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NEURODIVERSITY STRATEGY'S EFFECT ON STUDENTS' CREATIVE MIND AMONG BASIC-7 INTERMEDIATE SCIENCE CLASSROOMS IN MAKURDI METROPOLIS

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Wisdom Kwaghfan TERHEMBA[1], Jackson Ochigbudu ODE[1], Geoffrey Aondolumun AYUA[1], Emmanuel Edoja ACHOR[1]

[1]Department of Science Education, Faculty Education, Rev. Fr. Moses Orshio Adasu University, Makurdi, Benue State , Nigeria

WKT, 0009-0005-9025-8455

Correspondence: Wisdom Kwaghfan TERHEMBA, kwatexwisdom@gmail.com

Abstract

Neurodiversity Strategy's (NDS) Effect on Students' Creative Mind among Basic-7 Intermediate Science Classrooms in Makurdi Metropolis was studied using pre-test post-test quasi-experimental-control research design. Two research questions and two hypotheses were used to guide the study. A multistage sampling technique was used to select 70 Basic-7 Intermediate Science students from a population of 1,996 students in 25 Government Grant-Aided schools in Makurdi Metropolis. Torrance Test of Creative Thinking (TTCT-Figural B) was adapted and used for data collection. TTCT was validated by five experts and was trial tested on 22 Basic-7 students. Test scores collected were computed by Pearson Product Moment Correlation and yielded a reliability coefficient of 0.89. Mean and standard deviation were used to answer research questions, while hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). Findings revealed a significant difference in the development of creative-mind mean scores of students taught using NDS and those taught using ET in Intermediate Science ($\rho < 0.05$). Also, no significant difference in the development of creative-mind mean scores of male and female students taught Intermediate Science using NDS, ($\rho < 0.05$). The study concluded that the NDS was significantly more effective than the Expository Teaching (ET) method in enhancing the development of students' creative minds in Intermediate Science. Therefore, Science teachers were recommended to adopt NDS in teaching Intermediate Science to enhance students' creative mind at basic education level.

Keywords: Neurodiversity Strategy (NDS). Creative Minds Development (CMD) and Intermediate Science (IS).

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Introduction

Education is an essential tool for an individual's all-round development. It is crucial for progress and societal change, serving not only as a means of transmitting knowledge but also as a process of equipping learners with creativity for effective participation in contemporary dynamic life. This may explain why educational systems across the globe have increasingly shifted their emphasis from rote learning to hands-on activities, focusing on the development of transferable competencies that enable learners to think creatively and adapt comfortably to an ever-changing world. This aligns with Terhemba (2025), who noted that policy documents on education in many nations, including Australia, Canada, the United Kingdom, China, Singapore, the United States of America, and Nigeria, incorporate self-determining and activity-based curricula that provide hands-on activities for students' learning of science, thereby promoting lasting and functional science education. According to Manalu et al. (2022) and Pantiwati et al. (2023), a self-determining curriculum can enable both male and female science students to explore their environment through neurodiversity strategies, fostering the acquisition of creative thinking skills that support academic independence and employability.

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 resources. It follows a logical sequence like observation, experimentation, analysis and theory development. Therefore, the teaching and learning of scientific knowledge for creative minds could be imperative in science education so that male and female students may be useful to themselves, become self-reliant and national development. Science, be it in the aspect of Biology, Physics, Chemistry and Intermediate Science should be taught with teaching methods that may develop creative minds for independent living, sustainability and stability in the ever-changing globe (Ayua et al., 2025). However, Ayua and Agbidye (2020) lament that there is a problem between policy and practice that is occasioned by poor teaching methods, limiting the full potential of creative minds to be developed in Intermediate Science (IS) classrooms in Nigeria.

Primarily in Nigeria, Intermediate Science at basic education level is designed to sponsor scientific literacy, creative-minds and positive attitude towards science, reflecting national educational goals (Nigerian Educational Research and Development Council [NERDC], 2025). Basic-7 represents a critical stage in this process, as students transition into more abstract scientific concepts while merging foundational skills acquired at the lower basic education level. Although, evidence from inclusive classroom practice suggests that many students struggle to acquire essential creativity skills due to teacher-centred instructional approaches that passively prioritize content coverage over leaner engagement (Aina & Sofowora, 2019). This problem further compounds in inclusive classrooms where learners differ widely in adaptability, mindsets, learning space, cognitive styles and gender. Otherwise, Intermediate Science is supposed to equip basic education learners regardless of their status to be self-reliant and stable even if they discontinue with formal education after completing their junior secondary school.

Despite these benefits in Intermediate Science, it may be difficult to achieve the reality of it in the 21st century, if the teaching and learning of Intermediate Science continues with teaching strategies like expository teaching, rote memorization, teacher demonstration method, lecture method and textbook read method. Sagiru (2015) as cited in Terhemba et al. (2022) confirms that objectives of Basic Science are difficult to achieve due to poor teaching methods. Although, Ode et al. (2019) lament that if Basic Science is taught using appropriate methods such as: Creative exploration, Torrance incubation model of creative teaching, Design-Thinking-Process and neurodiversity strategies, students' creative minds for self-reliance may be assured. Therefore, for the purpose of this study Neurodiversity Strategy is preferred over other strategies because it could structure an inclusive framework that may actively engage all learners,

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accommodates diverse cognitive, learning needs and can link creativity to problem solving and hands-on learning outcomes in an inclusive Intermediate Science classroom.

Neurodiversity as a teaching strategy in an inclusive Basic-7 Intermediate Science classroom refers to recognizing and valuing the natural variation in how students' brains process information, learn and engage with tasks and then designing instruction that accommodates those differences. So that every learner can develop creativity when teachers implement neurodiversity-responsive practices. Students with diverse cognitive profiles feel accepted to participate fully and gain confidence, which may positively influence their social, emotional and academic outcomes (Azuka et al., (2024). Neurodiversity-informed instructional strategy emphasizes hands-on learning, multiple representations of content and supportive classroom environments that can accommodate learners with different genders for creative minds (Doyle, 2021).

Bruner's theory of discovery learning (1960) and Vygotsky's social development theory (1930) provide the theoretical anchor for this study by explaining how neurodiversity strategies can enhance the development of students' creative minds in Basic-7 Intermediate Science classrooms in Makurdi Metropolis. Bruner's view that learners construct knowledge through active discovery, inquiry, and problem-solving supports the adoption of neurodiversity strategies that encourage flexible teaching methods, hands-on activities, and multiple means of expression, thereby promoting creativity and independent thinking. In the same vein, Vygotsky's emphasis on social interaction, collaborative learning, and scaffolding within the Zone of Proximal Development highlights the role of guided support and peer engagement in cognitive growth. Neurodiversity strategies align with this by fostering inclusive classrooms where learners with diverse abilities interact, receive tailored support, and co-construct knowledge. Together, these theories justify the use of adaptive, learner-centred, and socially interactive instructional approaches as effective means of enhancing creative minds development among students.

Creative minds are learners' capacity to produce original, flexible and valuable ideas when engaged with problems, concepts or real-life circumstances, a capacity that can be developed through suitable pedagogy rather than being a fixed attribute. It is 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 life-skill in a wide variety of careers (Terhemba & Ayua, 2025). In an inclusive Basic-7 Intermediate Science classroom in Makurdi, creative minds can best be nurtured when neurodiversity strategy is integrated into instruction. This strategy can contribute meaningfully to different adaptability and mindset strengths, thereby enhancing creativity. 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-minded, flexible and risk taking. 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). When creative mind abilities in males and females are fully developed, they may give rise to manual dexterity to showcase its intentions.

Gender differences have consistently attracted scholarly attention, particularly in the context of science education and students' academic engagement. In many African societies, persistent gender disparities continue to hinder equal participation and achievement in science-related fields, thereby limiting the full realization of human potential in creativity (Danjuma, 2015). Female students, in particular, often encounter a range of structural and socio-cultural barriers that constrain their creativity in science. These

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challenges include entrenched stereotypes that portray males as naturally superior in scientific ability, subtle and overt teacher biases in classroom interactions, and the limited visibility of successful female scientists who could serve as sources of inspiration. Additionally, the inadequate emphasis on female role models, alongside prevailing societal expectations and cultural norms that prioritize domestic roles for girls, further discourages their active involvement in science learning (Ali et al., 2020). Although some empirical studies have reported differences in cognitive abilities particularly in areas such as creative minds between male and female students (Ulger & Morsunbul, 2017), other research findings contradict this position, indicating no statistically significant gender-based differences in students' academic performance or creative capacities (Terhemba, 2022). This divergence in findings suggests a focus and need for this study.

Empirically, Bailey and Petty (2025) studied Neurodiversity in Classroom Dynamics: Inclusive Pedagogical Frameworks for Neurodivergent Student Engagement in United Kingdom and key findings revealed a robust correlation coefficient of 0.826, indicating a strong positive relationship between inclusive teaching approaches and student success. The R-squared value of 0.683 suggests that 68.3% of the variance in student success can be explained by adaptive teaching methodologies. Ikyernum et al. (2022) investigated the effect of teacher-learner improvised material on creative thinking among varied-ability upper-basic Science students in Makurdi. Findings showed a significant difference in creative thinking level in favour of those taught using Teacher-Learner Improvised Material and no significant difference existed in the students' creative thinking level based on gender. Therefore, it was concluded that, the level of creative thinking among varied ability students can be enhanced without gender disparity if learners are actively involved in the improvisation of instructional materials. Ayua et al. (2022) examined the effect of creative teaching on creative thinking among different-ability upper-basic science students in Gboko-town which was studied using quasi-experimental design. Findings showed a significant difference in creative thinking level in favour of those taught using creative teaching and no significant difference existed in the students' creative thinking level based on gender. Thus, the Creative Teaching approach was recommended for teaching science in basic schools. Shaf et al. (2023) examined effect of mind mapping on the creative thinking skills of students in class X at SMA Negeri 1 Wajo, Indonesia and the results of hypothesis testing with the t-test obtained a t-value of 6.057, which was greater than r-table, which was 2.002 at a significant level of 0.05. So, it was concluded that there is an effect of learning with the mind mapping method on the creative thinking skills of students of class X on linear motion material at SMA Negeri 1 Wajo. Abd-Eldayem and Shaheen (2021) studied Mindfulness as a Mediator between Mind-Wandering and Creative Abilities in Cairo and Helwan universities in Egypt and found that the results revealed that mindfulness partially mediates the relationship between deliberate MW and creative abilities namely, verbal and figural fluency, verbal flexibility, and maintenance of direction whereas it completely mediates the relationship between deliberate MW and figural flexibility.

Although existing empirical studies provide useful insights into strategies that can enhance students' creativity, they reveal significant gaps that justify the need for the present study on the effect of neurodiversity strategy on students' creative minds in Basic-7 Intermediate Science classrooms in Makurdi Metropolis. For instance, Bailey and Petty (2025) reported a strong positive relationship ($r = 0.826$; $R^2 = 0.683$) between inclusive pedagogical frameworks and student success in the United Kingdom; however, their study is limited by its correlational design, which does not establish causality, and its focus on a developed context that differs socio-culturally and educationally from Nigeria, thereby limiting its applicability. Similarly, Ikyernum et al. (2022) and Ayua et al. (2022), conducted their studies within Benue State, concentrated on teacher-learner improvised materials and creative teaching respectively,

without explicitly addressing neurodiversity as a structured instructional strategy, thereby overlooking the specific needs and strengths of neurodivergent learners. In the same vein, Shaf et al. (2023) examined mind mapping in Indonesia and found significant effects on creative thinking, but the study focused on a single instructional technique rather than a holistic neurodiversity-informed approach, and its foreign setting limits contextual relevance. Furthermore, Abd-Eldayem and Shaheen (2021) explored mindfulness as a mediator of creative abilities among university students in Egypt, which, although insightful, is not only conducted at a higher education level but also emphasizes psychological constructs rather than classroom-based instructional strategies suitable for junior secondary students. Collectively, these studies highlight that while various teaching strategies can improve creativity, there is a dearth of empirical research that specifically investigates neurodiversity strategies as an inclusive, strength-based approach to enhancing creative minds among Basic-7 students in Intermediate Science, particularly within Makurdi Metropolis. This gap underscores the necessity of the present study to provide context-specific, experimental evidence on how neurodiversity-informed instruction can foster creativity among diverse learners.

Regarding empirical evidence on students' creative-minds development and gender, Williams and Lee (2021) examined gender differences in creativity among university students in Sydney, Australia using pre-test post-test quasi experimental design. Findings indicated that male students performed better in domains requiring divergent thinking, while female students excelled in creative writing and arts. Gender differences in creativity are evident in university students, suggesting the need for gender-specific support and encouragement in creative fields. Terhemba et al. (2023) investigated the effect of Creative-Teaching (CT) on Creative Thinking Originality (CTO) among different-ability upper-basic science students in Gboko using pre-test post-test quasi-experimental design. Findings showed no significant difference existed in the students' CTO based on gender. Thus, CT was recommended for teaching science at basic schools. Kim and Brown (2022) investigated influence of gender on creativity development in middle school students in New York, USA using pre-test post-test quasi experimental design and the study found that while both genders show potential for creative development, boys tend to show higher creativity in physical and mechanical tasks, whereas girls excel in linguistic and interpersonal creativity. Gender influences creativity development in specific domains. Educators should consider these differences to foster creativity in both boys and girls.

A critical examination of the reviewed empirical studies reveals important limitations that justify the need for investigating the effect of neurodiversity strategy on male and female students' creative minds in Basic-7 Intermediate Science classrooms in Makurdi Metropolis. For instance, Williams and Lee (2021) reported gender-based differences in creativity among university students in Sydney, noting that males performed better in divergent thinking while females excelled in creative writing and arts; however, the study is limited to a higher education context and a developed country, making its findings less generalizable to junior secondary school students in Nigeria, particularly within science classrooms. Similarly, Kim and Brown (2022) found domain-specific gender differences in creativity among middle school students in New York, but their study focused broadly on creativity development without considering culturally relevant classroom strategies such as neurodiversity-based instruction, and the foreign context further limits applicability to Makurdi Metropolis. In contrast, Terhemba et al. (2023), conducted within Benue State, found no significant gender difference in creative thinking originality among upper-basic students taught using creative teaching; while this finding is contextually relevant, the study did not incorporate neurodiversity strategies, thereby failing to account for how gender may interact with learners' diverse cognitive profiles in influencing creativity. Collectively, these studies present

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inconsistent findings on gender differences in creativity and largely neglect the role of neurodiversity as an inclusive, strength-based instructional approach. Moreover, none of the studies specifically examine the interaction between gender and neurodiversity strategy within the context of Basic-7 Intermediate Science classrooms in Makurdi Metropolis. This gap underscores the need for the present study, as it seeks to provide context-specific empirical evidence on whether neurodiversity strategies can equitably enhance the creative minds of both male and female students, thereby informing more inclusive and gender-responsive science teaching practices in science education.

Statement of the Problem

Science education is supposed to equip an individual to be functionally fit for the ever-dynamic world. However, the persistent mismatch between traditional instructional approaches and the diverse cognitive needs of learners in Intermediate Science classrooms, particularly among neurodivergent students whose creative potentials are often underutilized is the problem of this study. Despite growing recognition of neurodiversity as a framework that values differences in learners' cognitive functioning, many classroom practices in science education still adopt deficit-based models that emphasize limitations rather than strengths, thereby restricting students' creative expression and engagement (Chrysochoou et al., 2022). Empirical evidence indicates that neurodivergent learners such as those with ADHD, autism, and dyslexia possess unique strengths, including heightened creativity and innovative thinking, yet they remain underrepresented and inadequately supported in science-related learning environments. Furthermore, studies have shown that conventional teaching strategies often create barriers, including lack of inclusive pedagogy, insufficient teacher training, and stigmatization, which negatively affect the participation and academic outcomes of neurodivergent students. Although inclusive and creative pedagogies have been suggested as means of enhancing engagement and fostering creativity among diverse learners, there is still limited empirical evidence on the effectiveness of structured neurodiversity-based strategies in improving students' creative minds, especially at the junior secondary level in contexts like Makurdi Metropolis. Consequently, the lack of context-specific studies examining how neurodiversity strategies influence creativity in Basic-7 Intermediate Science classrooms creates a significant research gap that this study seeks to address.

Purpose of the Study

The purpose of this is to investigate neurodiversity strategy's effect on students' creative minds development among Basic-7 Intermediate Science Classrooms in Makurdi Metropolis. Basically, the following objectives were used to guide the study.

1. To determine the effect of neurodiversity strategy on students' creative minds in Basic-7 Intermediate Science Classrooms in Makurdi Metropolis.
2. To find out the effect of neurodiversity strategy on male and female students' creative minds in Basic-7 Intermediate Science Classrooms in Makurdi Metropolis.

Research Questions

The following research questions were used to guide the study.

1. What is the mean difference in the students' creative minds taught Intermediate Science using neurodiversity strategy and those taught using expository teaching?
2. What is the mean difference between male and female students' creative minds taught Intermediate Science using neurodiversity strategy?

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Hypotheses

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

1. Is there no significant mean difference in the students' creative minds taught Intermediate Science using neurodiversity strategy and those taught using expository teaching?
2. Is there no significant mean difference between male and female students' creative minds taught Intermediate Science using neurodiversity strategy?

Method

A pre-test post-test quasi-experimental-control research design was used to investigate neurodiversity strategy's effect on students' creative minds development among Basic-7 Intermediate Science Classrooms in Makurdi Metropolis. The study aimed to develop students' ability to harness their environment for novel and unique production. A multistage sampling technique (stratified, purposive, and random) was used to select 70 Basic-7 Intermediate Science students (17 males, 18 females in the experimental group; 15 males, 2 females in the control group) from a population of 1,996 students in 24 Government Grant-Aided schools in Makurdi Metropolis. Schools were first stratified into single and coeducational Intermediate Science schools, then purposely selected from schools that have similar amenities. To ensure fairness and objectivity, random selection was done before assigning subjects into experimental and control groups by raffle draw. Torrance Test of Creative Thinking (TTCT-Figural B) was adapted and used for data collection. Section A captured students' bio-data, while Section B included three activities for 10-minutes each, allowing students to make multiple responses to those activities in order to assess students' creative-minds development in Intermediate 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 25 Upper-Basic I students from a non-sampled school, and a reliability coefficient of 0.89 was determined by trial test and test scores were computed by Pearson Product Moment Correlation. After trial test and pretest, the experimental group was taught the concept of "Electrical Energy, Skill Acquisition and Ethical Issues in Science and Development" instead of any other topics in Intermediate Science, because it aligns closely with the practical, societal, and value-oriented goals of science education pave way for career opportunities in Science Technology Engineering and Mathematics education. The electrical energy, Skill Acquisition and Ethical Issues in Science and Development were taught using Neurodiversity Strategy lesson plans, while the control group was taught the concepts using Expository Teaching lesson plans for six weeks before the post-test. In the process of the experimental 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 (Neurodiversity Strategy and expository teaching) comparing group means while controlling for previous creative-minds development, data was on interval scale and the data was normally distributed (Emaikwu, 2021).

Results

Research Question One: What is the mean difference in the students' creative minds taught Intermediate Science using neurodiversity strategy and those taught using expository teaching?

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	St. D	Mean	SD	
Neurodiversity Strategy (NDS)	35	19.06	3.16	31.86	3.98	12.80
Expository Teaching (ET)	35	19.23	4.96	22.34	5.20	3.11
Difference		**0.17**		**9.00**		**9.69**

The results in Table 1 revealed that students taught Intermediate Science using Neurodiversity Strategy (NDS) had creative-minds mean scores of 19.06 with standard deviation of 3.16 in the Pre-CMD and creative-minds mean scores of 31.86 with standard deviation of 3.98 in the Post-CMD. Students taught Intermediate Science using Expository Teaching (ET) had creative-minds mean scores of 19.23 with standard deviation of 4.96 in the Pre-CMD and creative-minds mean scores of 22.34 with standard deviation of 5.20 in the Post-CMD. Table 1 further showed that students taught using NDS had mean gain scores of 12.80 while those taught using ET had a mean gain score of 3.11. Thus, there was a mean gain difference of 9.69 in favour of students taught Basic Science using NDS. This showed that students taught using NDS developed creative-minds more as compared to those taught using ET. Also, SD for ET at post-CMD was higher showing that their scores were not clustered closer to their mean scores than for NDS.

Research Questions Two: What is the mean difference between male and female students' creative minds taught Intermediate Science using neurodiversity strategy?

Table 2: ***Mean and Standard Deviation of Creative-Minds Development (CMD) of Male and Female Students Taught Basic Science using Neurodiversity Strategy***

Gender	Sample (n)	Pre-CMD		Post- CMD		Gain
		Mean	St. D	Mean	SD	
Male	17	18.88	2.76	32.06	4.31	13.18
Female	18	18.89	3.77	31.67	3.76	**12.78**
Difference		0.01		0.39		**0.40**

The results in Table 2 showed that male students taught Intermediate Science using Neurodiversity Strategy (NDS) had creative-minds mean scores of 18.88 with standard deviation of 2.76 in the Pre-CMD and creative-minds mean scores of 32.06 with standard deviation of 4.31 in the Post- CMD. Female

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Students who were taught Intermediate Science using the same Neurodiversity Strategy (NDS) had creative-minds mean scores of 18.89 with standard deviation of 3.77 in the Pre-CMD and creative-minds mean scores of 31.67 with standard deviation of 3.76 in the Post- CMD. Table 2 also revealed that male students taught Intermediate Science using NDS had mean gain scores of 13.18 while female students taught using NDS had a mean gain score of 12.78 with a trivial mean gain difference of 0.40 in favour of the male students taught Intermediate Science using NDS. This explained that male students taught using NDS developed creative-minds more as compared to their female counterpart students taught using the NDS. There was a SD of males in the post-CMD shows that males mean scores clustered closer to their mean score than female students.

Hypothesis One: There is no significant mean difference in the students' creative minds taught Intermediate Science using neurodiversity strategy and those taught using expository teaching?

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

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1634.977[a]	2	817.489	38.975	.000	.538
Intercept	1640.230	1	1640.230	78.199	.000	.539
Pre-CMD	50.849	1	50.849	2.424	.124	.035
Teaching Method	**1595.323**	**1**	**1595.323**	**76.058**	**.000**	**.532**
Error	1405.323	67	20.975			
Total	54449.000	70				
Corrected Total	3040.300	69				

The ANCOVA statistical summary in Table 3 shows that $F_{(1, 67)} = 76.058$; $\boldsymbol{\rho} = 0.000 < 0.05$. This suggests that the probability level is less than the specified alpha of 0.05. Therefore, the null hypothesis 1 was rejected. It means that there was a significant difference in the development of creative-minds mean scores of students taught using NDS and those taught using the ET in Intermediate Science. This implies that NDS significantly develops students' creative-minds more than ET in Intermediate Science. The partial eta squared value of 0.532 was considered to be a large effect size, indicating that the NDS has a substantial effect on students' creative-minds. This means that approximately 53.2% of the variance in students' creative-minds can be attributed to the difference between the two teaching methods and also, there to state that a strong association exists between the NDS and students' creative-minds.

Hypothesis Two: There is no significant mean difference between male and female students' creative minds taught Intermediate Science using neurodiversity strategy?

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Table 4: ***ANCOVA Summary of Students' Creative-Hands Development Based on Gender***

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1.379[a]	2	.690	.041	.960	.003
Intercept	1017.170	1	1017.170	60.624	.000	.655
Pre-CMD	.035	1	.035	.002	.964	.000
Gender NDS	**1.344**	**1**	**1.344**	**.080**	**.779**	**.002**
Error	536.907	32	16.778			
Total	36059.000	35				
Corrected Total	538.286	34				

The ANCOVA statistic result in Table 4 shows that $F_{(1, 32)} = 0.080$; $\rho = 0.779 > 0.05$. This confirms that the probability is greater than the specified alpha level of 0.05. So, the null hypothesis was not rejected. This specifies that there was no significant difference in the development of creative-minds mean scores of male and female students taught Intermediate Science using NDS in Intermediate Science. This explains that NDS is effective and has no significant gender-based disparities in learning outcomes for both male and female students. The partial eta squared value of 0.002 is considered a very small effect size, indicating essentially equivalent development of creative-minds mean scores of male and female students when taught using NDS. This means that approximately 0.2% of the variance of students' creative-mind can be attributed to no statistically difference between male and female students.

Discussion

Regarding creative-minds based on teaching methods, the result shows a significant difference in the development of creative-minds mean scores of students taught Intermediate Science using NDS and those taught using the ET in favour of NDS as was indicated by their means. The result is so because Neurodiversity Strategies engaged students with multiple teaching methods, differentiated instruction, and flexible assessment techniques that allow students to demonstrate understanding in different ways and make connections with instructional materials. In the NDS students took ownership of the class and developed creative-minds as they were fully motivated to learn meaningfully. However, such opportunities were limited in the expository teaching where students were taught by the teacher in directing instructions, lecturing, presenting information and focusing on transmission of knowledge only. The result is consistent with Bailey and Petty (2025), who reported a strong positive relationship between inclusive teaching approaches and student success, suggesting that adaptive and learner-centred strategies like NDS can substantially enhance learning outcomes. The finding corroborates Ikyernum et al. (2022) and Ayua et al. (2022), who found that student-centred approaches such as teacher-learner improvised materials and creative teaching significantly improved students' creative thinking compared to conventional methods, indicating that active learner engagement is key to fostering creativity. In the same vein, Shaf et al. (2023) demonstrated that mind mapping, an interactive and visual strategy, significantly enhanced students' creative thinking skills, further supporting the effectiveness of non-traditional instructional methods. Additionally, Abd-Eldayem and Shaheen (2021) highlighted the role of cognitive and psychological

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processes, such as mindfulness, in enhancing creative abilities, implying that strategies which accommodate diverse cognitive functioning like NDS can promote higher-order thinking skills. However, unlike these studies which focused on isolated techniques or psychological constructs, the present finding underscores the broader effectiveness of a neurodiversity-based, strength-oriented instructional approach over the traditional expository method in enhancing students' creative minds in Intermediate Science. This suggests that embracing learners' cognitive diversity through NDS provides a more holistic and impactful means of developing creativity among students.

The finding that there was no significant difference in the development of creative-minds mean scores of male and female students taught Intermediate Science using Neurodiversity Strategy (NDS) suggests that the strategy is gender-inclusive and effective for both groups, and this aligns with several empirical studies. For instance, the result is consistent with Ikyernum et al. (2022) and Ayua et al. (2022), who found no significant gender difference in students' creative thinking when exposed to learner-centred approaches such as improvised materials and creative teaching, indicating that engaging and participatory instructional methods can bridge gender gaps in creativity. Similarly, Terhemba et al. (2023) reported no significant difference in creative thinking originality based on gender, further supporting the notion that well-designed instructional strategies can provide equal opportunities for creative expression among male and female students. However, this finding contrasts with Williams and Lee (2021) and Kim and Brown (2022), who reported gender-based differences in specific domains of creativity, with males excelling in divergent or mechanical tasks and females in linguistic and interpersonal domains. The disparity may be attributed to differences in context, educational level, and the nature of instructional strategies used, as those studies were conducted in foreign settings and did not incorporate inclusive, strength-based approaches like NDS. Therefore, the present finding implies that neurodiversity strategy, by accommodating diverse cognitive styles and promoting equal participation, minimizes gender disparities and provides a balanced platform for enhancing creative minds among both male and female students in Intermediate Science.

Conclusion and Recommendations

Based on the findings of the study, it can be concluded that the Neurodiversity Strategy (NDS) is significantly more effective than the Expository Teaching (ET) method in enhancing the development of students' creative minds in Intermediate Science. The superiority of NDS lies in its learner-centred, inclusive, and flexible approach, which actively engages students through differentiated instruction, multiple learning pathways, and opportunities for self-expression and meaningful participation. This enables students to take ownership of their learning and develop higher-order thinking skills, including creativity. Furthermore, the study establishes that NDS is gender-inclusive, as it provides equal opportunities for both male and female students to develop their creative abilities without any significant disparity. This suggests that when appropriate, inclusive instructional strategies are employed, gender differences in creativity can be minimized or eliminated. Overall, the findings affirm that embracing learners' cognitive diversity through neurodiversity-based approaches offers a more holistic and effective means of fostering creativity in science education. The study therefore recommends that:

1. Science teachers should adopt Neurodiversity Strategies in teaching Intermediate Science to enhance students' creative minds and overall learning outcomes.
2. Curriculum planners should integrate neurodiversity-based instructional approaches into the Basic Science curriculum to promote inclusive and learner-centred education.

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3. Educational stakeholders, including government and school administrators, should organize training, workshops, and seminars to equip teachers with the skills required to effectively implement neurodiversity strategies in the classroom.
4. Teachers should employ a variety of instructional methods, including collaborative learning, hands-on activities, and flexible assessments, to accommodate diverse learners and promote creativity.
5. Since NDS has been found to be gender-inclusive, teachers should ensure equal participation of both male and female students in classroom activities to sustain this balance.
6. Further studies should be conducted in other subject areas and educational levels to validate and extend the applicability of neurodiversity strategies in enhancing students' creativity and academic performance.

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