International Journal of Education Humanities and Social Science

ISSN: 2582-0745
Vol. 8, No. 02; 2025

PEER COLLABORATION AS CORRELATES OF STUDENTS' MOTIVATION TO STUDY SCIENCE SUBJECTS IN PUBLIC SECONDARY SCHOOLS IN TUBAH, MEZAM, NORTHWEST REGION OF CAMEROON

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https://doi.org/10.54922/IJEHSS.2025.0933

ABSTRACT

This study looked at peer collaboration as Correlates of Students' Motivation to study science subjects in Public Secondary Schools in Tubah, Mezam Division of the Northwest Region of Cameroon. To achieve this, two specific research objectives were formulated which were to find out how peer collaboration specifically; peer monitoring and peer reward correlates students' motivation to learn science subjects. The study employed a cross-sectional descriptive design. With the use of random sampling a sample of a 264 students was selected from three secondary schools of Mezam division. Data was collected using a structured 4 Likert type scale questionnaire, with an internal consistency of 0.871, using the Cronbach alpha Reliability test. Data was analyzed using both descriptive and inferential statistics, where descriptive statistics such as the mean and standard deviations, frequencies and percentages were used to answer the research questions while linear regression was used as the inferential tool to verify the null hypothesis. Findings from the first research question identified that there exists a significant effect of peer monitoring on students' motivation to learn mathematics at 0.01 level of significance and 20.20% of the variance in students' motivation to learn mathematics can be accounted for by their involvement in peer monitoring activities while results from the second research question indicated that peer reward has a significant effect on students' motivation to learn mathematics at 0.01 level of significance and 8.2% of the variance in students' motivation to learn mathematics could be accounted for by engagement in peer reward activities. Based on these findings it was concluded that team work has a significant effect on students' motivation to learn mathematics in secondary school and it was therefore recommended among other things that teachers should provide opportunities for, peer monitoring, and peer rewards during mathematics classes, while further studies should explore the level of teachers' implementation of group work practices.

Keywords: Peer collaboration, Peer Monitoring, Peer Reward, motivation to learn science subjects.

1. INTRODUCTION

According to Ibrahim et al., (2023) peer collaboration, as a social constructivist approach, emphasizes the importance of interaction and cooperation among students, fostering a sense of collective responsibility and mutual learning (Ibrahim et al., 2023). Effective peer collaboration not only cultivates a supportive learning community but also nurtures intrinsic motivation by providing opportunities for students to construct knowledge collaboratively and develop essential social skills (Zhou, 2024). Nyman (2019) holds that there are different factors that influence students' motivation to learn such as teaching methods, but the form of engagement amongst students also counts. In the same vein, motivation to study has also been identified and attributed

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to several factors, including, classroom environment, and peer interactions (Gonzalez & McClain, 2021). It is therefore certain that to study and understand concepts, students need to be motivated by varied factors including their peers. Fostering student motivation stands as a pivotal goal for educators worldwide (Harrison & Rodriguez, 2023). The multifaceted nature of student motivation can be actually by various factors, including peer collaboration dynamics, and assessment practices.

Science subjects especially mathematics, have been identified as a critical subjects that underpins various fields of study and everyday problem-solving skills (Steen, 2013). However, many students in public secondary schools in Mezam, Northwest Region of Cameroon, exhibit low motivation to engage with mathematical concepts (Nkwenti et al., 2020). The collaborative approach to learning has emerged as a potential catalyst for enhancing students' motivation to study in many domains (Johnson & Johnson, 2014). By fostering a supportive and interactive learning atmosphere, collaboration can help students build confidence, share diverse perspectives, and develop a deeper understanding of science principles (Vygotsky, 1978). Offering children opportunities to exchange ideas in teams as they collaborate and work together to solve problems is certainly powerful for learning. This is especially true when supporting the development of young children's science skills. Research shows that collaborating with peers during early science activities can support later academic success (Christopher, & Farran, 2020). According to Topping (2017), peer monitoring as a form of collaboration/team work can contributes greatly to peer feedback. This form of collaboration improves social interactions, promote peer tutoring and learning amongst peer. Peer reward as an indicator of collaboration involves students being concerned about the progress of their peer through offering of support such as praise, encouragement and appreciation. Both indicators of peer collaboration provide structured learning for students to identify and provide support and feedback to each other on their works (Cobbinah, 2019). Scott-Ladd and Chan (2008) holds that there are many advantages to cultivating collaborative work skills from a social, professional and educational point of view. These include, among others, students' active engagement, positive interdependence, individual accountability, equal participation, higher understanding and retention of concepts, social skills.

2. BACKGROUND TO THE STUDY

The historical roots of teamwork in science and mathematics education can be traced back to collaborative learning practices that emerged in the early 20th century, influenced by progressive educational theories. Pioneers like Dewey (1938) emphasized experiential learning and social interaction as vital components of education, advocating for cooperative approaches in classrooms. By the mid-20th century, the rise of constructivist theories further promoted the idea that students learn effectively through collaboration, as they engage in discussions and problem-solving activities together (Piaget, 1973; Vygotsky, 1978). This shift was reflected in various educational reforms, leading to the incorporation of group work and peer tutoring in school curricula (Johnson & Johnson, 1989). The recognition of diverse learning styles and the importance of social dynamics in learning has since solidified group work as a fundamental aspect of science education, fostering critical thinking and deeper understanding among students (Slavin, 1995).

Obilor and Okah (2020) suggest that the teaching, learning, and assessment of can be enhanced by using peer tutoring methods. These techniques allow students to evaluate their own strengths and weaknesses while helping their peers with problem solving. Although Siti et al. (2018) identified

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that some students dislike when their mistakes became known, as it limits comfortability in receiving qualitative feedback from peers, Tom et al (2019) on the other hand argues that group work can be partly determined by friendship bonds, enmity, or other facts like, popularity of individuals, perception of criticism which can lead to lack of differentiation in the process. Despite these challenges, collaborative work practices may still positively influence students' motivation to learn mathematics, particularly when complemented by activities like peer monitoring, peer rewards, and teacher support.

According to Li and Pan (2009), motivation is the force that accounts for the arousal, selection, direction, and continuation of behavior in learning today, if the interest of a learner is aroused toward a particular subject be it externally or internally, it can drive the student to maintain and direct that particular behavior in order to learn and understand the concept being taught. Williams and Burden (2000), on their part holds that motivation is a state of cognitive and emotional arousal that leads to a conscious decision to act and that causes the exertion of intellectual and physical effort toward reaching a previously set goal. Holding to this fact, it means that if team work practices are adopted for teaching learning of mathematics, it can be ideal in enabling students to set learning goals, upon which personal efforts brings them to reality. Students can therefore hardly make significant progress in their learning if they do not get motivated to learn.

Learning motivation encompasses the internal drive and inclination to participate in learning activities, which can be classified into two main categories: intrinsic motivation and extrinsic motivation (Marsh et al. 1984). From a psycho-educational perspective, ‘motivation to learn’ has been described as a student’s ‘energy and drive to learn, work effectively and achieve to their potential’, in addition to the behaviors associated with this energy and drive (Martin, 2004). Students with learning goals of seeking understanding for mastery of a particular concept and skills are said to be intrinsically motivated to learn (Cavallo et al, 2000). Engaging students in collaborative team work where they monitor, reward and work in peer groups, can intrinsically motivate them to learn and gain better master of mathematical concepts. Ryan and Deci, (2001), are of the opinion that students are externally driven to perform an action with anticipation of some outcomes, other than learning itself. This idea of external reward becomes very visible when learners assess and reward peers, motivating them to learn. In this light, peer may strive to put more efforts in their learning, being aware of the rewards that accompany thereafter. Student motivation to learn has been undervalued to date though recently identified as an area influencing student success and retention especially in subject areas at schools (Edgar et al, 2019). This shows that there is recognition that students’ motivation can trigger involvement in studying a course, especially mathematics at secondary schools.

Since motivation is a drive that activates behavior, students could be externally motivated by their peers to study their subjects through peer grading. This can also contribute greatly to learning and achievement across the various areas of discipline such as mathematics. Teamwork can serve as a powerful motivator for learning, which is crucial for enhancing students' engagement with mathematical concepts and boosting their self-efficacy. A motivated learner approaches mathematics with commitment, energy, and creativity; they recognize the significance of their studies and are driven to reach their objectives (Beyoh, 2023). This suggests that teamwork can significantly impact students' motivation across various academic disciplines including mathematics. When students participate in collaborative activities, they are more likely to take

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responsibility for their learning, gain a deeper comprehension of the material, and feel more motivated to excel in the subject. Therefore, this approach can be particularly effective in mathematics education, especially when combined with reward systems and progress monitoring. Peer reward involves peers valuing and verbally expressing their appreciation and recognition of a colleague's effort towards the attainment of a given goal (Jodies, 2023). It usually includes one-on-one conversation, team meetings or classroom discussions. While Brown et al (2007), define peer monitoring as peer observing and checking the behavior of others within the group regarding appropriateness and effectiveness. This suggests that by watching and assessing the actions of their peers in a classroom environment, students may feel encouraged to put in more effort, aware that they are being observed. This awareness can contribute to their effective learning of mathematics. Addressing the contextual issues, many students in public secondary schools in Mezam, Northwest Region of Cameroon, have been identified to exhibit low motivation to engage with mathematical concepts (Nkwenti et al., 2020). This lack of motivation can be attributed to several factors, including teaching methods, classroom environment, and peer interactions (Gonzalez & McClain, 2021). Therefore, it is evident that team work activity in mathematics classrooms can have positive influence on student motivation to study mathematics. Due to the fact that the study addressed reward and monitoring aspects of team work, two theories were employed; Human motivation by (Maslow, 1943) which addressed peer reward and social learning theory by Bandura (1986) which addressed peer monitoring.

3. LITERATURE REVIEW

Peer Collaboration

At its simplest, collaborative learning is "any form of learning that occurs due to social interaction between two or more individuals when they are working together on the same task or toward the same goal" (Naji & Croje, 2022). It could be in a classroom setting or among peers when engaged in assigned task. Peer collaboration plays an important role in enhancing student learning in different disciplines. Studies have shown that peer collaboration can significantly improve performance in tasks such as regression modeling (Li & Goos, 2022), and collaborative assessment processes (Brundage et al., 2022). From these views above, peer collaboration can play a motivating role in enhancing the study of science especially in cases where students receive rewards and are monitored as they engage in problem solving. Motivation includes reasons, efforts, beliefs, and feelings, associated with learning science (Glynn et al., 2007, 2009). Through peer collaboration, students can refine their skills, develop evaluative judgment, and enhance their ability to critically assess the work of others (Chang-Tik, 2022). According to Cetin-Dindar (2016) motivation to learn science increases when there are more opportunities to relate science to real-world problems. This motivation can also occur when students collaborate, share responsibilities and learn to appreciate diverse viewpoints, creating a stimulating intellectual environment. This cooperative spirit nurtures enthusiasm and investment in learning as students are more likely to engage with content that they relate to through their peers. We can also see that peers have an important role to play in the learning industry as they interact in school. This is substantiated by Jacobson and Burdsal (2012) who found that positive peer influence in middle schools predicted higher academic achievement.

Peer Reward and Motivation to learn science subjects

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According to Johnson and Johnson (1989), peer reward is "a system of positive reinforcement in which students receives recognition and appreciation from their peers for their academic achievements and contributions to the learning community". This definition underscores the social nature of peer rewards, emphasizing the role of peer acknowledgment in reinforcing positive behaviors and academic accomplishments. Thus, through peer rewards, learners' can set and monitor goals whose accomplishment support science learning; they are also more likely to take ownership of their learning process, as they interact and exchange ideas with peers. This increased collaboration cultivates intrinsic motivation, as students feel valued and supported. Ames (1992) on the other hand, defines peer rewards as "a mechanism for creating a supportive and affirming classroom culture, where students are encouraged to recognize and celebrate each other's efforts and successes in learning." This definition highlights the nurturing aspect of peer rewards, emphasizing its potential to foster a sense of belonging and mutual respect among students. In the specific context of science learning, peer reward can bring about motivation when students get appreciated or recognized by their fellow colleagues for achieving a particular goal. Therefore, peer reward as an assessment practice for learning science can be ideal in our today's science classrooms.

Dweck (2006) emphasizes that peer rewards can contribute to creating a growth-oriented mindset among students, where they view their peers' achievements as sources of inspiration and motivation for their own learning. This perspective underscores the role of peer rewards in shaping students' attitudes towards academic success and effort in mathematics. Peer rewards have had a significant impact on students' learning outcomes and motivation across various disciplines. According to Falchokov (2001) when students receive recognition and appreciation from their peers for their academic achievements, they are more likely to experience a sense of validation and belonging within the learning community. In mathematics particularly, this can lead to increased confidence and self-efficacy, as students perceive their mathematical abilities as valued and respected by their peers.

Peer rewards can create a supportive and collaborative learning environment where students are motivated to excel in their academic pursuits. According to Deci and Ryan (2000), when students receive positive feedback and recognition from their peers, it can enhance their intrinsic motivation, leading to greater engagement and perseverance in challenging mathematical tasks. In mathematics learning, peer rewards can help alleviate the fear of failure and mistakes often associated with the subject (Timperley, 2007). By celebrating each other's achievements, students may feel less intimidated by the challenges of mathematics and more willing to take risks in problem solving. This can contribute to a positive mindset towards learning mathematics, where students are open to embracing challenges and learning from their experiences.

Cho et al. (2010) identified that peer rewards can foster a sense of collective responsibility for academic success within the peer group. When students recognize and celebrate each other's achievements, it promotes a culture of mutual support and encouragement, where everyone is responsible in contributing to the overall success of the group. Therefore, in the learning of mathematics, this can lead to collaborative problem-solving approaches and a sense of shared achievement among students, hence a motivational tool to learn across a variety of discipline.

Peer Monitoring and Motivation to learn science subjects

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Brown et al (2007) define peer monitoring as peer observing and checking the behavior of others within the group regarding appropriateness and effectiveness. Henington and Skinner (2000) stated, that peer monitoring can bring about both positive and negative social, emotional, and cognitive changes in students who are being monitored, as well as in those students doing the monitoring. Brown et al (2007) are of the view that peer monitoring, as learners keep an eye on whether their partners are going through appropriate and effective processes and procedures of learning, can alter their self-monitoring and could establish a positive interdependence among students. Peer monitoring that is attained by performing some specific role, seems to keep students "on task" without lowering indicators for students' intrinsic motivation (Yelva et al, 2020). Hence, engaging students in performing tasks that are geared towards monitoring peer can sustain their intrinsic motivation to acquiring positive behaviors that enhances their learning of concepts in subject areas such as mathematics. According to Boud et al. (1999) peer monitoring involves students engaging in the observation and assessment of their peers' learning behaviors and outcomes with the goal of promoting self-regulation and academic development. This definition underscores the active role of students in observing and supporting each other's learning processes, emphasizing the potential for fostering a culture of shared responsibility for academic progress.

Similarly, Zimmerman (2000) defines peer monitoring as a form of social learning in which students observe and provide feedback to their peers, leading to increased self-awareness, self-efficacy, and academic engagement. This definition highlights the social-cognitive aspects of peer monitoring, emphasizing its potential in enhancing students' metacognitive skills and motivation through social interactions with their peers. Peer monitoring has therefore shown to have a significant impact on students' learning outcomes and academic performance across various educational contexts. When students engage in observing and providing feedback to their peers, they develop a deeper understanding of effective learning strategies, self-regulation skills, and a sense of accountability for their own learning. In mathematics context, this can lead to improved study habits, time management, and academic achievement especially in challenging concepts.

Zimmerman (2000) went further to highlight that peer monitoring could promote a sense of collective efficacy among students, where they view their peers as valuable sources of support and feedback. According to Bandura (1997), when students observe their peers' successful learning behaviors and receive constructive feedback from them, it can enhance their belief in their collective ability to succeed academically. This can lead to a supportive and collaborative learning environment where students get motivated to help each other learn and excel in mathematics. Particularly, in the context of mathematical tasks and assignments, peer monitoring can help students develop a greater awareness of effective strategies for approaching complex tasks. Pintrich (2003) highlighted that observing and providing feedback to peers, students gain insights into the different approaches to problem-solving, critical thinking, and collaborative skills. Meaning that when students engage in observing and providing constructive feedback to their peers, it promotes a culture of mutual support and accountability for academic progress and such commitment can help each other succeed academically especially in mathematics learning.

Theoretical Review

Bandura (1986), in his social learning theory, asserts that individuals acquire various skills and knowledge from one another primarily through observation, imitation, and modeling. He further outlines that the modeling process consists of several stages: attention, retention, reproduction, and motivation. When students engage in activities, they focus on the feedback given by their peers regarding an assessed task, which allows them to emulate these insights and feel motivated to

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learn, ultimately leading to improved solutions. Denier et al. (2013) notes that, similar to Thorndike and Skinner, Bandura believes that learning happens through observation; however, he emphasizes that learners can also shape their own behaviors and influences their surroundings. According to Bandura (2001), observational learning can take place through three types of models: verbal, live, and symbolic. In the context of peer monitoring, verbal feedback from classmates during group activities can encourage positive learning behaviors and enhance motivation. Bandura (1986) This suggests that when students engage in collaborative activities, it enhances their learning through social interactions, as they are able to monitor and provide constructive feedback to their peers. In this light the social-cognitive theory of self-efficacy is a useful framework for guiding research on high school students in science engagement (Bae & DeBusk-Lane, 2019) because self-efficacy beliefs promote student engagement in science learning (Britner & Pajares, (2006). Through the peer monitoring process, students can gain cognitive skills, deepen their understanding of mathematical concepts, and exhibit positive habits that support their learning motivation as they constantly check each other's progress. Thus, collaborative work enables students to observe, evaluate, and learn from their peers' contributions, offering them examples and models for enhancement, highlighting the relevance of this theory to the study.

On the other hand, Maslow (1943) introduced the hierarchy of needs theory, which suggests that human motivation is driven by the fulfillment of basic psychological needs. This framework is particularly relevant for understanding how teamwork activities, such as peer rewards, can enhance students' motivation in science. Maslow identified five levels of needs: physiological, safety, belongingness and love, esteem, and self-actualization. While physiological and safety needs are foundational, esteem and self-actualization represent higher-order growth needs. Collaborative work can satisfy belongingness through social interaction and collaboration, enabling students to pursue deeper mathematical understanding and address higher-order needs. Additionally, feedback from peers helps fulfill esteem needs by acknowledging students' efforts and progress.

By meeting belongingness and esteem needs, peer rewards can foster intrinsic motivation for learning mathematics. Maslow (1970) noted that intrinsic motivation arises from fulfilling growth needs beyond mere survival and security. A supportive classroom environment that addresses various levels of needs enhances the motivational impact of teamwork. For example, peer rewards can create a sense of belonging when students recognize and encourage one another. Such interactions not only fulfill individual needs but also strengthen classroom community ties (Deci & Ryan, 2000). Through constructive peer feedback and collaborative activities, students can develop a positive attitude toward overcoming mathematical challenges, viewing mistakes as opportunities for growth and this viewpoint can go a long way to motivate them in taking mathematics study seriously. This aligns with Maslow's notion of self-actualization as an ongoing journey of personal development (Dweck, 2006).

4. STATEMENT OF THE PROBLEM

Science subjects have been identified as critical subjects that underpin various fields of study and everyday problem-solving skills (Steen, 2013). However, many students in public secondary schools in Mezam, Northwest Region of Cameroon today, exhibit low motivation to engage with science study (Nkwenti et al., 2020). Observations show that there are possible factors that may be affecting students' motivation to the learning of sciences as they ought to do. Based on researchers' observations, it is very possible that students may not fully get engaged in collaborative activities during science classes, which possibly hinders their motivation to study the

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subject. This lack of engagement prevents them from experiencing the benefits of peer reward and peer monitoring, ultimately leading to diminished enthusiasm. It is dependent on these observations that this study explores how peer collaboration influences students' motivation to learn science subjects.

5. RESEARCH OBJECTIVES

General Research Objectives

The main aim of this study is to find out the influence of peer collaboration on students' motivation to learn mathematics in public secondary schools in Mezam Division.

Specific objectives

- To investigate the influence of peer reward on students' motivation to learn science subjects
- To find out the influence of peer monitoring on students' motivation to learn science subjects

6. RESEARCH QUESTIONS

General Research Questions

What is the influence of peer collaboration on students' motivation to learn science subjects in public secondary schools?

Specific Research Questions

- How does peer reward influence students' motivation to learn science subjects in public secondary schools?
- How does peer monitoring influence students' motivation to learn science subjects in public secondary schools?

7. RESEARCH HYPOTHESES

General hypotheses

Ho: Peer collaboration has no significant influence on students' motivation to learn science subjects in public secondary schools

Ha: Peer collaboration has a significant influence on students' motivation to learn science subjects in public secondary schools

Specific Hypotheses

Ho_1: There is no significant influence of peer reward on students' motivation to learn science subjects in public secondary schools.

Ha_1: There is a significant influence of peer reward on students' motivation to learn science subjects in public secondary schools.

Ho_2: There is no significant influence of peer monitoring on students' motivation to learn science subjects in public secondary schools.

Ha_2: There is a significant influence of peer monitoring on students' motivation to learn science subjects in public secondary schools

8. METHODOLOGY

The study utilized a descriptive survey research design for two main reasons. Firstly, surveys allow for administration to large a group, which improves the reliability and generalizability of the

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results. Secondly, they enable standardized data collection, ensuring that all participants respond to the same questions uniformly. The study was conducted in the Mezam division, located in the North West Region of Cameroon.

The study's population comprised three secondary schools in the Mezam division of the North West region of Cameroon, totaling 6,057 students; 4,126 females and 1,931 males. The accessible population included 840 students from GBHS Bamenda, GBHS Bayelle, and CCAST Bambili, with 459 females and 381 males. Participants in the study were selected from Form 4 students at GBHS Bamenda, GBHS Bayelle, and CCAST Bambili, all of whom lived in the same community as their schools. The researchers utilized a non-probability sampling method, specifically simple random sampling, to determine the study sample. A total sample size of 264 students was established using the Krejcie and Morgan table. Data collection was conducted using a 4-point Likert-type scale questionnaire, which showed excellent internal consistency with a Cronbach's Alpha of 0.871. This tool was selected for its effectiveness, allowing the researcher to efficiently collect data from a large number of students in a cost-effective manner. The questionnaire aimed to assess Form 4 students' views on how peer grading and monitoring influence their motivation in science learning. By employing a standardized questionnaire, the study ensured uniform data collection, reducing potential bias and improving the reliability of the results obtained.

9. RESULTS AND DISCUSSIONS

This section presents the outcomes of the statistical analysis, organized into two key sections. The first section offers descriptive statistics related to the research questions. The second section describes the inferential statistics used to assess the null hypothesis, concluding with a discussion of the results in light of each hypothesis.

Research Question One: How does peer reward affect students' motivation to learn science subjects?

Table 1

How peer reward affects students' motivation to learn science subjects?

Items	N	Positive Response		Negative Response			
	N	SA+A	(%) Agreed	D+SD	(%) Disagreed	Mean	Std.
Receiving encouragement from my classmates, motivates me to learn new science topics	264	240	90.9%	24	9.1%	3.38	.725
When my peers clap for me for performing well in science subjects, it motivates me to do better	264	240	90.9%	24	9.1%	3.39	.683
Receiving appreciation from my peers during science classes triggers me to learn	264	239	90.5%	25	9.5%	3.25	.718
Recognition from peers during science classes makes me develop the desire for higher grades	264	219	83.0%	45	17.0%	3.12	.774

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Praise from classmates drives me in learning and solving difficult science problems	264	190	72.0%	74	28.0%	2.86	.953
Tokens from classmates encourages me to always pass my science exercises	264	174	65.9%	90	34.1%	2.74	.952
Rewards from peers does not motivate me to learn science	264	71	26.9%	193	73.1%	2.99	.969
Multiple response	**264**	**197**	**74.3%**	**67**	**25.7%**	**3.10**	**.825**

Key: SA = Strongly agree, A = Agree, D = Disagree, SD = Strongly disagree, Std. Standard deviation

The responses from the students indicate that peer reward has a positive effect on their motivation to learn science in public secondary schools. The majority of students (ranging from 65.9% to 90.9%) agreed that receiving encouragement, appreciation, recognition, praise, tokens, and rewards from their peers motivates them to work harder and learn the sciences better. The mean scores for the positive responses range from 2.74 to 3.39, indicating a relatively high level of agreement among students regarding the motivating effects of peer rewards. The standard deviations (Std.) are also relatively low, suggesting a consistency amongst students' responses. On the other hand, a smaller percentage of students (ranging from 9.1% to 34.1%) disagreed with the statement that peer rewards motivate them to learn science subjects. The mean score for the negative responses is 2.99, indicating a relatively neutral stance among students in this regard.

Summarily, the data suggests that peer reward has a positive impact on students' motivation to learn science subjects in public secondary schools. This was indicated by the fact that when receive encouragement, appreciation, recognition, praise, tokens, and rewards from their peers, it motivates them to work harder in learning science subjects.

Testing Hypothesis one

Table 2

Regression Model Summary on peer rewards and students' motivation to learn science subjects

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.286[a]	.082	.078	3.310

a. Predictors: (Constant), **Peer Reward**

The model summary table shows that a positive relationship (R = 0.286[a]) exists between peer rewards and motivation to learn science subjects. This implies that the more the students reward themselves during science classes, the more their motivation towards learning increases. Furthermore, R-Square for the model is 0.082, with an adjusted R-Square of 0.078. This therefore suggests that 8.2% of the variations in students' motivation to learn the sciences can be accounted for when they reward themselves during science classes.

Testing Hypothesis One

Ha_1: *There is a significant effect of peer reward on students' motivation to learn science subjects*

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Ho_1: *There is no significant effect of peer reward on students' motivation to learn science subjects*

Table 3
Regression Coefficients for peer reward and students' motivation to learn mathematics

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	12.687	1.507		8.421	.000
Peer Reward	.332	.069	.286	4.836	.000

Dependent Variable: **Motivation to learn Science subjects**

The table for regression coefficients shows that the regression equation is given by ***(Motivation to learn = 12.687+ 0.332 x Peer reward).*** Therefore, when students reward themselves during science classes, their motivation to learn the sciences is at 12.687. When their involvement in peer rewards increases by one unit, their motivation to learn increases by 0.332. This increase is significant at the 0.001 level of significance, indicated by a p-value of 0.000.

Table 4
ANOVA Table of peer rewards and students' motivation to learn science subjects

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	256.198	1	256.198	23.385	.000[b]
	Residual	2870.435	262	10.956		
	Total	3126.633	263			

a. Dependent Variable: **Motivation to learn science subjects**
b. Predictors: (Constant), **Peer Reward**

The ANOVA table above indicates that the F-value at a degree of freedom 263 is 23.385 with p = 0.000, $p<0.05$. This further shows that the test is significant at 0.01 level of significance. Since p-value is less than 0.05, the null hypothesis (Ho_1) is rejected while the alternative hypothesis (Ho_1) is retained. Therefore, it can be concluded there exists a significant effect of peer reward on students' motivation to learn science subjects, at 0.01 level of significance and 8.2% of the variance in students' motivation to learn science subjects, can be accounted for by peer reward.

This finding is in line with Loliyana et al., (2022) who investigated the effects of rewards and ice-breaking on Students' Learning Motivation at a Rural Public Elementary School in Lampung and found out that Students in the experimental class were significantly more motivated than those in the control group and that when students receive recognition and appreciation from their peers for their academic achievements, they are more likely to experience a sense of validation and belonging within the learning community. Similarly, the findings also tie with the works of Deci and Ryan (2000), who also found out that when students receive positive encouragement and recognition from their peers, it enhances their intrinsic motivation, leading to greater engagement and perseverance in challenging learning tasks.

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Research Question Two: How does peer monitoring affect students' motivation to learn science subjects?

Table 5
Research Question Two: Peer monitoring and students' motivation to learn science subjects

Items	N	Positive Response SA+A	(%) Agreed	Negative Response D+SD	(%) Disagreed	Mean	Std.
Follow up from classmates on challenging science topics drives me to set learning goals	264	215	81.4%	49	18.6%	3.16	.856
Provision of feedback from my classmates give me the zeal me to improve on my problem solving skills	264	194	73.5%	70	26.5%	2.93	.949
Tutoring from peers on drives me to put more effort in learning new formuli	264	213	80.7%	51	19.3%	3.11	.865
When my classmates keep eyes on me during lessons, it encourages me to focus on my learning	264	166	62.9%	98	37.1%	2.75	1.087
When my peers constantly check on my, progress it motivates me to always learn more	264	213	80.7%	51	19.3%	3.08	.932
When my classmates assist me in science assignment it encourages me to work harder	264	227	86.0%	37	14.0%	3.33	.865
Peer monitoring does not motivate me to learn	264	206	78.0%	58	22.0%	3.13	.942
Multiple response	**264**	**205**	**77.6%**	**50**	**22.4%**	**3.07**	**0.928**

The responses from the students indicate that peer monitoring has a significant impact on their motivation to learn especially the sciences. The majority of students (ranging from 62.9% to 86.0%) agreed that various forms of peer monitoring, such as follow-up on challenging topics, receiving tutoring, being observed during lessons, receiving assistance in assignments and constant progress checks from peers, positively influence their motivation and learning outcomes. Students expressed that peer monitoring helps them set learning goals, improve their solving skills, put more effort into learning new formulas, focus on their learning, work harder, and stay motivated to learn. The mean scores for these positive responses range from 2.75 to 3.33, indicating a relatively high level of agreement among students regarding the motivating effects of peer monitoring. The standard deviations (Std.) are also relatively low, suggesting consistent responses among the students. On the other hand, a smaller percentage of students (ranging from 14.0% to 26.5%) disagreed with the positive impact of peer monitoring on their motivation to learn science subjects. The mean score for the negative responses is 3.09, indicating a relatively neutral stance among students in this regard.

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Summarily, the data suggests that peer monitoring has a predominantly positive impact on students' motivation to learn science subjects. They indicated through follow-up on challenging topics, receiving tutoring, being observed during lessons, receiving assistance in assignments, and constant progress checks from peers helps them set learning goals, improve their solving skills, put more effort into learning new formulas, focus on their learning, work harder, and stay motivated to learn science subjects.

Table 6
Regression Model Summary on peer monitoring and students' motivation to learn science subjects

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.449[a]	.202	.199	3.087

a. Predictors: (Constant), **Peer Monitoring**

The model summary table shows that a positive relationship (R = 0.449[a]) exists between peer monitoring and motivation to learn science subjects. This implies that the more students monitor themselves during science classes, their motivation to learn also tend to increase. The table further indicates an, R-Square for the overall model to be 0.202, with an adjusted R-Square of 0.199. This means that 20.20% of the variations in students' motivation to learn science subjects can be accounted for when they monitor each other during learning.

Testing Hypothesis Two

Ha_2: *There is a significant effect of peer monitoring on students' motivation to learn science subjects*
Ho_2: *There is no significant effect of peer monitoring on students' motivation to learn science subjects*

Table7
Regression Coefficients for peer monitoring and students' motivation to learn science subjects

	Unstandardized Coefficients		Standardized Coefficients		
Model	**B**	**Std. Error**	**Beta**	**t**	**Sig.**
(Constant)	11.602	1.038		11.175	.000
Peer Monitoring	.453	.056	.449	8.135	.000

Dependent Variable: **Motivation to learn science subjects**

The table for regression coefficients indicates that the regression equation is given by ***(Motivation to learn = 11.602+ 0.453 x Peer Monitoring).*** Therefore, when students practice peer monitoring activity during their science classes, their motivation to learn is at 11.602, when peer monitoring activities increases by one unit, their motivation to learn increases by 0.453. This increase is significant at 0.001 level of significance as indicated by a p-value of 0.000.

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Table 8:
ANOVA Table of peer monitoring and students' motivation to learn science subjects

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	630.523	1	630.523	66.182	.000[b]
	Residual	2496.110	262	9.527		
	Total	3126.633	263			

a. Dependent Variable: **Motivation to learn science subjects**
b. Predictors: (Constant), **Peer Monitoring**

The ANOVA table shows that the F-value at a degree of freedom 263 = 66.182 with p = 0.000, p<0.05. This shows that the test is significant at 0.01 level of significance. Since p-value is less than 0.05, alternative hypothesis (Ha_2) is retained while null hypothesis (Ho_2) is rejected. Therefore, it can be concluded that there is a significant effect of peer monitoring on students' motivation to learn, at 0.01 level of significance and 20.20% of the variation in students' motivation to learn mcan be accounted for by peer monitoring.
This finding relates to the findings of Yelva et al (2020), who experimentally examined the effects of reciprocal peer-monitoring of learning behaviors on cognitive and affective learning outcomes of students, and results showed that peer-monitored group scored higher in cognitive learning outcomes than the self-monitored control group. The findings also tie to the assertion of Brown et al (2007) who identified that through peer monitoring where learners keep eye on partners if they are going through appropriate and effective procedures of learning, helps them develop self-monitoring and positive interdependence among themselves, which improves their learning motivation.

10. CONCLUSION AND RECOMMENDATIONS

Conclusion

The objectives of the study were to find out the extent to which peer reward influences students' motivation to study mathematics and how peer monitoring also influences students' motivation to learn science in public secondary schools in Mezam Division, North West Region Cameroon. The findings reveal that peer reward has a significant influence on students' motivation to study science, at 0.01 level of significance and 8.2% of the variance in students' motivation to learn science, can be accounted for by peer reward. Similarly, there is a significant effect of peer monitoring on students' motivation to study science subjects in public secondary schools, at 0.01 level of significance and 20.20% of the variation in students' motivation to learn science subjects can be accounted for by peer monitoring.

Recommendations

- Educators should enhance the implementation of peer reward activities during science lessons, and students should actively participate in these practices.
- Teachers' ought to promote and support peer monitoring activities in science classes, while students should take these initiatives seriously by regularly tracking and following up on their peers' progress.

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