerian contexts. Similarly, Lee and Green (2021) established that gifted students in South Korea displayed stronger links between creativity and intellect than regular students, while Parker and Johnson (2022) reported that intellectual ability predicted innovative problem-solving in New York colleges. Turner and Baker (2020) further showed that cognitive flexibility mediated the relationship between intellect and creativity among Melbourne high school students. Despite their contributions, these studies were all conducted outside Nigeria, used various instruments (e.g., CTAT, IAT, CPSI) instead of the Torrance Test of Creative Thinking (TTCT), and employed analyses such as SEM, path, or regression models rather than ANCOVA. Collectively, these limitations highlight the need for the present study, which seeks to determine creative-mind development among Basic Science students of varying intellectual abilities taught through using creative exploration strategy in Gboko, Benue State, Nigeria.

Statement of the Problem

The goal of meaningful and functional education is to produce individuals who can effectively contribute to a dynamic society, making creative science education essential for national progress and global prosperity. However, Nigeria faces a significant creativity gap due to ineffective teaching methods that fail to develop creative minds. Reports from United Nations Industrial Development Organization [UNIDO] (2016) and the Global Creativity Index (Mellander & King, 2015) reveal Nigeria's poor creativity ranking, highlighting a national deficiency that hampers innovation and development. Globally, creativity is recognized as a driver of sustainable growth, with high creativity indices correlating with strong national development (United Nations Education, Scientific and Cultural Organisation [UNESCO], 2017; World Economic Forum, 2015; United Nations Development Programme [UNDP], 2023). Given Nigeria's low creative capacity and lack of studies examining how creative exploration influences Basic Science students' creativity across different intellectual abilities in Gboko, this study seeks to address this pressing educational and developmental concern.

Objectives of the Study

The study focused on the following objectives:

1. Determine the effect of Creative Exploration (CE) on students' creative-minds development in Basic Science at upper basic education level.
2. Ascertain the effect of Creative Exploration (CE) on students' creative-minds development in Basic Science at upper basic education level based on intellectual abilities (operation, content and product learners).

Research Questions

The following research questions guided this study:

1. What is the mean difference in the creative-minds development between students taught Basic Science using Creative Exploration (CE) and those taught using Expository Teaching (ET)?
2. What is the mean difference in the creative-minds development among students with varied intellectual abilities (operation, content and product learners) taught Basic Science using Creative Exploration (CE)?

Hypotheses

The following null hypotheses were formulated and tested at $p \leq 0.05$ α-level:

$H0_1$ There is no significant difference in the mean creative-minds development between students taught Basic Science using Creative Exploration (CE) and those taught using Expository Teaching (ET).

$H0_2$ There is no significant difference in the mean creative-minds development among students with varied intellectual abilities (operation, content and product learners) taught Basic Science using Creative Exploration (CE).

Method

A pre-test post-test non-equivalent control group quasi-experimental design was used to investigate enhancing creative minds development in Basic Science students with different intellectual abilities through creative exploration in Gboko. The study was crucial because it's aimed to develop students' creative minds across different intellectual abilities to harness the natural world for novel and unique production of electric extension boards for creativity investment. Subsequently leading to students' self-reliance and stability even if they discontinue furthering with STEM education. A multistage procedure including stratified, purposive, and random sampling was used to select 70 Upper-Basic III science students (17 males, 18 females in the experimental group; 13 males, 22 females in the control group) from a population of 1,823 Upper-Basic Science students in 24 Government Grant-Aided schools in Gboko. Schools were first stratified into single and coeducational Basic Science schools, then purposively selected from urban areas due to comparable basic amenities such as pipe born water, electricity, laboratories, good roads and available market for creativity investment. To ensure fairness and objectivity, random selection was done before assigning subjects into experimental and control groups by raffle draw.

To elicit data, Torrance Test of Creative Thinking (TTCT Figural B) was adapted from Torrance (1979). Section A comprised of students' bio-data, while Section B contained three activities timing for 10-minutes, allowing multiple responses to assess students' creative-minds development in Basic Science. The TTCT was validated by five experts from different educational fields. Their feedback improved the face and content of the instrument. A trial test was conducted with 22 Upper-Basic III students which were not part of the main study of the sampled school. A reliability coefficient of 0.99 was determined by trial test and test scores collected were computed by Pearson Product Moment Correlation. After the validity of the instrument, the experimental group was taught the concept of "electrical energy" in Basic Science, this was because after treatment students can produce electrical extension boards for creativity investment in the available market. This could also be relevance to their daily lives and for career opportunities in STEM education. The electrical energy was taught using Creative Exploration, while the control group was taught the same concept using Expository Teaching for six weeks before the post-test. In the process of the treatment procedure, the extraneous variables such as group initial differences, interaction effects, and priming were controlled. Pre-test and post-test were administered under standard examination conditions. Mean and standard deviation were used to answer research questions, while hypotheses were tested at a 0.05 significance level using Analysis of Covariance (ANCOVA). This was because of the two independent variables (creative exploration and expository teaching) comparing group means while controlling for previous creative-minds development, data was on interval scale and the data was normally distributed.

Results

Research Questions One: What is the mean score difference in the Creative-Minds Development (CMD) of students taught Basic Science using Creative Exploration (CE) and those taught using Expository Teaching (ET)?

Table 1: Mean and Standard Deviation of Students' Creative-Minds Development (CMD) based on Teaching Method

Method	Sample (n)	Pre-CMD		Post- CMD		Gain	Mean Gain Difference
		Mean	St. D	Mean	SD		
Creative Exploration	35	10.11	3.01	21.00	3.68	**10.89**	**9.84**
Expository Teaching	35	10.06	2.36	11.11	3.11	**1.05**	

The results in Table 1 revealed that students taught Basic Science using Creative Exploration (CE) had creative-minds mean scores of 10.11 with standard deviation of 3.01 in the Pre-CMD and creative-minds mean scores of 21.00 with standard deviation of 3.68 in the Post-CMD. Students taught Basic Science using Expository Teaching (ET) had creative-minds mean scores of 10.06 with standard deviation of 2.36 in the Pre-CMD and creative-minds mean scores of 11.11 with standard deviation of 3.11 in the Post-CMD correspondingly. Table 1 further showed that students taught using CE had mean gain scores of 10.89 while those taught using ET had a mean gain score of 1.05. Thus, there was a mean gain difference of 9.84 in favour of students taught Basic Science using Creative Exploration (CE). This showed that students taught using CE developed creative-minds more as compared to those taught using ET. However, SD for ET at post-CMD was lower showing that their scores were clustered closer to their mean scores than for CE.

Research Questions Two: What is the mean difference in the creative-minds development among students with intellectual abilities taught Basic Science using Creative Exploration (CE)?

Table 2: Mean and Standard Deviation of Creative-Minds Development (CMD) of Students with varied Intellectual Abilities Taught Basic Science using Creative Exploration

Intellectual Ability	Sample (n)	Pre-CMD		Post- CMD		Mean Gain	Mean Gain Difference
		$\bar{x}$	SD	$\bar{x}$	SD		
Operation Learners	20	9.20	2.95	20.75	3.75	11.55	
Content Learners	15	11.33	2.72	21.33	3.68	10.00	1.55
Product Learners	0	0	0	0	0	0	

The result in Table 2 showed that operation learners taught Basic Science using Creative Exploration (CE) had creative-minds mean scores of 9.20 with standard deviation of 2.95 in the pre-CMD and creative-minds mean scores of 20.75 with standard deviation of 3.75 in the post-CMD. Content learners taught Basic Science using Creative Exploration (CE) had creative-minds mean scores of 11.33 with standard deviation of 2.72 in the pre-CMD and creative-minds mean scores of 21.33 with standard deviation of 3.68 in the post-CMD. Product learners taught Basic Science using Creative Exploration (CE) had creative-minds mean score of 0 with standard deviation of 0 in the pre-CMD and creative-minds mean scores of 0 with standard deviation of 0 in the post-CMD. Table 2 showed that operation learners, content learners and product learners taught using CE had mean gain scores of 15.20, 15.47 and 0 respectively. Table 2 showed a clustered mean gain difference of 0.27 in favour of content learners taught Basic Science using Creative Exploration (CE). This showed that content learners taught Basic Science using CE perhaps developed creative-minds more as compared to operation and product learners when taught Basic Science using CE.

Hypotheses

Hypotheses One: There is no significant difference in the mean creative-minds development scores of students taught Basic Science using Creative Exploration (CE) and those taught using Expository Teaching (ET).

Table 3: ANCOVA Summary of Students' Creative-Minds Development Based on Teaching Method

Source	Type III Sum of Squares	Df	Mean Square	F	ρ	Partial Eta Squared
Corrected Model	1726.793[a]	2	863.396	74.837	.000	.691
Intercept	923.821	1	923.821	80.075	.000	.544
Pre-CMD	16.564	1	16.564	1.436	.235	.021
Teaching Method	**1706.427**	**1**	**1706.427**	**147.909**	**.000**	**.688**

Error	772.979	67	11.537
Total	20548.000	70	
Corrected Total	2499.771	69	

a. R Squared = .691 (Adjusted R Squared = .682)
b. Computed using alpha = .05

The ANCOVA statistic summary in Table 3 shows that F (1,67) = 147.909; **ρ** = 0.000 < 0.05. This suggests that the probability level is less than the specified alpha of 0.05. Consequently, the null hypothesis is rejected. It means that there is a significant difference in the development of creative-minds mean scores of students taught using CE and those taught using the ET in Basic Science. This implies that CE significantly develops students' creative-minds abilities more than ET in Basic Science. The partial eta squared value of 0.688 is considered a large effect size, indicating that the CE has a substantial impact on students' creative-minds abilities. This means that approximately 68.8% of the variance in students' creative-minds can be attributed to the difference between the two teaching methods and also, there is a strong association between the CE and students' creative-minds.

Hypotheses Two: There is no significant difference in the mean creative-minds development among students with intellectual abilities taught Basic Science using Creative Exploration (CE).

Table 4: ANCOVA Summary of Students' Creative-Minds Development Based on Intellectual Ability

Source	Type III Sum of Squares	Df	Mean Square	F	ρ	Partial Eta Squared
Corrected Model	3.136[a]	2	1.568	.110	.896	.007
Intercept	1079.413	1	1079.413	75.605	.000	.703
Pre-CMD	.219	1	.219	.015	.902	.000
Intellectual Ability	**3.106**	**1**	**3.106**	**.218**	**.644**	**.007**
Error	456.864	32	14.277			
Total	15895.000	35				
Corrected Total	460.000	34				

a. R Squared = .007 (Adjusted R Squared = -.055)
b. Computed using alpha = .05

The ANCOVA statistic summary in Table 4 shows that F (1, 32) = 0.218; ρ = 0.644 > 0.05. This indicates that the probability level is greater than the stated alpha of 0.05. Thus, the null hypothesis is not rejected. This agrees that there is no significant difference in the development of creative-minds mean scores among students with different intellectual abilities taught Basic Science using CE. This simplifies that CE is effective for the intellectual ability students and has no intellectual ability-based disparities in learning outcomes of students. The partial eta squared value of 0.007 is considered as a very small effect size, indicating a constant development of creative-minds mean scores of students with different intellectual abilities taught using CE. This means that approximately 0.7% of the variance of students' creative-minds can be attributed to no statistically significant difference among students with different intellectual abilities.

Discussion

The study examined enhancing creative minds development in Basic Science students with different intellectual abilities through creative exploration in Gboko, Benue State, North Central Nigeria and the findings of the study revealed that there was a significant difference in the development of creative-minds of students taught Basic Science using Creative Exploration (CE) and those taught using Expository Teaching (ET). Students taught using CE developed more creative-minds as compared to students taught using ET. The finding of the study was thus, because students in the CE were engaged to explore, observe evidence, create explanations, investigate, carryout further investigations and make connections with instructional materials. By so doing, they took ownership of the class and developed creative-minds as they were fully motivated to learn meaningfully. The evidence was also shown in the production of electrical extension boards for creativity investment. However, such opportunities were not in the ET, where students were passively thought or fed by the teachers' directing instructions, lecturing, presenting information and focusing on transmission of knowledge only.

The result of this study substantiates the earlier findings by Pournesaei, et al. (2020) who found that neuropsychological model of making of creative mind improves the functions of perceptual-motion, spatial-vision, and memory children of dyscalculia. The result of the study is also consistent with the findings by Shaf et al. (2023) that there was a significant difference in creative thinking skills of students taught using the mind mapping method and those taught using teacher-centred approach. The result also supports findings by Ikyernum et al. (2022) who found a significant difference in creative thinking level in favour of those taught using Teacher-Learner Improvised Material (TLIM) as compared to Teacher Improvised Material (TIM). Moreso, the study agrees with Abd-Eldayem and Shaheen's (2021) findings that mindfulness mediates the relationship between deliberate mind wondering and creative abilities namely, verbal and figural fluency and verbal flexibility. Furthermore, the study collaborates those made by Ayua et al. (2022) that a significant difference existed in the creative thinking levels in favour of those taught using creative teaching as compared to lecture method. The finding of this study establish that creative exploration enhances creative-minds development in Basic science schools in Gboko, Benue State, Nigeria.

Regarding students' creative-minds development based on intellectual ability, the result shows no significant difference in the creative-minds development among students with different intellectual abilities taught basic science using creative exploration. this means that creative exploration has the ability to provide an inclusive learning environment where students of varying intellectual abilities can learn and develop creative-minds together. The finding supports that by Johnson and Smith (2021) that creative thinking is positively correlated with intellectual ability among college students. The finding also supports Harris and Clark's (2023) **findings which** showed higher intellectual abilities associating with better creative problem-solving skills among elementary school students. However, the finding disagrees with that made by Brown and Davis (2022) that creative problem-solving skills significantly predict higher intellectual abilities in middle school students. The findings disagree with White and Martinez's (2020) that creative thinking trajectories significantly predict intellectual ability development over time in high school students. This difference may be due to geographical locations, pedagogical factors, cognitive and learning factors, sociocultural and psychological factors. Upper-Basic schools should incorporate creative exploration activities that cater for different intellectual ability students to develop creativity.

Conclusion

The findings established that Creative Exploration (CE) provides a way out in developing students' creative-minds in Basic Science across different intellectual abilities in Basic Schools in Nigeria. CE is an approach that makes teaching and learning of Basic Science more accessible and engaging for all students, regardless of different intellectual abilities. It is therefore, a good alternative in the teaching and learning of Basic Science at Basic education level. Moreover, the usage of the Expository Teaching in teaching and learning Basic Science should be discouraged.

Recommendations

Based on findings of the study, the following recommendations were made:

i. Basic science teachers should use creative exploration to ensure effective teaching and learning of Basic science for creativity investment through creative minds of students.
ii. Workshops should be organized by professional bodies such as Science Teachers Association of Nigeria (STAN) and National Teachers Institute (NTI) to sensitise Basic science teachers and other educators on the use of creative exploration to develop creative-minds across different intellectual ability Basic science school students for creativity investment.
iii. Ministry of education should encourage the use of creative exploration among Basic science teachers in the classroom by funding seminars, workshops, conferences and refresher courses for teachers to ensure meaningful, functional and lasting teaching and learning.
iv. Principals and supervisors of Basic science teaching and learning should encourage Basic science teachers to use creative exploration in teaching Basic science to develop students' creative-minds in Basic science to harness science for self-reliance and sustainability.
v. Authors of Basic science textbooks should include creative exploration in the teachers' guide, the illustrations on how to provide support for the use of creative exploration in the classroom to promote creative-minds of students.
vi. Curriculum designers should encourage and promote creative exploration programme to supports holistic student development of creative-minds.

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