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Teachers Classroom Motivational Strategies and Basic Science Students' Academic Performance in Secondary Schools in Abua/Odual LGA, Rivers State

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Abstract
The study examined the role of different motivation strategies employed by subject teachers in the classroom to boost students' performance. It employed a posttest-only quasi-experimental design to achieve the objectives. The study's population consists of all the students from all nine UBE public secondary schools in Abua/Odual Local Government Area, Rivers State from which the simple random sampling techniques were used to select two schools for the study. The simple random sampling technique was adopted to further select two intact classes of 70 students and a class of 50 students totalling 120 participants. The two classes were taught for 6 weeks and the four different motivational strategies were applied during the teaching period Four research questions and four null hypotheses were raised and tested. The research instrument used for collecting data for the study was the Basic Science Achievement Test (BSAT). The instrument was validated and its reliability was established using the test re-test method. The mean and standard deviation were used to answer the research questions while the null hypotheses were tested using the analysis of variance (ANOVA) and the independent sample t-test. The result of the study revealed that the refreshment motivational strategy was more effective than others. Males were more responsive to all the strategies than females; however, there was no significant gender difference observed in the different motivational strategies. Based on the findings, it was recommended among others, that educational institutions should consider promoting the provision of meals as a motivational strategy, and the Federal Government school feeding program should be extended to all schools in the country.

Keywords: Motivational Strategies, Academic Performance, Teacher, Classroom, Basic Science

Introduction

Students see the study of science as both intriguing and difficult. This student's perception has largely contributed to low interest in science in general and in basic science in particular (Fryer, 2019). The students' enthusiasm has, in recent times, contributed to their poor performance in the subject. Therefore, more efforts need to be made to improve or enhance students' academic performance in basic science, and this needs a synergy of many factors, such as increasing students' interest in the subject through adequate motivational strategies, displaying a positive attitude on the part of the teacher, and applying discrete intrinsic and extrinsic motivation strategies to the student. It is believed that when students are adequately motivated, their performance in the subject may be improved in the same manner (Godwin & Miller, 2013). Motivation is regarded as an important component of the learning process that impacts behaviour in general and students' performance (Mekler et al., 2017). The term' motivation' derives from the Latin verb movere, which means 'to move' and is the pushing force utilized to satisfy demand in different circumstances. In psychology, for instance, it is a theoretical construct used to explain conduct; in science, it is used to express the reasons for an individual's actions, wants, and needs (Mekler et al., 2017). Motivation is literally the desire to do something while, typically, you are not willing; it is the force that appropriately leads and sustains goal-oriented

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behaviours (Fryer, 2019). He argues that motivation is what motivates a person or learner to achieve or perform something. The purpose a person has for accomplishing anything will drive him up to continue till he attains the desired outcome. According to Zenner et al. (2014), motivation is one of the most important factors in maintaining and sustaining continuous achievement in the learner's growth. Motivation as it is viewed, is an internal condition in which the person freely expresses a variety of attitudes in order to achieve specific predetermined objectives. Student motivation may impact accomplishment, and the components that contribute to motivation might differ (Elliot et al., 2017). There are variables that may improve students' motivation, which according to Godwin and Miller (2013) include situational interest, which may lead to students' motivation and an increase in their learning engagements. Engagement and hands-on, inquiry-based learning may create student interest when activities are correctly directed (Godwin & Miller, 2013). Educationists study different inquiry-based teaching approaches, such as problem-based learning, project-based learning, and problem-solving teaching, to see how they impact student motivation and achievement. Some academics claim that these teaching approaches may boost engagement and student learning when correctly conducted (Godwin & Miller, 2013). They explore teaching approaches and claim that they can only be really influential when the consequence is considered in terms of the influence on learning rather than the emphasis on teaching style. Some studies concentrate on students' and instructors' opinions of these varied tactics, while others are out-based, concentrating on the consequences of these strategies on student accomplishment. Chen et al. (2015) The use of motivating tactics in educational settings has long been a topic of interest among scholars and educators with a variety of viewpoints and outcomes. There are several classroom motivating tactics that classroom instructors may apply to excite and engage pupils. When successful motivating tactics are utilised in scientific lectures, it may boost learning, develop a good learning environment, and encourage student achievement (Kremer et al., 2019). Some of the classroom motivating strategies that have been demonstrated to be successful in the scientific classroom are categorised under "Reward Systems." This entails delivering physical rewards to students depending on their academic success. These incentives might take the form of applause, monetary presents, gift goods, and refreshments. They give students quick acknowledgement for their efforts and results, increasing their motivation to do well (Mekler et al., 2017).

Classroom applause can enhance student achievement by improving the learning environment, self-esteem, and engagement. Applause serves as a motivational tool, positively impacting both intrinsic and extrinsic motivation in students (Ryan & Deci, 2017). When used effectively, applause helps students recognize their accomplishments and promotes continuous learning. Applause boosts self-esteem by offering public recognition of students' efforts and successes, which, in turn, fosters confidence. This public appreciation encourages students to participate and strive for academic excellence. According to Roeser et al. (2021), students who feel acknowledged for their abilities are more inclined to tackle academic challenges and persevere through difficulties, fostering a growth mindset that is associated with long-term success. Applause is particularly effective for younger students, especially in early secondary education, as it satisfies their developmental need for peer and authority acceptance (Eccles & Wang, 2020). In addition, applause enhances student engagement. Classrooms where contributions are recognized tend to show higher levels of involvement, as students feel more motivated to participate and complete tasks. Active engagement in learning improves understanding of the subject matter (Skinner et al., 2018). As a tangible reward, applause motivates students to focus, work harder, and be more involved in their learning. Furthermore, applause contributes to a positive classroom environment. By recognizing individual achievements, applause promotes class unity and mutual respect. Kim and Hodges (2019) note that classrooms characterized by reciprocal support and recognition of effort create a more conducive learning environment. In these settings, students are more likely to encourage one another and collaborate, leading to enhanced individual and collective academic success. Additionally, applause can help reduce disruptive behaviour by redirecting students' attention toward positive actions and achievements. Lewis et al. (2021) found that recognizing accomplishments through applause decreases students' need to seek attention through negative behaviours. In a classroom where positive actions are consistently rewarded, students are more likely to stay focused on academic goals rather than engage in disruptive activities.

However, the effectiveness of applause as a motivational strategy may vary depending on student's age and developmental stage. Younger students tend to respond more positively to public recognition, while older students may require more intrinsic forms of motivation, such as personal praise or tangible rewards (Renninger & Hidi, 2021). Additionally, cultural and gender differences can influence how students perceive applause. For example, boys may value public recognition more due to their competitive nature, whereas girls may prefer private acknowledgement

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(Meece et al., 2021). The monetary gift motivational strategy involves offering students financial incentives to encourage improved academic performance. This approach is based on the idea that tangible rewards can effectively motivate students to engage more in their learning, leading to better outcomes. Research has examined the effects of monetary incentives on students' performance across various subjects, including basic science. Smith and Johnson (2017) conducted a study that tested the impact of financial rewards on students' performance in basic science. In a controlled experiment, one group of students received monetary rewards based on their performance in weekly assessments, while another group received no incentives. The results indicated a significant improvement in the academic performance of the students who received monetary rewards.

Similarly, Thompson et al. (2019) investigated the long-term effects of the monetary incentive strategy on students' academic performance over a full school year. The study found that students who received financial rewards maintained consistently higher performance throughout the academic year. However, concerns have been raised about the long-term sustainability of this approach. While monetary incentives may lead to short-term gains, there is a risk that they could undermine students' intrinsic motivation for learning. Vansteenkiste et al. (2020) argue that an overreliance on extrinsic rewards, such as money, might reduce students' curiosity and interest in the subject matter. Additionally, students might focus more on earning rewards than engaging deeply with the content. Although Smith and Johnson (2017) and Thompson et al. (2019) demonstrate the potential of monetary rewards to improve performance in basic science, educators and policymakers must consider the trade-offs between short-term performance boosts and the long-term development of intrinsic motivation. A balanced approach that includes both extrinsic and intrinsic motivators is likely to yield the most effective and sustainable results in educational settings.
Monetary incentives tend to be more effective with older students, especially those in higher grades such as JSS2. As students mature, their understanding of the value of money increases, making financial rewards a more appealing motivator (Dweck, 2021). In JSS2, students are likely to appreciate monetary rewards as they gain greater independence and personal responsibility. Moreover, research suggests that monetary incentives may have a stronger motivational impact on male students compared to females. Gneezy et al. (2020) found that boys are more responsive to extrinsic rewards, such as money, which provide immediate, measurable benefits. Boys often view monetary rewards as a means of expressing independence and competence, making them particularly effective in motivating male students. In contrast, female students may place less emphasis on monetary incentives and may be more motivated by social recognition, personal connections, and the learning process itself (Meece et al., 2021). Refreshment motivational strategies in schools can significantly boost students' academic performance by enhancing engagement, reducing fatigue, and increasing motivation. These strategies, including breaks, rewards, and other activities, help maintain students' focus and energy during learning (Sana et al., 2013). Small pauses during sessions or enjoyable activities in the curriculum improve students' attention and retention of content. According to Sana et al. (2013), these short breaks enhance memory retention and sustain attention, reducing the monotony that often leads to disengagement.

Prolonged studying without sufficient breaks can result in exhaustion and burnout, which negatively affect academic performance. Introducing refreshment breaks allows students to rest and mentally recharge, improving cognitive function and overall academic success. Kang (2009) emphasizes that well-timed breaks throughout the school day are linked to better learning outcomes and higher levels of student well-being. Additionally, refreshment techniques enhance motivation by offering incentives for reaching academic goals, tapping into intrinsic motivation. Deci and Ryan's Self-Determination Theory (1985) notes that recognition of students' efforts fosters engagement and drives them to continue striving for success, thereby improving academic performance. Incorporating varied activities, such as games, group work, and hands-on experiments, helps reinforce critical concepts and makes learning more accessible and enjoyable for all students, leading to better academic results (Bragg, 2017). Moreover, refreshment strategies contribute to a positive classroom atmosphere, where students feel valued and encouraged to take academic risks. Pekrun et al. (2011) argue that a supportive environment fosters collaboration, creativity, and academic exploration, crucial for achieving academic success. Similarly, Toppino et al. (2016) found that short breaks during learning sessions enhance memory retention and comprehension by reducing cognitive overload. Bragg (2017) also demonstrated that breaks during mentally demanding tasks help maintain focus and prevent fatigue, essential for effective learning.

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In lower grades like JSS1, refreshments are viewed as enjoyable rewards, making the learning environment more engaging (Harlen, 2015). For higher grades like JSS2, refreshments serve as practical motivators, especially during long study sessions or after exams, offering a sense of community among students (Harlen, 2015). Sharing refreshments strengthens social bonds, further enhancing their motivational effect. As Toppino et al. (2016) noted, providing refreshments can offer immediate gratification and serve as a short-term motivator. Younger students respond well to this tangible incentive, which provides a break from the classroom routine. Refreshments are also effective across genders, though responses may vary. Boys often see refreshments as informal rewards, improving their focus and engagement in classroom activities (Ryan & Deci, 2017). Female students tend to appreciate refreshments as part of a social experience, fostering a sense of belonging and camaraderie (Meece et al., 2021).

Research Questions

1. Is there any difference in the effectiveness of the different types of classroom motivation strategies
2. used on the students' performance between the two schools?
3. Is there any difference in the performance of students taught with different motivational strategies in the different classes?
4. What is the students' performance in the different motivational strategies based on their age?
5. Is there any difference in the performance of male and female students taught using different motivation strategies?
6.

Hypotheses

1. H01: There is no significant difference in the performance of students taught with different motivational strategies in the two schools
2. H02. There is no significant difference in the performance of students taught with different motivational strategies in the different classes
3. H03. There is no significant difference in the performance of students based on their age when they are exposed to the different motivational strategies.
4. H04. There is no difference in the male and female students' performance taught using different motivating strategies

Methodology

The study examined the impact of different motivation strategies deployed by teachers in the classroom to boost students' performance. It employed a posttest-only quasi-experimental design to achieve the objectives The study's population consists of all the students from all nine UBE public secondary schools in Abua/Odual Local Government Area, Rivers State from which the simple random sampling techniques were employed to select two schools as the participants. Furthermore, two intact classes of 70 students for JSS1 and a class of 50 students for JSS2 were selected. Students were taught the same topic for each class and the four motivational strategies were applied to observe the effects for six weeks Thereafter, a posttest was administered through the research instrument, the Basic Science Achievement Test (BSAT). The instrument BSAT has thirty objective test items with 4 options (A-D). The test was constructed using Bloom's taxonomy as a guide. The test was administered to students after it was validated and the reliability coefficient was determined for the two different classes in the two different schools. The results obtained at the end of the test were used as the students' performance scores (SPC). The mean and standard deviation were used to answer the research questions while the null hypotheses were tested using the analysis of variance (ANOVA) and the student's independent sample t-test.

Results

Research Question I. Is there any difference in the effectiveness of the different types of classroom motivation strategies used on the students' performance between the two schools?

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Table 1 Mean and standard deviation of the different motivational strategies

Motivation Strategy	No. of students	Mean	SD
1. Applaud	70	61.50	13.68
	50	51.50	18.68
2. Monetary incentive	70	42.58	19.17
	50	55.26	17.37
3. Gift items	70	54.72	12.63
	50	51.88	14.76
4. Refreshment	70	62.26	19.96
	50	59.22	16.26

Table 1 shows that the different motivational strategies employed to boost the performance of students had different degrees of responses by the students in the two schools. For applaud the mean and standard deviation for schools 1 and 2 were 61.50 and 13.63 and 51.58 and 19.17 respectively. For monetary incentive, the mean for school 1, was 42.58 and 19.17 and for school 2 the mean was 55.26 while the SD was 17.37, gift items, school 1 had a mean of 54.72. SD,12.63 and school 2, had a mean of 51.88 and SD, 14.75 while for refreshment, school 1 had a mean and SD of 62.26 and 19.95 respectively and school 2 had a mean and SD of 59.22 and 16.25 respectively. The table further revealed that students in school 1 were more inclined to refreshment and applaud than other motivational strategies while the students in class 2 preferred monetary and gift items.

H01. There is no significant difference in the performance of students taught with different motivational strategies in the two schools

Table 2. Summary of ANAVO of the performance of students with different motivational strategies

Variables		Sum of Squares	Df	Mean Square	F	Sig.
Applaud	Between Groups	2721.71	1.00	2721.71	10.89	0.00
	Within Groups	29488.22	118.00	249.90		
	Total	32209.93	119.00			
Monetary incentives	Between Groups	4685.26	1.00	4685.26	13.77	0.00
	Within Groups	40162.61	118.00	340.36		
	Total	44847.87	119.00			
Gift items	Between Groups	236.67	1.00	236.67	1.29	0.26
	Within Groups	21707.12	118.00	183.96		
	Total	21943.79	119.00			
Refreshment	Between Groups	294.95	1.00	294.95	0.86	0.36
	Within Groups	40465.38	118.00	342.93		
	Total	40760.33	119.00			

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Table 2 shows a significant difference between the two classes for Applaud($p>0.05$) and monetary incentives($p>0.05$) While for the gift items and refreshments, the table revealed no significant difference between the two schools, gift items ($p<0.05$) and refreshment ($p< 0.05$). Therefore, the null hypothesis was rejected for applause and monetary incentives and was retained for gift items and refreshments.

Research Question 2. Is there any difference in the performance of students taught with different motivational strategies in the different classes?

Table 3. Mean and standard deviation of students' performance with different motivation strategies in the different classes

Motivational strategy	Class	N	Mean	S. D
Applaud	**JSS1**	70.00	61.50	13.69
	JSS2	50.00	51.84	18.39
Monetary incentive	**JSS1**	70.00	42.59	19.18
	JSS2	50.00	55.26	17.37
Gift items	**JSS1**	70.00	54.73	12.64
	JSS2	50.00	51.88	14.77
Refreshment	**JSS1**	70.00	62.40	19.97
	JSS2	50.00	59.22	16.26

Table 3 above shows the performance of students in the different classes taught with different motivational strategies. Table 4.2 revealed that the JSSI class taught different motivational strategies. Students taught with applaud motivation had a mean performance of 61.50±13.68, and in JSS 2, the students had 51.34±18.39. Students motivated by a given monetary incentive in JSS 1 had a mean and SD of 42.58±19.17, while in JSS 2, the mean and SD were 55.26±17.37. For those motivated by gift items, the mean and standard deviation were 54.72±12.68 for JSS 1 and JSS 2 had 54.73±12.64, and for those motivated by refreshment, the table showed that JSS 1 had 62.40±19.97 while for JSS 2, the mean and SD were 59.22±16.26. For the last strategy, refreshment, the mean was 62.26±19.96. The table further revealed that the refreshment strategy was the most effective motivational strategy for improving students' performance, as indicated in both classes.

H02. There is no significant difference in the performance of students taught with different motivational strategies in the different classes

Table 4 shows the independent sample t-test on the impact of motivational strategies on their performance based on students' class

Motivational strategy	**Class**	**N**	**Mean**	**S. D**	**Df**	**T**	**P**
Applaud	**JSS1**	70.00	61.50	13.69	118	3.300	.001
	JSS2	50.00	51.84	18.39			.
Monetary incentive	**JSS1**	70.00	42.59	19.18	118	-3.710	.000
	JSS2	50.00	55.26	17.37			.
.Gift items	**JSS1**	70.00	54.73	12.64	118	1.134	.259
	LSS2	50.00	51.88	14.77			.
Refreshment	**JSS1**	70.00	62.40	19.97	118	.927	.356

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	JSS2	50.00	59.22	16.26		.

Table 4 above shows the performance of students in the different classes taught with different motivational strategies. Table 4.3 revealed that the JSSI class taught different motivational strategies. Students taught with applaud motivation had a mean performance of 61.50±13.68, and in JSS 2, the students had 51.34±18.39. For students motivated by a given monetary incentive, JSS 1 had a mean and SD of 42.58±19.17, while for JSS 2, the mean and SD were 55.26±17.37. For those motivated by gift items, the mean and standard deviation were 54.72±12.68 for JSS 1 and JSS 2 had 54.73±12.64, and for those motivated by refreshment, the table showed that JSS 1 had 62.40±19.97 while for JSS 2, the mean and SD were 59.22±16.26. For the last strategy, refreshment, the mean was 62.26±19.96. The table further revealed that the refreshment strategy was the most effective motivational strategy for improving students' performance, as indicated in both classes.

Research Question 3. What is the students' performance in the different motivational strategies based on their age?

Table 5. Mean and standard deviation of students' performance with different motivation strategies in the different ages

	AGE			
Motivational strategy		N	Mean	S. D
Applaud	**11-15**	70.00	61.50	13.69
	16-20	50.00	51.84	18.39
Monetary incentive	**11-15**	70.00	42.59	19.18
	16-20	50.00	55.26	17.37
Gift items	**11-15**	70.00	54.73	12.64
	16-20	50.00	51.88	14.77
Refreshment	**11-15**	70.00	62.40	19.97
	16-20	50.00	59.22	16.26

Table 5 above shows the performance of students of different ages in the different classes taught with different motivational strategies. Table 4.2 revealed that for applauds, ages 11–15 had a mean performance of 61.50±13.68, and for 16–20 years, the students had 51.34±18.39. For students motivated by monetary incentives, 11–15 had a mean and SD of 42.58±19.17, while for 16–20, the mean and SD were 55.26±17.37, respectively. For those motivated by gift items, the mean and standard deviation were 54.72±12.68 for 11–16 and 54.73±12.64 for 16–20. For those motivated by refreshment, the table showed that 11–15-year-olds had 62.40±19.97, while for 16–20-year-olds, the mean and SD are 59.22±16.26. The last strategy, the refreshment, had a mean of 62.26±19.96 for ages 11–16. The table further revealed that the refreshment strategy was the most effective motivational strategy for improving students' performance, as indicated in both classes.

HO3. There is no significant difference in the performance of students based on their age when they are exposed to the different motivational strategies.

Table 6 shows the independent sample t-test of peer influence on the academic achievement of male and female students

	Age				**Df**	**T**	**P**
Motivational strategy		**N**	**Mean**	**S. D**			
Applaud	**11-15**	70.00	61.50	13.69	118	3.300	.001
	16-20	50.00	51.84	18.39			.
Monetary incentive	**11-15**	70.00	42.59	19.18	118	-3.710	.000
	16-20	50.00	55.26	17.37			.

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Gift items	**11-15**	70.00	54.73	12.64	118	1.134	.259
	16-20	50.00	51.88	14.77			.
Refreshment	**11-15**	70.00	62.40	19.97	118	.927	.356
	16-20	50.00	59.22	16.26			.

Table 6 above shows the performance of students of different ages in the different classes taught with different motivational strategies. Table 4.2 revealed that for applauds, ages 11–15 had a mean performance of 61.50±13.68, and for 16–20 years, the students had 51.34±18.39. There was a significant difference in the performance of students based on age when the Applaud motivational strategy was used. For students motivated by monetary incentives, 11–15 had a mean and SD of 42.58±19.17, while for 16–20, the mean and SD were 55.26±17.37, respectively, and the t-test analysis also revealed a significant difference in the performance ($p = 0.00 > 0.05$). For those motivated by gift items, the mean and standard deviation were 54.72±12.68 for 11–16 and 54.73±12.64 for 16–20, but the t-test analysis indicated no significant difference in the performance of students based on their age when they were exposed to the motivational strategy. For those motivated by refreshment, the table showed that 11–15-year-olds had 62.40±19.97, while for 16–20-year-olds, the mean and SD were 59.22±16.26. The last strategy, the refreshment, had a mean of 62.26±19.96 for ages 11–16. The table further revealed that the refreshment strategy was the most effective motivational strategy for improving students' performance, as indicated in both classes.

Research Question 4. Is there any difference in the performance of male and female students taught using different motivation strategies?

Table7. Mean and standard deviation of gender performance of students from the different motivational strategies

Motivation Strategy	Gender	No.of students	Mean	SD
Applaud	Male	75	58.48	16.36
	Female	45	55.80	16.64
Monetary incentive	Male	75	44.57	18.65
	Female	45	53.35	19.60
Gift items	Male	75	54.16	12.96
	Female	45	52.51	14.67
Refreshment	Male	75	63.40	18.18
	Female	45	57,20	18.59

Table 7 revealed that males had a mean of 58.48 and an SD of 16.36, while females had 55.80 and 16.64, respectively, for the mean and SD, when exposed to the Applaud motivational strategy. For the monetary incentive, the mean and SD were 44.57, 18.65, 53.35 and 19.60, respectively, for males and females. Gift items showed that males had a mean of 54.16 and SD of 12.96, while females had a mean of 52.51 and SD of 14.67. For refreshment, male students had a mean of 63.40 and an SD of 18.18, and females had a mean of 57.20 and an SD of 12.59. The table further revealed that males were more receptive to the different motivational strategies than females, except for the gift items, where the females proved to be more inclined than their male counterparts. Furthermore, the refreshment motivational strategies proved to be better than all the other types used for the study.

H04. There is no difference in the male and female students' performance taught using different motivating strategies

Table 8 shows the independent sample t-test of peer influence on the academic achievement of male and female students

Motivation Strategy	Gender	No.of students	Mean	SD	Df	T	p	Decision
Applaud	Male	75	58.48	16.36	118	.863	.390	NS

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	Female	45	55.80	16.64				
Monetary incentive	Male	75	44.57	18.65	118	.660	.016	S
	Female	45	53.35	19.60				
Gift items	Male	75	54.16	12.96	118	.550	.522	NS
	Female	45	52.51	14.67				
Refreshment	Male	75	63.40	18.18	1188	.485	.076	NS
	Female	45	57,20	18.59				

Table 8 above shows the performance of students in the different classes taught with different motivational strategies. Table 4.2 revealed that for applauding motivational strategy, the JSSI class taught using different motivation strategies. Students taught with applaud motivation had a mean performance of 58.48±16.68, and females had a mean of 55.80±16.64. For students motivated by a given monetary incentive, males had a mean and SD of 44.57±18.65, while females had a mean and SD of 53.35±19.60. For those motivated by gift items, the mean and standard deviation were 54.16±12.96 for males and females had 52.51±14.67, and for those motivated by refreshment, the table showed that males had 63.40±18.18 while females had a mean and SD of 57.20±18.18. The table showed that there was no significant difference between male and female performance when exposed to applause, gifts, and refreshments as motivational strategies, but there was a significant difference between male and female performance when the monetary incentive was used as a motivational strategy.

Discussion

The effectiveness of motivational strategies in enhancing students' performance, particularly in science education, has been documented in different areas. This study reinforces the efficacy of motivational techniques, especially extrinsic rewards, which have been shown to significantly impact students' learning outcomes across different academic levels. In this study, four key motivational strategies were evaluated: providing meals, applause, monetary incentives, and gifts. Among these, providing meals was identified as the most effective strategy, yielding a mean score of 62.26 ± 19.96. This finding corroborates with Harlen (2015), who similarly highlighted the importance of tangible rewards in fostering student engagement and achievement. The results further emphasize the role of age in shaping the effectiveness of these strategies. Younger students (typically under 16 years of age) displayed a strong preference for applause as a motivational tool. When they received applause for correct answers, their motivation increased, leading to improved performance. This age-specific response aligns with developmental theories, such as those proposed by Eccles and Wang (2020), which suggest that younger students are more responsive to public recognition and social reinforcement. Applause, in this case, served as a powerful extrinsic motivator, helping to boost self-esteem and engagement in the classroom.

In contrast, older students, particularly those aged 16 to 20 years, responded differently. For this group, the provision of meals emerged as the most effective strategy, with a mean score of 62.77. This preference for meals over other forms of motivation can be explained by the increasing practical considerations of older students, who tend to value tangible rewards such as food, which satisfy immediate needs and provide a sense of personal gratification (Harlen, 2015). While applause remained effective for younger students, it appears that older students require more substantive rewards to sustain their motivation and focus in academic settings. Interestingly, despite the differences in age-specific preferences, the study revealed that both age groups consistently identified refreshments and applause as effective motivational strategies. These findings suggest that while the intensity of the effect may vary, these two strategies are universally effective in enhancing student motivation and performance. The consistency of these results across age groups corroborates prior research, indicating that the use of refreshments and public recognition can transcend age boundaries and remain potent tools in the classroom (Renninger & Hidi, 2021). Furthermore, the study investigated how students' academic level affects the effectiveness of these motivational strategies. The result suggested that students' class levels played a significant role in shaping their responses to different motivational approaches. However, the specific distinctions of how class level interacted with motivational strategies were not fully detailed in the study. While the findings provide valuable insights, it is important to note the absence of crucial methodological details such as sample size, research design, and statistical analyses, which are necessary for a complete understanding of the study's robustness and generalizability. Nonetheless, the results reinforce the notion that tailored motivational strategies, such as providing meals for older students and using applause for younger students, can substantially improve academic performance in science education.

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Conclusion

The study demonstrates the significant impact of various motivational strategies on enhancing students' academic performance in Basic science. Among the strategies evaluated, the provision of meals emerged as the most effective, particularly for older students, suggesting that tangible rewards fulfil immediate needs and serve as strong extrinsic motivators. Despite the age-related differences in preference, both refreshments and applause proved to be consistently effective across all groups, illustrating their broad applicability as motivational tools. While extrinsic rewards such as meals and applause can significantly boost short-term performance, the findings cautioned to be mindful of balancing these with strategies that foster intrinsic motivation for long-term engagement and academic success. These details are essential for a comprehensive understanding of the study's findings and their broader implications.

Recommendations

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

1. Educational institutions should consider promoting the provision of meals as a motivational strategy.
2. Encourage applause and positive reinforcement for younger students. For younger students, especially those in the lower age groups, applauding and providing positive reinforcement when they answer questions correctly can be highly motivating.
3. Explore age-appropriate motivational strategies for older students: because, older students (aged 16 to 20 years) may respond more positively to different motivational approaches.

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