INFLUENCE OF TEACHER FACTORS ON STUDENTS' MOTIVATION IN CHEMISTRY IN SENIOR SECONDARY SCHOOLS IN TARABA STATE, NIGERIA

SAMBO, Aliyu Abubakar
ADAMU, Jibrilla (PhD)
ADAMU, Mohammed
Department of Physical Sciences Education, Faculty of Education, Modibbo Adama University, Yola
j.adam1438@gmail.com , jibrillaadamu@mau.edu.ng
madamu1119@mau.edu.ng
a.m.skudu1119@gmail.com

Abstract
The study probed the influence of teacher factors on students' motivation in chemistry in senior secondary schools in Taraba state, Nigeria. The study employed a correlational research design and was guided by three objectives, research questions and hypotheses. The population of the study was 15,853 constituting the entire SS II students offering chemistry in the state while the sample was 375 students, selected using multistage random sampling technique. Chemistry Students' Teacher Factors Questionnaire (CSTFQ) and Chemistry Students' Motivation Questionnaire (CSMQ) were used for data collection. The CSTFQ and CSMQ were trial tested and yielded reliability coefficients of .85 and .81 respectively using Cronbach`s alpha. Mean and standard deviation were used to answer the research questions, while linear regression was used to test hypotheses one and two while multiple regression was used to test the third hypothesis all at .05 level of significance. Results showed high levels of teacher-student relationships and instructional strategies. The results further revealed significant relationships between teacher-student relationships ($r = .300$, $p < .05$), instructional strategies ($r = .367$, $p < .05$) and teacher factors (($r = .405$, $p < .05$) and students' motivation. Based on the findings, the researchers recommend that teachers prioritize building strong relationships with students and employ diverse and interactive instructional approaches that can boost and sustain students' motivation towards learning chemistry.
Keywords: Teacher Factors, Students' Motivation, Chemistry.

Introduction

Science education is an indispensable tool for any nation aspiring for greatness, as it equips learners with the necessary skills to navigate the challenges confronted by modern times, including poverty, climate change, food insecurity, population explosion, housing crisis, pandemic to mention a few. It is therefore imperative for all the nations of the world, to have a curriculum that equips learners with science literacy skills for active living in the society (Babajide, 2015). In accordance with these needs and desires, the Federal Government of Nigeria (2013), emphasizes the significance of science education aimed to inculcate scientific literacy among the citizenry and prepare them for active living in the society. Science (chemistry inclusive), is important for breakthroughs in technology, medicine, pharmacy, engineering, agriculture and other sectors of the economy (Talanquer, 2016). Despite the numerous benefits accrued to the teaching and learning of science (chemistry inclusive), the academic performance of students in chemistry in Taraba state remains worrisome. A six-year

WAEC data (2018-2023) obtained from Taraba state revealed a fluctuating abysmal performance, with the highest percentage credit (43.71%) in chemistry recorded in 2019 (Taraba State Government, 2024). Efforts made by researchers to avert the trend of poor performance in science in general and chemistry in particular revealed a myriad of factors responsible for poor academic performance.

Adesoji, Omilani and Dada (2017), blamed the poor performance of students in chemistry to the abstract nature, complex reactions and the mathematical nature of the subject. Other factors such as lack of motivation, poor problem-solving skills and difficulty in connecting theoretical knowledge with practical applications also hinder the learning process. It therefore means that, for effective teaching and learning of chemistry, concerted effort must be made by researchers to probe the factors that can boost students` motivation to learn chemistry. According to Knappers (2017), teacher factors particularly teacher-student relationships and instructional strategies have a profound influence on students` motivation and academic performance. Although many studies have investigated the relationship between teacher-student relationships and instructional strategies and academic achievement and motivation, little effort has been made to probe the combined influence of teacher-student relationships and instructional strategies on students` motivation, hence, this study.

The teacher-student relationships extend beyond mere going to the class to impart knowledge and skills to the learners but characterized by factors such as mutual respect, trust and effective communication. Hemre and Pianta (2017), stressed the importance of open and constructive communication in fostering a motivating classroom environment. It gives students a sense of belonging and encouragement for active participation in the learning process when they feel heard and understood. Establishing clear channels of communication with students stimulates their motivation to learn and academic achievement likely to improve. However, poor students` motivation is not solely blamed on poor teacher-student relationships but on whole lots of other factors such as poor instructional strategies. Instructional strategies that engages students in critical thinking, analysing and synthesizing instructional contents, significantly boost students` motivation by fostering engagement, curiosity and a sense of ownership of their learning. Through active participation, students develop a stronger believe in their abilities, leading to increased self-efficacy and a great desire to learn (Rezai, Ahmadi, Ashkani & Hosseini, 2018).

Statement of the Problem

Chemistry requires high levels of student motivation for meaningful learning, sustained engagement and successful academic performance. Ideally, students should be intrinsically and extrinsically motivated to participate actively in chemistry lessons, ask questions, complete tasks diligently and demonstrate confidence in handling abstract chemical concepts. A highly motivated student is expected to show curiosity, perseverance in solving scientific problems and a willingness to connect theoretical ideas to real-world applications (Meydan, 2021; Liu, Gao & Arshad, 2025). In an effective learning environment, teacher-student relationships should be warm, supportive and respectful, while instructional strategies should be interactive,

student-centered and capable of stimulating interest, self-efficacy and engagement (Gudu & Jesse, 2023; Hamre & Pianta, 2017).

However, the current situation in Taraba state reveals persistent challenges in students' motivation toward chemistry. Analysis of WAEC chemistry results from 2018–2023 shows consistently low and fluctuating performance, with Taraba State achieving only 43.71% credit pass at its peak, indicating that many students lack the motivation required to master chemistry concepts effectively (Taraba State Government, 2024). Existing research further suggests that students often experience low interest in chemistry due to abstraction, difficulty connecting theory to real-life situations, and limited confidence in problem-solving (Adesoji, Omilani & Dada, 2017; Rezai et al., 2018). These outcomes indicate motivation levels far below the ideal. Evidence increasingly highlights that teacher-related factors may be contributing significantly to this motivational decline. Studies show that when teacher-student relationships are weak characterized by limited communication, low emotional support, or lack of recognition students tend to disengage and lose confidence in science subjects (Rawal, 2022; Jiang, Kwok & Deng, 2025). Similarly, when instructional strategies are teacher-centered, overly theoretical or lacking in practical and technology-enhanced learning experiences, students struggle to remain motivated and actively involved (Gudu & Jesse, 2023; O'Byrne & Ferriter, 2016). Although international and national studies affirm the importance of these teacher factors, there remains insufficient empirical evidence on their combined influence on students' motivation in chemistry within the context of Taraba state.

This gap creates a compelling need for systematic local investigation. Without understanding how teacher-student relationships and instructional strategies jointly influence motivation, policymakers and educators may lack informed interventions to improve chemistry outcomes. Therefore, this study seeks to examine the influence of teacher factors specifically teacher-student relationships and instructional strategies on students' motivation in chemistry in senior secondary schools in Taraba state, to address the persistent challenge of low motivation and poor academic performance in the subject.

Objectives of the Study

The purpose of the study is to investigate the influence of teacher factors on students' motivation in chemistry in senior secondary schools in Taraba state. The study was specifically designed to determine:

1. The level to which teacher-student relationships influence students' motivation in chemistry in senior secondary schools in Taraba state.
2. The level to which instructional strategies used by teachers influence students' motivation in chemistry in senior secondary schools in Taraba state.
3. The level to which teacher factors (instructional strategies and teacher-student relationships) influence students' motivation in chemistry in senior secondary schools in Taraba state.

Research Questions

The following research questions were raised to guide the study:

1. To what level do teacher-student relationships influence students' motivation in chemistry in senior secondary schools in Taraba state?
2. To what level do instructional strategies used by teachers influence students' motivation in chemistry in senior secondary schools in Taraba state?
3. To what level do teacher factors (instructional strategies, and teacher-student relationships) influence students' motivation in chemistry in senior secondary schools in Taraba state?

Hypotheses

The following null hypotheses were tested at .05 level of significance:

HO_1: Teacher-student relationships do not significantly influence students' motivation in chemistry in senior secondary schools in Taraba state.

HO_2: Instructional strategies used by teachers do not significantly influence students' motivation in chemistry in senior secondary schools in Taraba state.

HO_3: Teacher factors (instructional strategies and teacher-student relationships) do not significantly influence students' motivation in chemistry in senior secondary schools in Taraba state.

Methodology

This study adopted a correlational survey design. The population of the study comprised 15,853 SS II students offering chemistry in senior secondary schools in Taraba state in the 2023/2024 academic session. A sample of 375 students was selected by multistage random sampling technique. The instruments for data collection were Chemistry Students` Teacher Factors Questionnaire (CSTFQ) and Chemistry Students` Motivation Questionnaire (CSMQ). The CSMQ was adapted from Science Motivation Questionnaire II (SMQ II) by Glynn, Brickman, Armstrong and Taasoobshirazi (2011). The CSTFQ and CSMQ were validated by three experts from the Faculty of Education, Modibbo Adama University, Yola. One expert is from Chemistry Education, one from Physics Education and one from Mathematics education. The instruments were trial tested and reliability coefficients of .85 and .81 respectively, were obtained using Cronbach`s alpha.

The CSTFQ was made up of two clusters: Teacher-student relationships and instructional strategies with 10 items each, thus making a total of 20 items. The CSMQ on the other hand, is not clustered and was made up of 10 items. Both the CSTFQ and CSMQ had a five-point Likert-type response mode as follows: Very High Level (VHL) = 5, High Level (HL) = 4, Moderate Level (ML) = 3, Low Level (LL) = 2 and Very Low Level (VLL) = 1.

Data collection took place over a period of two weeks with the assistance of the chemistry teachers of the selected schools. In the first week, an introductory letter was obtained from the department of physical sciences education, Modibbo Adama University, Yola, introducing the researchers to the authorities of the selected schools. Thereafter, questionnaires were distributed to the research assistants who were instructed to ensure that the participants completed the questionnaires independently. In the second week, the research assistants administered the questionnaires during chemistry lessons, provided clarifications as needed and ensured all administered questionnaires were returned. Mean and standard deviation were

used to answer the three research questions, linear regression was used to test hypotheses one and two while multiple regression was used to test the third hypothesis all at .05 level of significance. If p-value is less than .05, the null hypothesis is rejected, otherwise, the null hypothesis is retained.

Results

Research Question 1: To what level do teacher-student relationships influence students' motivation in chemistry in senior secondary schools in Taraba state?

Table 1: Mean and Standard Deviation of the Level to which Teacher-Student Relationships Influence Students' Motivation in Chemistry

S/N	Item (n = 375)	Mean	S. D	Remark
1	My chemistry teacher provides support for me in the class	3.85	1.10	HL
2	My chemistry teacher presents information to me in a way that is easy to understand	3.88	1.04	HL
3	My chemistry teacher views me as an important part of the classroom	3.95	1.01	HL
4	My chemistry teacher motivates me to give my best effort	3.96	1.00	HL
5	My chemistry teacher acknowledges my effort through recognition	3.89	1.05	HL
6	My chemistry teacher Motivating me through inspiring teaching	3.88	1.10	HL
7	My chemistry teacher engages me in meaningful classroom activities that are connected to real-world experiences	3.85	1.12	HL
8	My chemistry teacher uses various strategies to promote unity among students	3.90	1.05	HL
9	My chemistry teacher accepts to all student's cultures in the class	3.84	1.06	HL
10	My chemistry teacher focuses on stopping unwanted behaviour from students	3.82	1.20	HL
	Grand Mean	**3.88**	**1.07**	**HL**

The results in table 1 indicate strong teacher-student relationships in Senior Secondary Schools in Taraba state, with a grand mean of 3.88 and standard deviation of 1.07. All the items are at high level. The two extreme levels are observed in `my chemistry teacher motivates me to give my best` (3.96) and `my chemistry teacher focusses on stopping unwanted behaviour from students` (3.82).

Research Question 2: To what level do instructional strategies used by teacher influence students' motivation in chemistry in senior secondary schools in Taraba state?

Table 2: Mean and Standard Deviation of Level to which of Instructional Strategies used by Chemistry Teacher Influence Students' Motivation in Chemistry

S/N	Item (n = 375)	Mean	S. D	Remark
1	Utilizing instructional materials by my chemistry teacher in teaching enhances my understanding of chemistry	3.83	1.14	HL
2	My chemistry teacher engages students with instructional activities (e.g., discussions, group work) in Chemistry class	3.83	1.12	HL

3	My chemistry teacher provides feedback on assignments or classwork	3.82	1.08	HL
4	My chemistry teacher connects the new concepts to prior knowledge	3.85	1.03	HL
5	Utilizing different instructional methods by my chemistry teacher gives me more interest in the subject	3.98	0.97	HL
6	My chemistry teacher encourages active participation during chemistry lessons	3.82	1.06	HL
7	Providing learning objectives at the end of each lesson by my chemistry teacher makes me understand very well	3.85	1.04	HL
8	Using technology in teaching by my chemistry teacher enhances my learning experiences	3.81	1.10	HL
9	My chemistry teacher actively participates in his lessons to make the class interactive	3.79	1.06	HL
10	My chemistry teacher uses multimedia resources (such as videos, animations, or simulations) to explain difficult concepts in Chemistry	3.55	1.25	HL
	Grand Mean	**3.81**	**1.09**	**HL**

Table 2 highlights the level of instructional strategies employed by chemistry teachers in Senior Secondary Schools in Taraba state. The grand mean and standard deviation are respectively 3.81 and 1.09 indicating high level of instructional effectiveness. The highest level of instructional effectiveness is observed in `utilizing different instructional methods by my chemistry teacher gives me more interest in the subject` (3.98) while the lowest level is observed in `my chemistry teacher uses multimedia resources (such as videos, animations or simulations) to explain difficult concepts in chemistry (3.55).

Hypothesis 1: Teacher-student relationships do not significantly influence students' motivation in chemistry in senior secondary schools in Taraba state.

Table 3a: ANOVA from Linear Regression of Influence of Teacher – Students Relationships on Students' Motivation in Chemistry

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	8.026	1	8.026	36.921	.000[b]
	Residual	81.082	373	.217		
	Total	89.107	374			

a. Dependent Variable: Students' motivation

The ANOVA results in Table 3a indicate that the teacher-student relationship significantly influences students' motivation in chemistry, F(1, 374) = 36.921, with a p-value less than .05. This suggests that there is a significant influence of the teacher-student relationship on students' motivation to learn chemistry.

Table 3b: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.300[a]	.090	.088	.46624

a. Predictors: (Constant), Teacher - students relationship

The model summary presented in Table 3b shows an r-value of .300 and an adjusted R-square of .088. This implies that the teacher-student relationship explains approximately 8.8% of the variance in students' motivation in chemistry.

Table 3c: Coefficients of Beta

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	2.687	.193		13.918	.000
	Teacher - students relationship	.300	.049	.300	6.076	.000

a. Dependent Variable: Students' motivation

Results of analysis in Table 3c shows the coefficient of beta. The coefficient for the teacher-student relationship is β = .300 with a t-value of 6.076 and a p-value of .000. This indicates a significant influence of teacher-student relationship on students' motivation, with higher quality teacher-student interactions associated with increased motivation.

Hypothesis 2: Instructional strategies used by teachers do not significantly influence students' motivation in chemistry in senior secondary schools in Taraba state.

Table 4a: ANOVA from Linear Regression of Influence of Instructional Strategies on Students' Motivation in Chemistry

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	12.003	1	12.003	58.067	.000[b]
	Residual	77.104	373	.207		
	Total	89.107	374			

a. Dependent Variable: Students' motivation

The analysis of variance (ANOVA) results presented in Table 4a for the influence of instructional strategies on students' motivation in chemistry indicates a significant influence. The F-ratio is $F(1, 374) = 58.067$, $p < .05$. This suggests that instructional strategies significantly influence students' motivation in Chemistry.

Table 4b: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.367[a]	.135	.132	.45466

a. Predictors: (Constant), Instructional strategies

The results of analysis in Table 4b shows the model summary used to indicate how an independent variable explain the variation in the dependent variable. The model summary reveals that the correlation coefficient (r) is .367, and the adjusted R square is .132. This indicates that approximately 13.2% of the variance in students' motivation can be explained by instructional strategies.

Table 4c: Coefficients of Beta

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	2.408	.191		12.621	.000

	Instructional strategies	.378	.050	.367	7.620	.000

a. Dependent Variable: Students' motivation

The standardized beta coefficient for instructional strategies presented in Table 4c is β = .367, with a t-value of 7.620 and a p-value of .000. This highlights that instructional strategies have a substantial and statistically significant influence on students' motivation.

Hypothesis 3: Teacher factors (instructional strategy, and teacher-student relationship) do not significantly influence students' motivation in chemistry in senior secondary schools in Taraba state**.**

Table 5a: ANOVA from Linear Regression of Influence of Teacher Factors (Instructional Strategies and Teacher-Student Relationships) on Students' Motivation in Chemistry

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	14.591	2	7.296	36.480	.000[b]
	Residual	74.516	372	.200		
	Total	89.107	374			

a. Dependent Variable: Students' motivation

Table 5a presents the ANOVA Results conducted to test whether instructional strategies, teacher - student relationships significantly influence students' motivation in chemistry. The ANOVA for the combined influence of teacher factors (instructional strategy, and teacher-student relationship) on students' motivation in chemistry shows $F(2, 372) = 36.480$, $p < .05$. This indicates that these factors collectively have a significant influence on students' motivation.

Table 5b: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.405[a]	.164	.157	.44817

a. Predictors: (Constant), Instructional strategies, Teacher - students relationship,

The model summary in Table 4.6b shows an R value of .405 and an adjusted R square of .157. This suggests that about 15.7% of the variance in students' motivation can be explained by teacher factors.

Table 5c: Coefficients of Beta

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.983	.241		8.239	.000
	Teacher - students relationship	.186	.053	.186	3.515	.000
	Instructional strategies	.306	.056	.296	5.466	.000

a. Dependent Variable: Students' motivation

The Table 5c shows the coefficients of beta of multiple regression analysis. The standardized beta coefficients for teacher-student relationship β = .186 (t = 3.515, p = .000), and for instructional strategies β = .296 (t = 5.466, p = .000). This indicates that teacher-student

relationships and instructional strategies significantly influence students' motivation. This means that instructional strategies make the strongest contribution followed by teacher-student relationships in explaining the variance in students' motivation.

Discussion of Findings

The findings indicate that the level of teacher-student relationships in senior secondary schools in Taraba state is high, with chemistry teachers creating a supportive learning environment through positive interactions. Moreover, the study reveals that teacher-student relationships have a significant influence on students` motivation to learn chemistry. The result is consistent with previous research by Liu et al. (2025), Nawaz (2023) and Rawal (2022) who also found a positive and significant influence of teacher-student relationships on students` motivation. Despite the limited scope of discussion, the timely conduct of this study addresses a notable gap in research on this topic in Taraba state.

The study further revealed that chemistry teachers in senior secondary schools in Taraba state exhibit a high level of instructional effectiveness, utilizing diverse methods to spark students` interest in the subject. Moreover, the findings indicate that instructional strategies have a significant influence on students` motivation in chemistry, suggesting that teachers` instructional strategies can greatly influence the students` enthusiasm for learning. This result aligns with previous studies by Gudu and Jesse (2023), Hariri et al. (2021), Karimi and Zade (2019) and Liu et al. (2025), who also reported a positive and significant relationships between instructional strategies and students` motivation. However, the findings contrast the findings of a study by Juan et al. (2023) that found no significant effect of learning strategies on motivation.

In addition, the study revealed that teacher factors specifically teacher-student relationships and instructional strategies, have a significant influence on students` motivation in chemistry. This highlights the importance of teachers playing an active role in fostering students` motivation through engaging approaches. This finding is supported by Meydan (2021) who identified teacher-student factors, classroom management skills and teaching methods as key influences on motivation.

Conclusion

The study concludes that teacher factors, specifically teacher-student relationships and instructional strategies play a significant role in motivating students to learn chemistry. Notably, instructional strategies have a stronger influence on students` motivation than teacher-student relationships. This suggests that effective teaching strategies are crucial in driving students` engagement and motivation in chemistry.

Recommendations

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

1. Teachers should prioritize building strong relationships with students by being approachable, supportive, and genuinely investing in their academic success and well-being. Teachers should create a classroom atmosphere where students feel valued, trusted and understood through practices such as active listening and regular feedback which help foster a sense of belonging and increase students` motivation to learn chemistry.
2. Chemistry teachers should boost students` motivation by using diverse, student-centred approaches like hands-on activities, collaborative learning and real-world problem-solving that encourage critical thinking, analysis and synthesis of learning contents, helping students engage more deeply with chemistry.

3. Chemistry teachers should regularly participate in professional development programs to update their teaching methods. Teachers should harness available technologies like simulations and educational apps to make chemistry lessons more dynamic, interesting, engaging, relevant and meaningful to students` lives.

References

Adesoji, F. A., Omilani, N. A., & Dada, S. O. (2017). A comparison of perceived and actual students' learning difficulties in physical chemistry. *International Journal of Brain and Cognitive Sciences, 6*(1), 1–8. https://doi.org/10.5923/j.ijbcs.20170601.01

Babajide, V. F. (2015). Science Education in Nigeria: The journey so far. *International Journal of Innovative Research in Education, Technology and Social Strategies, 1*(1), 53-69.

Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice-Hall.

Federal Government of Nigeria (2013). *National Policy on Education*. Yaba-Lagos: NERDC press

Glynn, S. M., Brickman, P., Armstrong, N. & Taasoobshirazi, G. (2011). Science motivation questionnaire II: Validation with science majors and non-science majors. *Journal of Research in Science Teaching, 48,* 1159-1176.

Gudu, B. O., & Jesse, N. W. (2023). Teaching methods and strategies on learners' motivation in English language lectures in higher education in Kenya. *American Journal of Education and Practice, 7*(1), 36–60. https://doi.org/10.47672/ajep.1344

Hamre, B. K., & Pianta, R. C. (2017). *Learning opportunities in pre-school and early elementary classrooms. In Socializing intelligence through academic talk and dialogue* (pp. 29-48). Routledge.

Hariri, H., Karwan, D. H., Haenilah, E.Y., Rini, R. & Superman, U. (2021). Motivation and learning strategies: students` motivation affects students` learning strategies. *European Journal of Educational Research*, *10*(1), 39-40.

Jiang, J., Kwok, S. Y. C. L. & Deng, X. (2025). Effects of social mistreatment, academic alienation and developmental challenges on chemistry students` well-being through coping strategies: A longitudinal study. *Br J Educ Psychology*, *5*(2), 464-479. https://doi.org/10.1111/bjep.12730

Juan, W., Lei, W., Huanhuan, Y. & Dongfang, Y. (2025). The influence of learning strategies on students` learning motivation, engagement and academic performance in the context of online flipped teaching. *SAGE Open, 15*(2).

Karimi, M. N. & Zade, S. S. H. (2019). Taechers` use of motivational strategies: effects of a motivation-oriented professional development course. *Innovation in Language Learning and Teaching, 13*(2), 194-204.

Knapper, V. (2017). *Factors that Influence Student Academic Motivation and how those Factors Impact the Student Achievement of Third Grade Students.* Atlanta University, Georgia: Ph.D. Dissertation.

Liu, J., Gao, J., & Arshad, M. H. (2025). Teacher-student relationships as a pathway to sustainable learning: Psychological insights on motivation and self-efficacy. *Acta Psychologica, 254*, Article 104788. https://doi.org/10.1016/j.actpsy.2025.104788

Meydan, E. (2021). Investigating secondary school students' motivation for chemistry class in terms of various variables. *International Journal of Progressive Education, 17*(1), 498–512. https://doi.org/10.29329/ijpe.2021.329.31

Nawaz, N. (2023). Impact of teacher student relationship on motivation levels and academic performance in learning Chinese as a second language among Pakistani students. *European Scientific Journal of Social Sciences, 19*(10).

O'Byrne, W. I., & Ferriter, M. M. (2016). The impact of technology on inquiry-based learning in social studies. *Journal of Computing in Teacher Education, 32*(1), 15–23.

Pajares, F. (2014). *Motivational role of self-efficacy beliefs in self-regulated learning*. In D. H. Schunk & B. J. Zimmerman (Eds.), Motivation and self-regulated learning: Theory, research, and applications (pp. 111-139). Routledge.

Poling, D. V., Van-Loan, C. L., Garwood, J. D., Zhang, D. R. (2022). Enhancing teacher-student relationship quality: A narrative review of school-based interventions. *Educational Research Review, 37*.

Rawal, S. B. (2022). The role of teacher-student relationship in motivation. *AMC Multidisciplinary Research Journal, 3*(1), 11–23.

Rezai, A., Ahmadi, R., Ashkani, P., & Hosseini, G. H. (2018). Implementing active learning approach to promote motivation, reduce anxiety and shape positive attitudes: A case study of EFL learners. *Heliyon, 4*(11), Article e00935.

Skinner, E. A., & Belmont, M. J. (2019). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the Teachers year. *Journal of Educational Psychology, 11*(4), 702-718.

Talanquer, V. (2016). Concept Inventories: Tools for Uncovering Chemical Thinking. *Journal of Chemical Education, 93*(5), 963-970.

Taraba State Government. (2024). *Ministry of basic and secondary education, Jalingo: WAEC chemistry performance report (2018–2023)*

Wang, Q., & Hsu, H. Y. (2016). Using the cloud-based technology to promote student participation and learning motivation in authentic learning environments. *Interactive Learning Environments, 24(*5), 1103–1117.