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Effectiveness of ASEI-Based Instructional Strategies in Shaping Students' Attitude Toward Drug Abuse Education in Basic Science Classrooms

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Abstract: This study critically examines the Effectiveness of ASEI-Based Instructional Strategies in Shaping Students' Attitude toward Drug Abuse Education (DAE) in Basic Science Classrooms. Within Abuja, Nigeria. Guided by two core research questions and hypotheses. The study adopted a quasi-experimental, pretest-posttest control group design, the research involved a purposive sample of 120 Basic II students from two co-educational public schools in the Abuja Municipal Area Council (AMAC). One school constituted the experimental group, receiving instruction through the ASEI-Based strategy, while the other functioned as the control group and was exposed to traditional teaching methods. Data were collected using the Basic Science Attitude Scale (BSAS), a 30-item instrument adopted from Eze, et. al (2020) to measure students' attitudes toward drug abuse education. The instructional intervention lasted for four weeks, after which pretest and posttest attitude scores were compared using descriptive statistics and Analysis of Covariance (ANCOVA) to control for initial group differences. The results of the ANCOVA revealed significant differences in post-intervention attitude scores, indicating that students exposed to ASEI-based instruction developed more positive attitudes toward drug abuse education compared to their counterparts taught through conventional methods. Furthermore, findings showed no gender-based variations in attitude changes within the experimental group. These results underscore the pedagogical value of ASEI-based strategies in enhancing affective learning outcomes, especially in sensitive health-related education such as drug abuse prevention. Therefore, the study recommended among other that the use of ASEI-Based should be reinforced as student-centered pedagogy in addressing not only cognitive but also affective learning outcomes in science education, particularly in areas involving social and health-related issues.

Introduction

Drug abuse among adolescents continues to be a critical public health issue and educational concern in Nigeria and across the globe. Since 2000s, there has been a noticeable increase in the abuse of substances such as cannabis, codeine, tramadol, and other psychoactive drugs among secondary school students in Nigeria (National Drug Law Enforcement Agency [NDLEA], 2021).

These substances pose a serious threat to students' mental, emotional, and academic well-being, often resulting in disciplinary problems, school dropouts, health complications, and poor academic performance (Oshodi, et al, 2020). Consequently, it is imperative that Basic Science education, which forms part of the Nigerian junior secondary school curriculum, effectively addresses issues related to drug abuse through preventive education and positive attitudinal change. Unfortunately, the traditional teaching methods employed in many Nigerian classrooms are largely ineffective in achieving these goals. These methods are often teacher-centered, emphasizing rote memorization and passive learning while neglecting the affective domain of learning that deals with attitudes, values, and emotional engagement (Yusuf, 2019). As such, students may acquire factual knowledge about drugs but fail to internalize the values and develop the conviction necessary to avoid drug abuse. This disconnect between knowledge acquisition and behavior underscores the need for more innovative, student-centered instructional strategies.

The ASEI-based instructional strategy an acronym for Activity, Student-centered, Experiment, and Improvisation offers a promising alternative. Developed under the Strengthening Mathematics and Science Education (SMASE) project by the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA), the ASEI framework seeks to transform classroom teaching from passive content delivery to dynamic, interactive, and meaningful learning experiences (CEMASTEA, 2016). ASEI-based instruction encourages teachers to facilitate learning through student engagement in hands-on activities, real-world problem-solving, experimentation, and the use of improvised teaching aids. These strategies are particularly relevant to drug abuse education as they promote critical thinking, peer interaction, and affective engagement. Incorporating ASEI strategies into drug abuse education allows students to actively explore real-life scenarios, participate in role plays, analyze case studies, and engage in reflective discussions about the consequences of substance abuse. Such experiential learning fosters not only cognitive understanding but also emotional awareness and value reorientation.

In addition to instructional method, gender is another key variable that can influence students' attitudes toward drug abuse education. Empirical evidence suggests that male and female students may differ in how they perceive, respond to, and internalize information related to health and social behavior (Eze, et al, 2020). Some studies have indicated that male students are generally more likely to engage in drug-related behaviors, possibly due to greater peer pressure or societal norms (Ajayi et al, 2018). Others suggest that female students may exhibit more positive attitudes toward health education due to their generally higher levels of emotional sensitivity and risk aversion (Okafor, et al 2020). Given these gender-based differences, it becomes essential to investigate whether ASEI-based instructional strategies are equally effective across genders or if one gender benefits more from this approach in terms of attitude formation. Furthermore, attitude formation is a multifaceted process involving cognitive, affective, and behavioral components (Ojelade, et al 2021). The ASEI model supports all three: cognitively, by enhancing students' understanding of drug-related issues; affectively, by evoking emotional responses through stories, dramatizations, and real-life contexts; and behaviorally, by encouraging students to adopt and commit to drug-free lifestyles. This holistic approach makes ASEI-based strategies particularly suited for affective outcomes such as attitude change, which traditional teaching methods often overlook. Despite its proven success in improving science learning outcomes, research on the effectiveness of ASEI-based instructional strategies in shaping students' attitudes particularly in drug abuse education is limited in the Nigerian secondary schools. Most existing studies have concentrated on ASEI's impact on cognitive performance and academic achievement (Ajayi, et al, 2017), while the affective outcomes remain under-explored. Given the increasing prevalence of drug abuse among Nigerian adolescents and the inadequacy of current teaching methods, it becomes necessary to examine the role of ASEI-based instruction in influencing students' attitudes toward drug abuse education in Basic Science.

This study, therefore, seeks to examine the effectiveness of ASEI-based instructional strategies in shaping students' attitudes toward drug abuse education in Basic Science classrooms, while also considering the role of gender as a moderating factor. By focusing on this innovative pedagogy, the study seeks to contribute to the growing body of research on science education reforms and to offer practical insights for educators, curriculum developers, and policymakers working to combat drug abuse through effective school-based interventions.

Research Questions

The following research questions guided the study.

1. What is the difference in mean attitude scores of students taught DAE contents of Basic Science using ASEI Based instructional strategy and conventional teaching method?
2. What is the difference in the mean attitude scores of male and female students taught DAE contents of Basic Science using ASEI Based instructional strategy?

Hypotheses

The study was guided by the following null hypotheses and tested at 0.05 level of significance

HO_1: There is no significant difference in the mean attitude scores of male and female students taught DAE content of Basic Science using ASEI Based instructional strategy.

HO_2 There is no significant difference in the mean attitude scores of students taught DAE contents of Basic Science using ASEI Based instructional strategy and those taught using conventional method.

Theoretical Framework

The study on the effectiveness of ASEI-Based instructional strategies in shaping students' attitudes toward drug abuse education is anchored on two major educational theories: **Social Learning Theory by Albert Bandura (1977)** and **Constructivist Learning Theory, initially advanced by Jean Piaget (1952) and later expanded by Lev Vygotsky (1978).** These theories provide both psychological and pedagogical foundations for understanding how students form attitudes and internalize knowledge in affective domains such as drug abuse education. **Albert Bandura's Social Learning Theory (1977)** emphasizes the importance of observational learning, imitation, and modeling in shaping behavior and attitudes. According to Bandura, individuals especially children and adolescents learn not only through direct instruction but also by observing the actions, decisions, and consequences experienced by others in their environment. This theoretical framework is especially relevant to drug abuse education, where young learners are frequently influenced by peer behavior, societal trends, and the implicit messages conveyed in their social environments. In the Basic Science classroom, ASEI-based instructional strategies (which stand for Activity, Student-centered, Experiment, and Improvisation) provide a structure that encourages active student participation and observational learning. These strategies often incorporate role-plays, group discussions, debates, and community-based examples that mirror real-life scenarios involving substance abuse. Through these processes, students are not only provided with factual knowledge about the dangers of drug abuse but also presented with models of responsible behavior and opportunities to rehearse resistance strategies in safe, guided environments. Thus, Social Learning Theory supports the notion that affective learning such as the development of anti-drug attitudes that can be effectively achieved through structured social interaction and behavior modeling within the ASEI instructional framework.

Complementing the Social Learning Theory is the **Constructivist Learning Theory**, first developed by Jean Piaget (1952) and later refined by Lev Vygotsky (1978). While Piaget's focus was on how learners individually construct knowledge through cognitive development stages, Vygotsky introduced a social dimension, emphasizing the role of interaction, language, and

culture in shaping cognition. Vygotsky's notion of the **Zone of Proximal Development (ZPD)** asserts that learners can achieve higher levels of understanding and performance with the guidance of teachers or more knowledgeable peers. ASEI-based instructional strategies are deeply rooted in constructivist ideals. By emphasizing activity, experimentation, and student-centered learning, ASEI promotes active knowledge construction. For example, in teaching drug abuse education, students may be asked to analyze case studies, discuss moral dilemmas, and create role-plays that allow them to explore the consequences of substance abuse. These learning activities align with the constructivist view that understanding is best achieved when students are meaningfully engaged in their learning processes and are allowed to connect new information with prior experiences.

The constructivist perspective also supports differentiated learning approaches that consider individual and group differences including gender. Students bring unique backgrounds, experiences, and values into the classroom, all of which influence how they process and internalize information. Gender, as a socially constructed category, can influence how students engage with issues like drug abuse. For instance, societal expectations often associate drug-related behaviors with masculinity, while discouraging such behaviors among females. Therefore, the constructivist framework not only justifies the need for interactive, personalized learning strategies but also encourages educators to be sensitive to the gender dynamics that may influence attitude formation. In summary, the integration of Social Learning Theory and Constructivist Learning Theory provides a comprehensive theoretical basis for this study. While Bandura's theory explains how attitudes are acquired and reinforced through observation and social modeling, the constructivist perspective emphasizes the learner's active role in constructing meaning from these experiences. Both theories converge in supporting the ASEI-based instructional model as a powerful pedagogical tool capable of influencing student attitudes toward drug abuse. Furthermore, both theories recognize the importance of context, culture, and individual differences such as gender in shaping the effectiveness of educational interventions. These theoretical underpinnings guide the current study in examining not only whether ASEI-based strategies are effective but also whether they operate equitably across gender lines in Basic Science classrooms within the Federal Capital Territory, Abuja.

Literature Review

Research in science education has increasingly emphasized the importance of instructional approaches that actively engage learners, particularly in addressing socio-health issues such as drug abuse. Traditional didactic methods, which often rely on passive reception of information, have been criticized for their limited impact on students' attitudes and behaviors (Nwankwo & Ogbuagu, 2021). In contrast, innovative pedagogical models like the ASEI (Activity, Student-centered, Experiment, Improvisation) framework have garnered attention for their potential to enhance not only cognitive achievement but also affective domains such as attitude and value formation. ASEI's emphasis on experiential and participatory learning aligns well with the educational objectives of drug abuse prevention programs embedded within Basic Science curricula. Through activities that require students to experiment, improvise solutions, and engage collaboratively, ASEI strategies foster deeper understanding and personal connection to the content (Chukwuemeka, et al, 2025). This hands-on involvement helps students internalize the risks and social consequences associated with drug use, promoting a reflective attitude that traditional lecture-based approaches often fail to achieve. A recent study by Musa and Bello (2023) demonstrated that students exposed to ASEI-based instruction showed higher levels of awareness and more critical attitudes toward substance abuse compared to peers taught with conventional methods.

Another critical dimension explored in recent literature is the role of gender in shaping educational outcomes related to drug abuse attitudes. Gender differences in learning preferences,

risk perception, and socialization patterns have been documented across various contexts (Abubakar, et al 2021). For instance, females are often reported to exhibit stronger affective responses to health education messages, which can translate into more pronounced attitude changes when instructional methods resonate with their learning styles (Okafor et al., 2022). Conversely, male students may require more interactive and competitive learning environments to achieve similar attitudinal shifts (Ibrahim, et al 2021). These findings underscore the necessity of adopting instructional designs that are sensitive to gender-specific needs to maximize the effectiveness of drug abuse education. In addition to gender, several studies highlight the significance of teacher competence and resource availability in implementing ASEI-based strategies effectively. Adeyemi Oladipo (2020) found that successful application of ASEI depends heavily on teachers' mastery. of its components and their ability to adapt activities to local contexts, particularly in resource-limited settings common in Nigerian schools. When teachers lack adequate training or when classrooms are overcrowded, the interactive and experimental aspects of ASEI may be compromised, leading to diminished impact on students' attitudes. This calls for targeted professional development and infrastructural support to sustain high-quality implementation of ASEI in Basic Science classrooms.

Moreover, the affective outcomes of instructional strategies have been examined through various evaluative frameworks, with attitude change often considered a precursor to behavioral intention and actual behavior modification. Research by Okeke, et al (2021) corroborates that positive shifts in students' attitudes towards drug abuse, facilitated through ASEI teaching methods, can lead to increased resistance to peer pressure and reduced likelihood of substance experimentation. Their study further indicates that participatory learning fosters a sense of responsibility and self-efficacy, which are crucial mediators in the attitude-behavior relationship.

Despite the promising evidence supporting ASEI's role in shaping attitudes, there remains a paucity of research specifically targeting drug abuse education within the Basic Science curriculum in Nigeria, especially with nuanced analyses of gender as a moderating factor. Most studies to date have concentrated on academic achievement or general science engagement, leaving a critical gap in understanding the affective and behavioral implications of ASEI instruction in health-related topics (Ojelade, et al 2018; Aregbesola, 2023). Addressing this gap, the present study aims to provide empirical data on how ASEI-based strategies influence male and female students' attitudes towards drug abuse education, thereby contributing to the design of more inclusive and effective science pedagogy. However, the lack of extensive empirical studies on the intersection of ASEI, attitude formation, and gender within drug education content represents a key gap that this study aims to fill. By examining how ASEI strategies affect male and female students' attitudes differently, the present research contributes to the ongoing discourse on effective, inclusive, and value-driven science education in Nigeria.

Methodology

This study employed a quasi-experimental design with pretest and posttest control groups to examine the effectiveness of ASEI-Based instructional strategies on students' attitudes toward drug abuse education in Basic Science classrooms. The target population consisted of 44,457 Basic II (JSS II) students in public schools under the FCT Universal Basic Education Board, Abuja. A purposive sample of 120 students was drawn from two co-educational public schools in Abuja Municipal Area Council (AMAC). One school was assigned as the experimental group, receiving instruction through ASEI-Based strategy, while the other served as the control group, taught via conventional methods. This grouping also allowed for gender comparison within the experimental group. Data were collected using the Basic Science Attitude Scale (BSAS), a 30-item instrument adopted from Eze, et. al (2020) to measure students' attitudes toward drug abuse education. The scale included a 4-point Likert rating (Strongly Agree to Strongly Disagree), with reverse scoring applied for negatively worded items. The BSAS was validated for face, content,

and construct validity by experts from the University of Abuja and an experienced Basic Science teacher from AMAC. Reliability testing through a pilot study of 40 students yielded a Cronbach's alpha of 0.80, indicating good internal consistency. Pretest and posttest attitude scores were collected from both groups before and after the four-week instructional period. Descriptive statistics (mean and standard deviation) summarized the attitude scores. To test for differences between groups while controlling for pretest scores, Analysis of Covariance (ANCOVA) was performed using SPSS Version 23. Specifically, ANCOVA tested the null hypotheses that there would be no significant difference in posttest attitude scores between:

1. Students taught using ASEI and those taught with conventional methods, adjusting for pretest scores.
2. Male and female students within the ASEI experimental group, adjusting for pretest scores.

The significance level was set at 0.05 for all analyses.

Results

The analysis of the data according to research questions and test of hypotheses as used in the study were presented as follows:

Research Question One: What is the difference in the mean attitude scores of male and female students taught DAE contents of Basic Science using ASEI Based instructional strategy?

Table 1: Mean and Standard Deviation of Attitude Scores of Students taught Basic Science using ASEI Based instructional strategy and conventional teaching method

Groups	N	Pre-test		Post-test		Mean Gain
		Mean	SD	Mean	SD	
Experiment	60	11.00	1.15	18.40	3.72	7.40
Control	60	10.86	2.37	12.06	4.68	1.20
Mean difference		0.04		6.34		6.20

Table 1 shows the mean and standard deviation of mean attitude scores of experimental and control groups taught basic science with ASEI Based instructional strategy and conventional method. From the results obtained, students in experimental group had a mean attitude score of 11.00 with a standard deviation of 1.15 for pretest while for the post test is 18.40 and 3.72 respectively. However, the mean and standard deviation of students in control group was 10.86 and 2.37 for pre-test while for the post test was 12.06 and 4.68 respectively. Therefore, the mean difference in attitude scores between students in experimental and control group was 6.20 in favour of students in experimental group.

Research Question Two: What is the difference in the mean attitude scores of male and female students taught DAE contents of Basic Science using ASEI Based instructional strategy?

Table 2: Mean and Standard Deviation of Attitude Scores of Male and Female Students taught Basic Science using ASEI Based instructional strategy

Groups	N	Pre-test		Post-test		Mean Gain
		Mean	SD	Mean	SD	
Male	32	2.98	0.05	3.45	0.15	0.47
Female	28	2.99	0.05	3.42	0.16	0.45
Mean difference		0.01		0.05		0.02

Result in table 2 shows that the mean and standard deviation of male and female taught Basic Science using ASEI. The mean and SD of male students equal to 2.98 and 0.05 for pre-test and

3.45 and 0.15 for post-test. While that of female was 2.99 and 0.05 for pre-test and 3.42 and 0.16 for post-test. The mean gain 0.02 and the implication of this is that there is significant difference between mean attitude scores of male and female students taught Basic Science using ASEI

Test of Hypotheses

Ho_1: There is no significant difference in the mean attitude scores of students taught DAE contents of Basic Science using ASEI Based instructional strategy and those taught using conventional method.

Table 3: Summary of Analysis of Covariance ANCOVA of Experimental and Control Group

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	.770[a]	2	37.748	105.100	.000
Intercept	284	1	284	42.063	.000
Pretest	101.131	1	101.131	53.102	.002
Attitude	123.633	1	123.633	122.685	.000
Error	197.342	115	99.342		
Total	1251.342	118			
Corrected Total	.871.131	119			

a. R Squared = .230 (Adjusted R Squared = 223)

The result in table 3 shows the attitude mean scores of students in experimental and control group after intervention, F (1, 119) = 99.342, p= 0.000 for the main effect (attitude was significant at 0.05 alpha level). Reason being that the p-value of 0.00 < 0.05 α-value. This shows that there is a significant difference in the attitude of the students in Chemistry concept due to expose to ASEI learning. Therefore, there is significant difference in the mean attitude scores of students taught DAE contents of Basic Science using ASEI Based instructional strategy and those taught using conventional method.

Ho_2: There is no significant difference in the mean attitude scores of male and female students taught DAE content of Basic Science using ASEI Based instructional strategy.

Table 4: Analysis of Covariance ANCOVA Analysis of Attitude Scores of Male and Female Students Taught DAE contents of Basic Science in Experimental Group

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.105[a]	2	.052	77.328	.234
Intercept	.013	1	.013	19.590	.210
Pretest	.103	1	.103	152.051	.105
Gender	8.633	1	3.633	.001	.234
Error	.139	55	13.013		
Total	582.084	58			
Corrected Total	.144	59			

a. R Squared = .124 (Adjusted R Squared =.107)

Result in table 4 showed the summary result of ANCOVA analysis of attitude scores of male and female students taught Basic Science using ASEI Based instructional strategy. From the table, the F (1, 59) = 13.013, p-value =.234. Since the P-value of was greater than 0.05 level of significance.

Thus, the hypothesis one is accepted, and therefore there is no significant difference in the mean attitude scores of male and female students taught DAE contents of Basic Science using ASEI Based instructional strategy in experimental group.

Discussion of Findings

Drug abuse among adolescents remains a pressing concern in Nigeria, with increasing abuse of substances such as cannabis, tramadol, and codeine noted since the early 2000s (NDLEA, 2021). Despite its inclusion in the Basic Science curriculum, Drug Abuse Education (DAE) has not achieved its full potential in fostering attitudinal change due largely to the continued reliance on traditional, teacher-centered instructional methods (Yusuf, 2019). These methods prioritize rote learning and often neglect the affective domain of education, which is critical for internalizing values and promoting behavior change (Oshodi et al., 2020). The current study aimed to evaluate the impact of ASEI-based instructional strategies an acronym for Activity, Student-centered, Experiment, and Improvisation on students' attitudes toward drug abuse, and to explore gender as a potential moderating factor. Findings from Table 1 show that students in the experimental group, who were taught using ASEI methods, demonstrated a significantly higher attitude gain (mean gain = 7.40) compared to those taught using conventional methods (mean gain = 1.20), yielding a mean difference of 6.20. This outcome supports earlier findings that student-centered, experiential teaching approaches are more effective in cultivating positive attitudes (Chukwuemeka et al., 2025; Musa & Bello, 2023).

These results are further supported by **Bandura's Social Learning Theory (1977),** which posits that learning occurs through observation, modeling, and imitation. ASEI-based strategies make use of such mechanisms through role plays, dramatizations, and real-life scenarios techniques that allow students to observe modeled behaviors, reflect on consequences, and rehearse positive choices. Similarly, the theory of **Constructivist Learning** advanced by Piaget (1952) and expanded by Vygotsky (1978), affirms that learners construct meaning actively and socially. ASEI's emphasis on hands-on, collaborative activities mirrors this theory, enabling students to engage cognitively and affectively with the topic of drug abuse (CEMASTEA, 2016). The implications of this are profound. By transforming passive learners into active participants, ASEI does more than transmit knowledge it fosters deep engagement, emotional resonance, and value internalization. This holistic learning experience is essential in drug abuse education, where attitudinal change is a critical precursor to behavior modification (Okeke et al., 2021). It aligns with calls from scholars like Nwankwo & Ogbuagu (2021), who emphasize the need for innovative strategies that target both the cognitive and affective domains of learning. Regarding gender, findings from Table 2 indicate only a marginal difference in mean attitude gains between male (0.47) and female (0.45) students taught using ASEI strategies, with a negligible mean difference of 0.02. This suggests that ASEI instruction is equally effective for both genders. While literature has noted that females often display stronger affective responses to health education due to socialization patterns and risk aversion tendencies (Okafor et al., 2020; Abubakar et al., 2021), the balanced results here imply that ASEI strategies are inclusive and capable of engaging all learners regardless of gender. These findings reinforce Ibrahim et al. (2021), who argue that instructional environments that encourage active participation and peer interaction can mitigate gender disparities in affective learning outcomes.

Moreover, the consistency in gains across gender also reflects the constructivist principle that learning is influenced by social and cultural factors, including gender, but can be harmonized through context-responsive, participatory pedagogy (Vygotsky, 1978). ASEI offers such a model by engaging students in reflective discussions, case analysis, and problem-solving tasks that are grounded in familiar socio-cultural realities. Nonetheless, as Oladipo (2020) cautions, the success of ASEI is highly contingent on teacher competence and the availability of resources. Inadequate training or large class sizes can hinder its proper implementation, thereby diluting its potential

benefits. For sustainable integration of ASEI into the Basic Science curriculum, professional development and infrastructural support are therefore essential. In conclusion, the findings of this study strongly support the ASEI-based instructional strategy as a powerful tool for promoting positive student attitudes toward drug abuse education. It not only outperforms conventional methods in affective learning outcomes but also operates equitably across gender. These results call for a rethinking of pedagogical practices in Basic Science education, emphasizing the need for experiential, student-centered approaches that prepare students cognitively, emotionally, and behaviorally to resist drug abuse. As the evidence shows, such reform is not just beneficial—it is necessary.

This result strongly supports the effectiveness of the **ASEI-based instructional strategy** in fostering more positive attitudes toward drug abuse education compared to the conventional method. The significant improvement in attitude can be attributed to the **student-centered, activity-oriented, and experiential nature** of ASEI strategies, which are known to engage the **affective domain** of learning more effectively than teacher-centered approaches. In Nigerian secondary schools, where drug abuse is a rising concern among adolescents (NDLEA, 2021), merely delivering factual knowledge about drug dangers is insufficient. **Oshodi et al. (2020)** highlight that emotional engagement and value internalization are critical in shaping behavior, which traditional methods often fail to achieve. ASEI, by involving students in **role plays, discussions, and improvisational activities**, fosters reflective thinking and empathy, making the risks of drug abuse more personally meaningful. The significance of this result also aligns with **Bandura's (1977) Social Learning Theory**, which emphasizes the role of **modeling, observational learning, and emotional engagement** in attitude and behavior formation. In ASEI classrooms, students observe positive behavioral models, rehearse resistance strategies, and reflect on real-life drug abuse cases—leading to stronger attitude shifts.

Similarly, **Constructivist Learning Theory** (Vygotsky, 1978; Piaget, 1952) supports the idea that **knowledge and values are best internalized through active engagement** and social interaction. The ASEI strategy, by involving learners in cooperative learning and critical discussion, supports deeper understanding and **attitudinal change** through personalized and contextualized experiences. Moreover, research evidence continues to validate the role of participatory instructional strategies in shaping students' attitudes. For instance, **Chukwuemeka et al. (2025)** found that ASEI instruction significantly increased reflective and responsible attitudes among students regarding health risks like drug use. **Musa and Bello (2023)** similarly reported that students taught drug education through ASEI methods developed more critical views of substance abuse than those taught via lectures. Attitude formation, especially concerning drug education, requires learners to engage **cognitively, emotionally, and behaviorally**. ASEI addresses all three dimensions: by facilitating understanding (cognitive), stimulating emotional responses (affective), and promoting action-oriented reflections (behavioral). As **Ojelade et al. (2021)** emphasize, such a holistic instructional approach is crucial for **long-term attitude change**.

The findings in this study also resonate with the concerns raised by **Yusuf (2019)** that **rote learning methods do not sufficiently engage the affective domain**, which is essential for effective drug abuse education. The ASEI-based approach, in contrast, offers a transformative framework capable of shifting students' values and convictions toward a **drug-free lifestyle**. Based on the ANCOVA results and supporting literature, this study provides strong empirical evidence that the **ASEI-based instructional strategy significantly improves students' attitudes** toward drug abuse education compared to conventional methods. The statistically significant difference ($p < .05$) affirms that ASEI's interactive and reflective nature makes it more effective for attitude change a critical outcome in drug abuse prevention among adolescents. These findings underscore the urgent need for **curricular reforms** that prioritize affective engagement in Basic Science classrooms, particularly in areas addressing **health-related social issues** like drug abuse.

Educators, curriculum planners, and policymakers should consider institutionalizing ASEI practices as a **sustainable and inclusive strategy** to combat drug abuse through education.

The ANCOVA results in Table 4 demonstrate that the ASEI-based instructional strategy has an **equalizing effect** on students' attitudes toward drug abuse education across gender lines. The lack of significant difference between male and female students suggests that the ASEI strategy is **gender-inclusive** and **equally effective** in shaping attitudes among both groups. This finding is consistent with previous studies that affirm the **neutralizing impact of activity-based and participatory learning strategies** on gender differences in affective outcomes. For instance, **Ajayi and Adebayo (2022)** observed that in classrooms where interactive teaching methods like ASEI were used, **attitudinal gains were similar across genders**. They argued that engaging learners in collaborative and inquiry-driven tasks fosters a **common emotional and cognitive experience**, reducing the influence of gender on affective learning.

Furthermore, **Bandura's (1986) Social Cognitive Theory** supports the idea that when students are provided with **equitable learning environments**, such as those fostered by ASEI, the influence of external variables like gender becomes less pronounced. The model of reciprocal determinism suggests that learning is shaped more by personal agency and interactive learning contexts than by biological or social categories. The findings also align with **constructivist perspectives**, which emphasize that **meaning-making is a personal yet socially facilitated process**, not inherently dependent on gender. Through ASEI-based strategies such as group activities, role-playing, real-life scenario analysis, and reflective journaling both male and female students are able to **internalize values and attitudes** toward drug prevention in a meaningful way.

Musa and Ismail (2023) highlighted that when students are given equal opportunities to participate in open-ended, reflective, and learner-centered environments, **attitude development is not gender-biased**. In their study of Basic Science students in Northern Nigeria, they found no significant gender difference in attitudinal outcomes when ASEI-based techniques were employed. These results further contradict traditional stereotypes that boys and girls process social-emotional topics like drug abuse differently. Rather, they suggest that **effective pedagogical strategies can bridge attitudinal gaps** and create a level playing field in affective education. The **NDLEA (2021)** also encourages gender-neutral preventive education models in schools, supporting the use of participatory frameworks like ASEI. The results from Table 4 support the **retention of the null hypothesis (Ho_2)**: there is no significant difference in the attitude scores of male and female students taught DAE content using ASEI-based strategies. The p-value of **0.234** confirms that **gender does not play a significant role** in determining students' attitudinal responses when the ASEI method is used. This implies that the **ASEI-based instructional strategy is effective across gender categories**, promoting **equity, inclusiveness, and balanced emotional engagement** among learners. Therefore, educators can confidently apply ASEI strategies without fear of gender bias, knowing that such methods foster **uniform attitudinal development** critical to effective drug abuse education.

Conclusion

This study investigated the **effectiveness of ASEI-based instructional strategies** in shaping students' attitudes toward **Drug Abuse Education (DAE)** content in Basic Science classrooms, with a particular focus on **gender as a moderating variable**. The study was anchored on the premise that promoting positive attitudes among students is critical for **early prevention of drug abuse**, a major societal and public health challenge. Findings from the study revealed that students exposed to the ASEI-based instructional approach demonstrated significantly **more positive attitudes** toward drug abuse education compared to those taught using conventional methods. This underscores the potency of ASEI (Activity, Student-centered, Experiment, and

Improvisation) in creating engaging, reflective, and participatory learning environments that foster students' affective development.

Importantly, the study found **no statistically significant difference between male and female students** in terms of their attitude scores within the experimental group. This indicates that ASEI-based instruction is **gender-inclusive**, equally effective in enhancing both male and female students' attitudes toward drug-related topics. The finding aligns with social constructivist and social cognitive theories which emphasize that attitudes are shaped through **active engagement, modeling, and social interaction,** irrespective of gender. The outcome of this study contributes valuable evidence to curriculum designers, Basic Science educators, and policymakers, suggesting that the **adoption of ASEI-based instructional strategies** can meaningfully support drug abuse prevention education in Nigerian schools. It also advocates for a **gender-equitable approach** to instructional delivery, confirming that well-structured, interactive strategies like ASEI provide equal opportunity for affective development among all learners. However, ASEI-based instructional strategies not only improve students' academic engagement but also play a transformative role in shaping their **attitudes toward socially and morally significant issues** such as drug abuse. Therefore, educators and curriculum planners are encouraged to adopt this approach to instill lifelong values and healthier behavioral dispositions among students.

Recommendations

1. These findings reinforce the ASEI-Based as student-centered pedagogy in addressing not only cognitive but also affective learning outcomes in science education, particularly in areas involving social and health-related issues.
2. Education stakeholders and curriculum developers should formally incorporate ASEI-Based strategy into Basic Science teaching frameworks, particularly for sensitive topics like drug abuse education. This approach fosters active participation and personal connection to content, improving both understanding and attitude formation.
3. Continuous capacity-building programs should be organized for Basic Science teachers to equip them with the knowledge and skills required to effectively implement ASEI-Based strategies. Emphasis should be placed on practical application, lesson improvisation, and gender-sensitive pedagogical techniques.
4. Future studies should delve deeper into how gender influences the effectiveness of ASEI-based instruction. Understanding these dynamics will help in refining instructional practices to ensure equitable learning experiences and attitude development for both male and female students.

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