



## **Comparative Assessment of Motivation and Interpersonal Skills on Academic Achievement in Chemistry among Post-Basic School Students in Gombe State, Nigeria**

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### **Abstract**

*This study investigated the predictive power of motivation and interpersonal skills on students' academic achievement in chemistry in post-basic schools in Gombe State, Nigeria. A predictive correlational research design was adopted for the study. The population comprised 10,038 SS III students offering Chemistry in 71 post-basic schools. A sample of 370 students was selected using a multistage sampling technique. Data were collected using the Chemistry Students' Motivation and Interpersonal Skills Questionnaire (CSMISQ), adapted from the Academic Competency Evaluation Scale-Student Form, and the Chemistry Result Proforma (CRP). The CSMISQ consisted of 25 items, comprising 15 motivation and 10 interpersonal skills items measured on a five-point Likert scale. The instrument was validated by three experts, while Cronbach's alpha yielded reliability coefficients of 0.78 and 0.81 for the motivation and interpersonal skills subscales, respectively. Data were analyzed using linear and multiple regression. The findings showed that students' motivation significantly predicted academic achievement in Chemistry ( $R = .565$ ,  $R^2 = .320$ ,  $t(368) = 13.145$ ,  $p < .05$ ). Students' interpersonal skills also had a significant predictive power on their academic achievement ( $R = .443$ ,  $R^2 = .196$ ,  $t(368) = 9.471$ ,  $p < .05$ ). Furthermore, students' motivation and interpersonal skills jointly had a significant predictive power on their academic achievement in Chemistry ( $R = .643$ ,  $R^2 = .414$ ,  $F(2, 367) = 129.578$ ,  $p < .05$ ). The study concluded that motivation and interpersonal skills are significant predictors of academic achievement in Chemistry. It was recommended that Schools and teacher education programmes should integrate motivational and interpersonal-skill development into Chemistry instruction through supportive, collaborative and student-centred learning environments that promote both academic engagement and effective social interaction.*

**Keywords:** Motivation, interpersonal skills, academic achievement, Chemistry

### **Introduction**

Science education is fundamental to the development of scientific literacy, problem-solving ability, and the capacity to understand and respond to scientific and technological developments. It provides learners with knowledge and skills needed to understand the natural world and participate meaningfully in a society increasingly shaped by science and technology. The Federal Government of Nigeria (FGN, 2014) recognizes science education as an important component of the national education system, with subjects such as Biology, Physics, Chemistry, and Agricultural Science providing foundations for further study in science-related fields. Among these subjects, Chemistry



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occupies a particularly important position because it provides an understanding of the composition, properties, and transformations of matter. Bochet (2023) emphasized the importance of Chemistry education in developing scientific understanding, while Pernaa et al. (2022) highlighted its relevance to contemporary issues such as sustainability and environmental challenges. Chemistry education also provides foundational knowledge for professional fields including medicine, engineering, agriculture, and other science- and technology-related occupations (Khanam, 2018). Consequently, students' achievement in Chemistry remains an important indicator of the effectiveness of science education at the post-basic school level. Despite the importance of Chemistry, students' academic achievement in the subject remains a concern, particularly in Gombe State. Reports of the West African Examinations Council (WAEC) indicated that 77.02%, 89.89%, and 85.45% of candidates who sat for the West African Senior School Certificate Examination (WASSCE) obtained grades A1–C6 in 2019, 2020, and 2021, respectively. In contrast, data reported by the Gombe State Ministry of Education indicated that only 27%, 32%, 36%, and 39% of candidates obtained grades C6–A1 in 2019, 2020, 2021, and 2022, respectively. Although the state-level figures showed a gradual improvement across the period, the proportion of students attaining the stated grades remained considerably below the national figures. This situation is important because inadequate achievement in Chemistry may restrict students' opportunities to meet entry requirements for further study in science- and professionally oriented programmes. The persistent concern therefore creates a need to examine factors that may help explain differences in students' academic achievement in Chemistry.

Previous studies have identified several factors associated with students' achievement in Chemistry. Apu (2020), for instance, reported that students' attitude, availability of learning resources, student–teacher interpersonal relationships, and regularity of attendance were associated with Chemistry achievement. Similarly, Sibomana et al. (2021) identified the abstract nature of chemical concepts, limited opportunities for practical experimentation, and inadequate learner engagement among factors associated with low achievement in Chemistry. Chinda and Pepple (2021) also reported associations between teacher-related factors, including teachers' qualifications, experience, and training, and students' achievement in Chemistry. While these findings demonstrate that Chemistry achievement is influenced by a range of instructional, environmental, and learner-related factors, they also suggest the need to examine psychosocial characteristics of learners that may contribute to their academic outcomes. Two such characteristics that warrant attention are students' motivation and interpersonal skills. Students' motivation is an important psychological construct in understanding academic engagement and achievement. Ryan and Deci (2020), from the perspective of self-determination theory, distinguish between intrinsic and extrinsic forms of motivation and explain how motivational processes influence the initiation, direction, and persistence of behaviour. In educational settings, motivation is closely associated with students' willingness to engage with learning activities and sustain effort in the face of academic challenges. Martin (2017) similarly noted the close conceptual relationship between motivation and academic engagement, while Pintrich (2003) emphasized the importance of motivational processes in regulating students' learning behaviour. In addition, students' motivational orientations may be shaped by features of the learning environment, including instructional practices, teacher support, and social interactions (Wigfield & Eccles, 2020). Thus, students who are sufficiently motivated may be more willing to invest effort, persist with difficult learning tasks, and engage actively in Chemistry learning.

Empirical studies have generally reported positive associations between students' motivation and academic achievement, although the strength and consistency of the relationship vary across



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contexts. For example, Huang et al. (2025), in a study of low-income college students in China, found that intrinsic motivation was a significant predictor of students' Grade Point Average. Sofyan et al. (2025) also reported a significant relationship between learning motivation and academic achievement among high school students in Indonesia. Bin Abdulrahman et al. (2023) similarly found significant relationships between intrinsic and extrinsic motivation and academic performance among medical students in Saudi Arabia. However, Yasminei et al. (2023) reported no substantial relationship between motivation and academic achievement among secondary school students in selected Arab schools in Malaysia. This contrasting finding suggests that the relationship between motivation and achievement may depend partly on educational, cultural, and contextual conditions.

Evidence from Nigeria provides further support for examining motivation as a predictor of Chemistry achievement. A study by Akanbi and Okunuga (2023) reported that intrinsic and extrinsic motivation significantly predicted Chemistry achievement among secondary school students in Lagos State, with intrinsic motivation showing the stronger predictive contribution. In Ekiti State, Boris (2021) found a significant positive relationship between students' motivation and academic achievement in Chemistry, while Oyekola et al. (2020) similarly reported a positive relationship between motivation and Chemistry achievement among secondary school students in Oyo State. Comparable findings have also been reported in other school subjects. Okoro (2021) found that motivation was associated with students' academic achievement in Social Studies in Taraba State, while Radda et al. (2024) reported a significant relationship between motivation and academic performance in Islamic Studies in Katsina State. Baji and Paul (2024) likewise found a significant relationship between motivation and Biology achievement among secondary school students in Niger State. Taken together, these studies provide substantial evidence that motivation may be an important predictor of academic achievement; however, motivation does not operate in isolation from students' social and interpersonal experiences within the learning environment.

Interpersonal skills represent another learner-related factor that may be relevant to academic achievement. They refer broadly to the abilities and behaviours through which individuals communicate, cooperate, establish relationships, and interact effectively with others. In the school environment, such skills may include communication, active listening, cooperation, teamwork, empathy, and appropriate social interaction. DiPerna and Elliott (2002) conceptualized interpersonal skills within the broader framework of academic enablers, emphasizing behaviours that facilitate students' successful functioning in academic settings. These skills are particularly relevant to learning because students regularly interact with teachers and peers, seek assistance, exchange ideas, participate in group activities, and engage in collaborative academic tasks. Effective interpersonal functioning can therefore create conditions that facilitate communication, help-seeking, cooperation, and productive classroom interaction (Cavazos, 2013).

Research evidence also indicates that interpersonal functioning is associated with students' academic outcomes. Zhang (2022) reported a significant relationship between teachers' interpersonal behaviours and learners' academic achievement, emphasizing the importance of interpersonal processes within educational settings. Sukarna (2021) found that students' interpersonal communication skills significantly influenced learning outcomes in Mechanical Engineering, while Awan and Amin (2021) reported significant associations between interpersonal competencies and academic performance. Similarly, Alva et al. (2021) found a positive relationship between students' interpersonal relationships and academic performance among high school students. Kiuru et al.



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(2020) further demonstrated that adolescents' interpersonal relationships were associated with school well-being and academic achievement during educational transitions. These findings suggest that interpersonal skills may complement students' motivational resources by facilitating the social behaviours through which learners participate effectively in classroom and collaborative learning activities.

The consideration of motivation and interpersonal skills together is particularly relevant because academic achievement is unlikely to be adequately explained by a single learner characteristic. From the perspective of self-determination theory, students' motivation is influenced by social contexts that support effective engagement and psychological functioning (Ryan & Deci, 2020). Similarly, the academic-enablers perspective of DiPerna and Elliott (2002) recognizes social and behavioural competencies as important resources for successful academic functioning. Examining the two variables simultaneously may therefore provide a broader understanding of the psychosocial characteristics associated with students' academic achievement in Chemistry than examining either variable independently. However, important gaps remain in the existing empirical literature. Studies conducted outside Nigeria have established relationships between motivation and academic achievement (Huang et al., 2025; Sofyan et al., 2025) or between interpersonal functioning and academic outcomes (Zhang, 2022; Kiuru et al., 2020), but their educational, cultural, and subject contexts differ from post-basic Chemistry education in Gombe State. Within Nigeria, Akanbi and Okunuga (2023), Boris (2021), and Oyekola et al. (2020) provide evidence of the predictive or correlational relationship between motivation and Chemistry achievement, but these studies did not incorporate interpersonal skills into the predictive model. Consequently, these studies were conducted in states other than Gombe State. Consequently, there is limited empirical evidence on whether motivation and interpersonal skills individually and jointly predict students' academic achievement in Chemistry among post-basic school students in Gombe State. The present study addresses this gap by examining the predictive power of students' motivation and interpersonal skills on academic achievement in Chemistry in post-basic schools in Gombe State, Nigeria.

### **Purpose of the Study**

The purpose of this study is to determine the extent to which academic students' motivation and interpersonal skills predict their academic achievement in chemistry in post basic schools of Gombe State. Specifically, the study intends to determine;

1. The predictive power of students' motivation on their academic achievement in chemistry
2. The predictive power of students' interpersonal skills on their academic achievement in chemistry.
3. The predictive power of students' motivation and interpersonal skills jointly on their academic achievement in chemistry.

### **Research Questions**

The following research questions were raised to guide the study;

1. What is the predictive power of students' motivation on their academic achievement in chemistry?
2. What is the predictive power of students' interpersonal skills on their academic achievement in chemistry?
3. What is the predictive power of students' motivation and interpersonal skills jointly on their academic achievement in chemistry?

### **Null Hypotheses**



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The following hypothesis were formulated to be tested at 0.05 level of significance:

- H<sub>01</sub>:** The predictive power of students' motivation on their academic achievement in chemistry is not significant.
- H<sub>02</sub>:** The predictive power of students' interpersonal skills on their academic achievement in chemistry is not significant.
- H<sub>03</sub>:** The predictive power of students' motivation and interpersonal skills jointly on their academic achievement in chemistry is not significant.

## Research Methodology

This study adopted a predictive correlational design. The design was considered appropriate because the study sought to determine the extent to which students' motivation and interpersonal skills statistically predict their academic achievement in Chemistry without manipulating any of the variables (s) (Sani, 2017). The population for the study comprised all the SS III students in Chemistry in (2023/2024 session) in Gombe state totaling 10,038 of the 71 Chemistry-offering post basic schools within the 11 Local Government Areas and three educational zones of the state. The sample size of this study was 370 students based on (Adam, 2020) who were selected using multi stage sampling technique. The instruments for data collection for this study were Chemistry Students' Motivation and Interpersonal skills Questionnaire (CSMISQ) adapted from student form of Academic Competency Evaluation scale (ACES-Student) by DiPerna and Elliotts (2018), and Chemistry Result Proforma (CRP). The CSMISQ consists of 25 items across the two sections: Section A contains information about the personal information. While section B contain 15 items for motivation and also 10 items on interpersonal skills measured on five Likert-type scale: Very High Level = 5 points, High Level = 4 points, Moderate Level = 3 points, Low Level = 2 points and Very Low Level = 1 point. The CRP on the other hand was designed by the researcher and used for collecting already existing scores and used as students' academic achievement in Chemistry.

The face and construct validity of the CSMISQ were established by three experts, while Cronbach's alpha yielded reliability coefficients of 0.78 for the motivation subscale and 0.81 for the interpersonal skills subscale during the trial testing. The data collected for the study were analyzed using Linear regression. The research questions were answered using correlation coefficient (R). The range of the R-value is  $\pm 0.0$ -0.29 (low),  $\pm 0.30$  to 0.8 (moderate), and  $\pm 0.81$  (strong) (Ratner, 2009). Regression t-tests were used to test hypotheses one and two at the 0.05 level of significance. Regression ANOVA was used to test hypothesis three at the same level of significance. Regression t-tests were used to examine the unique predictive power of each motivation and interpersonal skill (hypotheses 1-2), while regression ANOVA was used to test whether motivation and interpersonal skill jointly explained a significant proportion of academic achievement in Chemistry (hypothesis 3).

## Presentation of Results

**Research Question 1:** What is the predictive power of students' motivation on their academic achievement in chemistry?

**Table 1: Regression Model Summary for Students' Motivation Predicting Academic Achievement in Chemistry**

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1     | .565 <sup>a</sup> | .320     | .318              | 2.80583                    |

a. Predictors: (Constant), Students' motivation in learning Chemistry

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The results in Table 10b shows that Students' motivation have moderate positive power ( $R = .565$ ) on students' academic achievement in Chemistry. The  $R^2$  of 0.320 indicates that 32.0% of the variation in students' academic achievement in Chemistry is explained by Students' motivation. This indicates Students' motivation is a good predictor of students' academic achievement in Chemistry. **H<sub>01</sub>:** The predictive power of students' motivation on their academic achievement in chemistry is not significant.

**Table 2: Regression Coefficients for the Prediction of Academic Achievement in Chemistry from Students' motivation**

| Model |                      | Unstandardized Coefficients |            | Standardized Coefficients | t      | Sig. |
|-------|----------------------|-----------------------------|------------|---------------------------|--------|------|
|       |                      | B                           | Std. Error | Beta                      |        |      |
| 1     | (Constant)           | 11.017                      | 1.252      |                           | 8.803  | .000 |
|       | Students' motivation | .608                        | .046       | .565                      | 13.145 | .000 |

a. Dependent Variable: Students' academic achievement

Result in Table 2 shows that  $t(1, 368) = 13.145$ ;  $p=0.000 < 0.05$  for the predictive power of the mastery goals on the pre service chemistry teachers' CGPA. The null hypothesis is rejected, because the observed p-value of 0.000 is less than of the significant level (0.05). Therefore, students' motivation has a significant predictive power on students' academic achievement.

**Research Question 2:** What is the predictive power of students' interpersonal skills on their academic achievement in chemistry?

**Table 3: Regression Model Summary for Students' Interpersonal skills Predicting Academic Achievement in Chemistry**

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1     | .443 <sup>a</sup> | .196     | .194              | 3.04990                    |

a. Predictors: (Constant), Students' interpersonal skills in learning Chemistry

The results in Table 3 shows that Students' Interpersonal Skills have moderate positive power ( $R = .443$ ) on students' academic achievement in Chemistry. The  $R^2$  of 0.196 indicates that 19.6% of the variation in students' academic achievement in Chemistry is explained by Students' Interpersonal Skills. This indicates Students' Interpersonal Skill is a good predictor of students' academic achievement in Chemistry.

**H<sub>02</sub>:** The predictive power of students' interpersonal skills on their academic achievement in chemistry is not significant.

**Table 4: Regression Coefficients for the Prediction of Academic Achievement in Chemistry from Students' Interpersonal Skills**

| Model |                         | Unstandardized Coefficients |            | Standardized Coefficients | t      | Sig. |
|-------|-------------------------|-----------------------------|------------|---------------------------|--------|------|
|       |                         | B                           | Std. Error | Beta                      |        |      |
| 1     | (Constant)              | 16.241                      | 1.184      |                           | 13.713 | .000 |
|       | Students' Interpersonal | .407                        | .043       | .443                      | 9.471  | .000 |

a. Dependent Variable: Students' Academic Achievement

Result in Table 4 shows that  $t(1, 368) = 9.741$ ;  $p=0.000 < 0.05$  for the predictive power of students' interpersonal skills on students' academic achievement. The null hypothesis is rejected, because the observed p-value of 0.000 is less than of the significant level (0.05). Therefore, students' interpersonal skills have a significant predictive power on students' academic achievement.

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**Research Question 3:** What is the predictive power of students' motivation and interpersonal skills jointly on their academic achievement in chemistry?

**Table 5: Regression Model Summary for Students' Motivation and Interpersonal Skills Jointly Predicting Academic Achievement in Chemistry**

| Model | R                 | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1     | .643 <sup>a</sup> | .414     | .411              | 2.60757                    |

a. Predictors: (Constant), Students' Motivation, Students' Interpersonal Skills

The results in Table 5 show that Students' Motivation and Interpersonal Skills jointly have moderate positive power ( $R = .643$ ) on students' academic achievement in Chemistry. The  $R^2$  of 0.414 indicates that 41.4% of the variation in students' academic achievement in Chemistry is explained by Students' Motivation and Interpersonal Skills jointly. This indicates Students' Motivation and Interpersonal Skills jointly is a good predictor of students' academic achievement in Chemistry.

**H<sub>03</sub>:** The predictive power of students' motivation and interpersonal skills jointly on their academic achievement in chemistry is not significant

**Table 6: ANOVA for the Multiple Regression of Students' Motivation and Interpersonal Skills on Academic Achievement in Chemistry**

| Model      | Sum of Squares | Df  | Mean Square | F       | Sig.              |
|------------|----------------|-----|-------------|---------|-------------------|
| Regression | 1762.115       | 2   | 881.058     | 129.578 | .000 <sup>b</sup> |
| Residual   | 2495.391       | 367 | 6.799       |         |                   |
| Total      | 4257.507       | 369 |             |         |                   |

a. Dependent Variable: Students' Academic Achievement in Chemistry

b. Predictors: (Constant), Students' Motivation, Students' Interpersonal Skills

The results in Table 6 show that  $F(2, 367) = 129.578$ ,  $p < 0.05$  for the predictive power of students' motivation and interpersonal skills jointly on academic achievement in Chemistry. Since the p-value 0.000 is less than the 0.05 level of significance, the null hypothesis is rejected. Therefore, students' motivation and interpersonal skills jointly have a significant predictive power on students' academic achievement in Chemistry.

## Discussion of Findings

The first finding revealed that students' motivation significantly predicted their academic achievement in Chemistry. This finding agrees with Huang et al. (2025), Sofyan et al. (2025), Bin Abdulrahman et al. (2023), Akanbi and Okunuga (2023), and Oyekola et al. (2020), who reported significant positive relationships between students' motivation and academic achievement. However, it contradicts Yasminei et al. (2023), who found no significant relationship between motivation and academic achievement. The difference may be attributed to variations in educational, cultural and subject contexts.

The second finding established that students' interpersonal skills significantly predicted their academic achievement in Chemistry. This finding is consistent with Zhang (2022), Sukarna (2021), Awan and Amin (2021), Alva et al. (2021), and Kiuru et al. (2020), who found that interpersonal relationships, communication, teamwork and social skills were positively associated with students' academic performance. This may be because interpersonal skills facilitate effective communication, cooperation, peer interaction, help-seeking and collaborative learning.



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The third finding showed that students' motivation and interpersonal skills jointly significantly predicted their academic achievement in Chemistry. This finding indicates that academic achievement may be enhanced when students possess both the willingness to learn and the ability to interact effectively with others. It is supported by studies linking motivation (Huang et al., 2025; Sofyan et al., 2025; Akanbi & Okunuga, 2023) and interpersonal skills (Zhang, 2022; Alva et al., 2021; Kiuru et al., 2020) with academic performance. The finding therefore highlights the importance of considering both factors simultaneously in understanding Chemistry students' academic achievement.

## Conclusion

This study concludes that students' motivation and interpersonal skills are significant predictors of academic achievement in Chemistry, demonstrating that academic success is influenced by both students' willingness to learn and their ability to interact effectively with others. Motivation promotes students' interest, effort and commitment to learning, while interpersonal skills enhance communication, cooperation, peer interaction and collaborative learning. The joint contribution of these factors provides a more comprehensive explanation of students' academic achievement than either factor considered independently. Therefore, students who are motivated to learn and possess effective interpersonal skills are more likely to attain better academic outcomes in Chemistry. The study consequently recommends that Chemistry teaching and teacher education programmes foster supportive learning environments that strengthen students' motivation while providing opportunities for the development of effective interpersonal skills.

## Recommendations

1. Chemistry teachers should adopt motivational teaching practices, such as setting achievable learning goals, providing constructive feedback and relating Chemistry concepts to students' real-life experiences, to strengthen students' motivation and improve academic achievement.
2. Chemistry teachers should incorporate more collaborative learning activities, such as group discussions, peer tutoring and practical teamwork, to develop students' interpersonal skills and enhance their academic achievement.
3. Schools and teacher education programmes should integrate motivational and interpersonal-skill development into Chemistry instruction through supportive, collaborative and student-centred learning environments that promote both academic engagement and effective social interaction.

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