INFLUENCE OF STUDY HABIT ON ACADEMIC ACHIEVEMENT OF CHEMISTRY EDUCATION STUDENTS IN MODIBBO ADAMA UNIVERSITY, YOLA

By

SANI Wasila

4A Close 80 Unit Housing Estate, Jimeta, Yola, Adamawa State

wasilamuhammedsani4@gmail.com

&

ADAMU Mohammed

Department of Physical Sciences Education, Faculty of Education, Modibbo Adama University, Yola

madamu1119@mau.edu.ng

Abstract

The study examined the influence of study habit on academic achievement of chemistry education students in Modibbo Adama University, Yola (MAU, Yola). The study employed the correlational design and was anchored by the Self-Regulated Learning (SRL) Model by Zimmerman (2000). Three objectives, research questions and null hypotheses guided the study. The population of the study was 72 which equals the entire registered chemistry education students in 2025/2026 session while a sample of 67 representing the entire sophomore, penultimate and final year students were selected using purposive sampling technique. A researcher developed Chemistry Education Students' Study Habit Questionnaire (CESSHQ) and Chemistry Achievement Pro forma (CAP) were used for data collection while mean, standard deviation, PPMC and multiple regression were used for data analysis. It was found that chemistry education students in MAU, Yola showed high levels of notetaking (3.67) and collaboration (3.86) in their learning. It was also found that notetaking ($r = -0.180$, $p > 0.05$), collaboration ($r = -0.132$, $p > 0.05$) and study habit [$F_{(2, 64)} = 1.088$, $p > 0.05$] had no significant separate and combined relationship with the academic achievement of the participants. It was recommended among others that moderating factors such as quality of notes and frequency of collaboration be examined to ascertain if the null findings are due to poor implementation rather than the study habits themselves.

Keywords: Study habit, Notetaking, Collaboration, and Academic achievement.

Introduction

Science education is widely conceived as a powerful driver and a catalyst for a rapid technological advancement. It is an aspect of education that strengthens critical thinking, problem-solving, creativity, and scientific literacy skills which are germane to social progress, economic growth, and sustainable development; and prepares learners for meaningful participation in a technology-driven world (Cortes et al., 2024). As a tool for innovation, productivity, and addressing the challenges confronted by humanity today, science education requires the right investment and policy framework to fully harness its benefits. It was in line with this perspective that the Federal Ministry of Education (2018) provided a policy roadmap with clear goals that center on producing the critical science and technology workforce, improving infrastructure, funding, teacher incentives, monitoring and industry collaboration to strengthen science education in the country. In addition to the general provisions to promote science teaching and learning, frantic efforts are required to meet the requirements for teaching and learning of specific science subjects such biology, chemistry, physics, and mathematics. This is significant since these subjects have different nature (though similar) and organized in different contents.

Within the broad science spectrum, chemistry education holds a unique and pivotal position for explaining the composition, structure, properties, and transformation of matter that underpin industrial, environmental, agricultural, and medical innovations (Mera Cabezas et al., 2024). As a discipline that bridges scientific theory and technological applications, chemistry drives innovations in manufacturing processes, pharmaceutical, resource sustainability, and material science. The dynamic nature chemistry demands learners to understand phenomena at macroscopic, microscopic, and symbolic levels thereby fostering higher order thinking and scientific reasoning abilities essential for technological advancements (Irwanto et al., 2024). From the above, it can be summarily put that effective chemistry education produces scientifically literate and skilled professionals capable of contributing to national productivity and global competitiveness. However, despite the benefits of chemistry in virtually every sector of the economy, the achievement of chemistry education students in the universities remains abysmal in recent history.

In a study, Umate et al. (2025) noted that, more than 50% of chemistry education students struggle to graduate timely, a situation which could be attributed to weak achievement among these students. In the same vein, evidence of poor achievement in the last three consecutive sessions has been found in Modibbo Adama University, Yola (MAU, Yola), where 22.22% of the final year chemistry education students failed to timely graduate and 47.86% of their cohorts graduated with lower second class and below lower second class degrees (MIS, MAU, Yola, 2026). The situation of chemistry achievement in MAU, Yola needs to improve since these students are being nurtured to teach chemistry at the post-basic schools upon graduation. Persistent underachievement among these students in MAU, Yola in particular and other universities by

extension, risks lowering the quality of chemistry teaching in post-basic schools in Nigeria. As a result, students may struggle in external examinations leading to fewer enrollment into medical and engineering programmes at the tertiary level.

The state of achievement among chemistry education students in the universities have attracted attention resulting to instructional modification such as flipped instruction, virtual laboratories, supplemental/co-class support and metacognitive or practice-based supports (Chestnut & Johnson, 2025). The persistent record of poor achievement among these students despite some of these interventions suggests that tailored interventions are needed rather than a single one-size-fits-all solution. It is worthy of note that most of the interventions previously introduced are expensive (require institutional support) and may not be accessible to all students. Hence the need to explore a more intentional, deliberate, cheaper and coachable student-related variable such as study habit. When students are equipped with the necessary skills and strategies to manage their learning, study habit provides a more sustainable and individualized approach to addressing these learning gaps.

According to Sukhendu (2019), study habits are the skills developed and consistently practiced by students towards understanding academic subjects and passing examinations. This underscores the need for students to know how best to learn and adapt to them. Study habits have many components such as time management, goalsetting, notetaking, active learning, memory strategies, practicing, collaboration, self-assessment, organization and balance (Harkawal, 2023). Notetaking and collaboration are chosen for this study as they represent individual engagement and social learning respectively; two key aspects of study habits that make students take ownership of their learning.

Salame et al. (2024), defined notetaking as an active learning strategy which involves jotting down key ideas, concepts and explanation during lectures, discussion or reading, usually in a form of summary which enables later review of information. In essence, well-structured notes allow students to summarize chunk of information into key points making revision easier and more effective. Studies indicate that students who use structured notetaking strategies tend to have higher performance and improved GPAs (Salame et al., 2024; Salame and Thompson, 2020). While notetaking provides students with a personal toolkit for capturing and reviewing information, collaboration enables them to expand their understanding through engaging discussion and brainstorming with peers or course mates.

Collaboration refers to students working together in groups to share ideas, information, discuss topics, solve problems through interaction, cooperation and shared responsibility with the aim to advance their knowledge on common topics of interest (Nguyen, 2020). Collaborative learning allows students to actively engage with course materials while benefitting from the knowledge, perspectives and skills of their peers

(Johnson & Johnson, 2016). Empirical study by Ain et al. (2025) shows that collaborative learning results in higher academic achievement. The findings of this study are hoped to trigger seminars on effective notetaking and purposeful collaboration training in MAU, Yola so that chemistry education students could blend notetaking with collaborative learning strategies to improve their academic achievement.

Purpose of the Study

The purpose of the study was to determine the influence of study habit on academic achievement of chemistry education students in Modibbo Adama University, Yola. Specifically, the study determined the influence of:

1. Notetaking on chemistry education students' academic achievement in Modibbo Adama University, Yola.
2. Collaboration on chemistry education students' academic achievement in Modibbo Adama University, Yola.
3. Study habit on chemistry education students' academic achievement in Modibbo Adama University, Yola.

Research Questions

The following posers were answered in this study:

1. To what level does notetaking influence chemistry education students' academic achievement in Modibbo Adama University, Yola?
2. To what level does collaboration influence chemistry education students' academic achievement in Modibbo Adama University, Yola?
3. What is the mean academic achievement (CGPAs) of chemistry education students in Modibbo Adama University, Yola for 2024/2025 academic session?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

HO_1: Notetaking does not significantly influence chemistry education students' academic achievement in Modibbo Adama University, Yola.

HO_2: Collaboration does not significantly influence chemistry education students' academic achievement in Modibbo Adama University, Yola.

HO_3: Study habit does not significantly influence chemistry education students' academic achievement in Modibbo Adama University, Yola.

Literature Review

The study is hinged on the Self-Regulated Learning (SRL) Model by Zimmerman (2000). SRL deals with self-generated thoughts, feelings, and behaviours oriented towards the attainment of goals. The SRL is made up of forethought (goals establishment), performance (strategies for goal attainment), and self-reflection (outcome evaluation against strategy used). The SRL model stresses the significance of students having clear learning goals (chemistry topics to be learnt), performance (study habits such as notetaking, collaboration, spaced repetition etc.), and self-reflection to evaluate outcome to ascertain whether the skills applied contributed to the accomplishment of goals.

Performance here, are the study habits, otherwise called study skills which refer to the repeated range of behaviours, tactics or strategies students use to organize, assimilate, and recall academic materials (Aljaffer et al., 2024). In a study, Gizachew (2024) found significant positive relationship between study habits and academic achievement among undergraduate students; suggesting that students who effectively manage their studies perform better academically. Similar finding was also found and reported by Aljaffer et al. (2024). However, few studies conducted, found no significant relationship between study habits and academic achievement (Melon et al. 2025; Kayal & Rahaman, 2025). It is worthy of note that this study only covers notetaking and collaboration components of study habit which provide personal and social learning opportunities respectively, that enable students take ownership of their learning.

Notetaking is the act of paraphrasing, summarizing and reorganizing content in one's own words which support comprehension and retention (Voyer et al., 2022). Studies indicate that students who structure their notes well often have higher performance and improved CGPAs than those with poorly written notes (Salame et al., 2024). This aligns with the submission of Salame and Thompson (2020). In contrast, Emory et al. (2021) and Voyer et al. (2022) reported no significant relationship between notetaking and academic achievement which allows for more studies on the two variables in other contexts. In modern societies characterized by heightened social isolation occasioned by social media, investigation of the influence of collaboration alongside notetaking is crucial and timely.

Yang (2023) defined collaborative learning as an instructional approach where learners engage together to construct shared understanding through negotiation, discussion, and argumentation etc. Empirical studies show that collaborative leaning improves academic achievement (Emeka et al., 2025; Abubakar, 2025). On the contrary, Wullschleger et al. (2025) reported no significant relationship between collaborative learning and academic achievement.

This literature review cuts across Asia, Africa, and South American countries, conducted on a wide range of teaching subjects and educational levels. Coincidentally, all the studies reviewed on collaborative learning and notetaking are respectively quasi experimental and correlational in design, stressing the significance of conducting more studies using other designs to gain deeper understanding of the influence of study habit on academic achievement. In addition, majority of the studies found significant positive relationship, with only a few ones reporting null findings with academic achievement, which underscores the need for further investigation in other contexts. There is notable paucity of studies in Adamawa state on study habit and academic achievement, particularly among chemistry education students in MAU, Yola. This study therefore bridged the knowledge deficit in this context.

Methodology

The study applied the correlational design to explore the relationship between study habit and academic achievement of 67 students purposively drawn from the entire 72 registered chemistry education students for 2025/2026 session in MAU, Yola. The subjects were selected based on having CGPAs at the end of 2024/2025 academic session. The choice of purposive sampling is appropriate since it allows subjects to be intentionally and deliberately selected based on criteria that align with study objective (Bisht, 2024). Consequently, freshers were insulated from the study since they do not have preceding CGPAs.

Data was collected in two phases over two weeks stint using Chemistry Education Students' Study Habit Questionnaire (CESSHQ) and Chemistry Achievement Pro forma (CAP) developed by the researchers. The CESSHQ is divided into two clusters of 10 items each, measuring the levels of notetaking and collaboration among chemistry education students based on Very High Level (VHL) = 5 to Very Low Level (VLL) = 1 response mode while the two-column CAP was used to retrieve the participants' academic achievement (CGPAs).

Research questions were resolved using mean and standard deviation according to the VHL = 4.50-5.00, HL = 3.50-4.49, ML = 2.50-3.49, LL = 1.50-2.49, and VLL = .50-1.49 limits of real numbers; hypotheses one and two were tested using PPMC while the third hypothesis was tested using multiple regression, all at .05 level of significance. If p-value is less than or equal to .05, a null hypothesis was rejected and vice versa.

Results

Results are logically presented in line with the research questions and null hypotheses.

Research Question One

To what level does notetaking influence chemistry education students' academic achievement in Modibbo Adama University, Yola?

Table 1: Mean and Standard Deviation of the Level of Notetaking of Chemistry Education Students in Modibbo Adama University, Yola (n = 67)

S/N	Items	Mean	S.D.	Remark
1	I summarize key chemistry concepts in my own words	3.93	.77	HL
2	I paraphrase to make complex chemistry ideas simpler	3.73	.73	HL
3	I organize my notes using subheadings	3.60	.68	HL
4	I use diagrams to visualize chemical processes	3.57	.66	HL
5	I highlight key terms in my notes	3.60	.74	HL
6	I review my notes after lectures	3.58	.76	HL
7	I use colour-coding for subheadings	3.64	.79	HL
8	I focus on capturing main ideas during lectures	3.63	.79	HL
9	I create concepts outlines to structure my notes	3.64	.83	HL
10	I update my notes with additional information	3.76	.87	HL
	Average	3.67		HL

Table 1 shows the result of analysis for the level of notetaking of chemistry education students in MAU, Yola. The table shows high levels of notetaking among these students since mean values consistently fell within extreme values of 3.93 and 3.57.

Research Question Two

To what level does collaboration influence chemistry education students' academic achievement in Modibbo Adama University, Yola?

Table 2: Mean and Standard Deviation of the Level of Collaboration Among Chemistry Education Students in Modibbo Adama University, Yola (n = 67)

S/N	Items	Mean	S.D.	Remark
1	I freely share my ideas during group discussions	3.76	.87	HL
2	I engage in discussions to clarify chemical concepts	3.76	.87	HL
3	I interact with peers to learn from them	3.73	.83	HL
4	I participate in group problem-solving activities	3.64	.79	HL
5	I listen attentively to others` perspectives	3.73	.81	HL
6	I contribute equally in chemistry discussions	3.78	.79	HL
7	I learn new chemistry concepts through peer interactions	3.87	.78	HL
8	I have open dialogue about chemistry topics	3.96	.79	HL
9	I share my resources during group discussions	4.09	.79	HL
10	I value feedback from group members	4.28	.73	HL
	Average	3.86		HL

Table 2 shows the result of analysis of research question two. The table shows that the mean scores of the individual items ranged from 3.64 to 4.28. The average mean score of 3.86 indicates the high level of collaboration among chemistry education students in MAU, Yola.

Research Question Three

What is the mean academic achievement (CGPAs) of chemistry education students in Modibbo Adama University, Yola?

Table 3: Mean and Standard Deviation of Academic Achievement (CGPAs) of Chemistry Education Students in Modibbo Adama University, Yola (n = 67)

	N	Mean	S.D.
Students' Academic Achievement	67	2.00	0.66

Result of analysis in Table 3 shows the mean CGPAs of 2.00 and standard deviation of 0.66 of the chemistry education students in MAU, Yola. This implies that majority of the students hold third class and lower second class degrees.

Hypothesis One

HO_1: Notetaking does not significantly influence chemistry education students' academic achievement in Modibbo Adama University, Yola.

Table 4: Result of Pearson Product Moment Correlation of Notetaking and Chemistry Education Students' Academic Achievement

	n	R	P-value	Remark
Notetaking	67	-0.180	0.145	Not Significant
Academic Achievement	67			

Table 4 is the result of analysis of hypothesis one which portrays a weak negative relationship between notetaking and chemistry education students' academic achievement in MAU, Yola (r = -0.180). The null hypothesis was retained since p-value (0.145) is greater than (0.05).

Hypothesis Two

HO_2: Collaboration does not significantly influence chemistry education students' academic achievement in Modibbo Adama University, Yola.

Table 5: Result of Pearson Product Moment Correlation of Collaboration and Chemistry Education Students' Academic Achievement

	n	R	P-value	Remark
Collaboration	67	-0.132	0.287	Not Significant
Academic Achievement	67			

Table 5 is the result of analysis which indicates a weak negative relationship (r = -0.132) between collaboration and chemistry education students' academic achievement in MAU, Yola. Since p-value (0.287) is greater than 0.05, the null hypothesis was therefore retained.

Hypothesis Three

HO_3: Study habits do not significantly influence chemistry education students' academic achievement in Modibbo Adama University, Yola.

Table 6a: Summary of ANOVA of Regression Analysis of Correlation Between Study Habit and Chemistry Education Students' Academic Achievement

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.941	2	.470	1.088	.343[b]
	Residual	27.654	64	.432		
	Total	28.595	66			

a. Dependent Variable: Academic Achievement

b. Predictors: (Constant), Collaboration, Notetaking

Result of analysis presented on Table 6a indicates no significant correlation between study habits (Notetaking and Collaboration) and academic achievement $F(2, 64) = 1.088$, $p > 0.05$. The result suggests that the null hypothesis be retained since p-value (0.343) is greater than 0.05.

Table 6b: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.181[a]	.033	.003	.65734

a. Predictors: (Constant), Collaboration, Notetaking

The model summary presented on Table 6b indicates how study habits (Notetaking and Collaboration) account for the variance in academic achievement. The result shows that only 0.30% of the variance in academic achievement is attributed to study habits.

Table 6c: Coefficients of Beta

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.796	.583		4.791	.000
	Notetaking	-.184	.182	-.162	-1.011	.316
	Collaboration	-.031	.181	-.028	-.174	.862

a. Dependent Variable: Academic Achievement

Table 6c shows the coefficients of multiple regression analysis of how each of the variable included in the model contributes in predicting academic achievement. Notetaking has a standardized beta coefficient of -0.162 and significant t-test of -1.011, $p > 0.05$. Collaboration has a standardized beta value of -0.028 and significant t-test of -0.174, $p > 0.05$. This means that notetaking and collaboration explain 16.20% and 2.80% respectively of the academic achievement of chemistry education students in MAU, Yola. It can be concluded that notetaking made a higher unique contribution in explaining the academic achievement of chemistry education students than collaboration.

Discussion of the Findings

This study examined the influence of notetaking, collaboration, and study habit on the academic achievement of chemistry education students in MAU, Yola. Result shows that chemistry education students have high level of notetaking and there is positive, weak and insignificant correlation between notetaking and academic achievement. This suggests that the high level with which chemistry education students organize, update, highlight key terms, paraphrase, and summarize their notes etc. did not significantly impacted on their academic achievement. This finding aligns with those of Emory et al. (2021) and Voyer et al. (2022) who both reported no significant relationship between notetaking and academic achievement. Conversely, Salame and Thompson (2020) and Salame et al. (2024), both found and reported positive significant relationship between notetaking and academic achievement.

In addition, the findings of the study show that collaboration among chemistry education students is on the high level. However, this high-level collaboration was found to be insignificantly correlated with their academic achievement. This is consistent with the findings of Wullschleger et al. (2025) who also reported no significant relationship between collaboration and academic achievement. On the other hand, findings of studies conducted by Ain et al. (2025) and Emeka et al. (2025) showed that collaboration among students has a great influence on their academic achievement.

Furthermore, the findings revealed weak insignificant correlation between study habit and academic achievement of chemistry education students despite deploying effective notetaking and

collaboration in their studies, suggesting that academic achievement depends on more than study habit. This agrees with Melon et al. (2025) and Kayal and Rahaman (2025) who also discovered no significant relationship between study habit and academic achievement. In contrast, Aljaffer et al. (2024) and Gizachew (2024) found that study habits are significant predictors of academic achievement.

Conclusion

The study concludes that chemistry education students in MAU, Yola showed high levels of notetaking and collaboration in their quest for the acquisition of chemistry knowledge and skills which insignificantly correlated with their academic achievement. This shows that chemistry achievement in MAU, Yola may depend on an interplay of whole lots of other factors including good study habit. As a result, chemistry achievement in MAU, Yola should not be considered the only function of chemistry education students' study habit.

Recommendations

Although, no significant relationship was found between notetaking, collaboration, and academic achievement of chemistry education students in MAU, Yola, it is still recommended that the Department of Physical Sciences Education and MAU, Yola should organize seminars and train students on evidenced-based notetaking techniques such as Cornell, outlining, mapping, charting, summarization etc. as well as collaborative learning skills to ensure purposeful collaboration among students. This is significant since the null findings may be attributed to chemistry education students' inadequate training on notetaking and purposeful collaboration.

It is also recommended that future research should examine the influence of moderating factors sch as notes quality, time spent on and frequency of collaboration, students' motivation etc. to ascertain if these null findings are due to poor implementation of the study habits rather than the study habits themselves.

References

Abubakar, A. (2025). Effectiveness of collaborative-based learning on the achievement of students in basic science at junior secondary schools in Kebbi State, Nigeria. *International Journal of Multidisciplinary Research and Growth Evaluation*, *6*(6), 349-353.

Ain, N., Yousuf, M. I., Dahar, M. A. & Hanif, M. (2025). Impact of collaborative learning on students` academic achievement at the secondary school level. *ProScholar Insights*, *4*(3), 34-40. https://doi.org/10.55737/psi.2025c-43102

Aljaffer, M. A., Almadani, A. H., AlDughaither, A. S., Basfar, A. A., AlGhadir, S. M., AlGhamdi, Y. A., AlHubaysh, B. N., AlMayouf, O. A., AlGhamdi, S. A., Ahmad, T., & Abdulghani, H. M. (2024). The impact of study habits and personal factors on the academic achievement performances of medical students. *BMC Medical Education*, *24*(1), 888.

Bisht, R. (2024). What is purposive sampling? Methods, technologies, and examples. Researcher.life. https://researcher.life

Chestnut, J. & Johnson, C. C. (2025). Factors influencing students` academic success in introductory chemistry: A systematic literature review. *Education Sciences*, *15*(4), 413.

Cortes, S. T., Lorca, A. S., Pineda, H. A., Tubog, R. & Vilbar, A. (2024). Strengthening science education in basic education through a professional development program in participatory action research for science teachers. *Social Sciences & Humanities Open*, *10*, 101194.

Emeka, I. D., Albert, C. O. & Iruka, A. E. (2025). Effect of collaborative approach of learning on students` academic performance in mathematics in Anambra state. *African Journal of Educational, Management, Teaching and Entrepreneurship Studies*, *14*(2), 1-12.

Emory, J., Teal, T. & Holloway, G. (2021). Electronic notetaking technology and academic performance in nursing students. *Contemporary Nurse*, *57*(3), 235-244.

Federal Ministry of Education (2018). *National Policy on Science and Technology Education*. Federal Ministry of Education.

Gizachew, M. (2025). The relationship between study habits and academic achievement: The case of Ethopian Adventist College. *Indonesian Journal of Curriculum and Educational Technology Studies*, *13*(1), 44-61.

Harkawal, J. S. (2023). Key components of good study habits. Harkawal.in. htpps://harkawal.in

Irwanto, I., Afrizal, A. & Lukman, I. R. (2024). Research trends in chemistry education: A bibliometric review (1895-2022). *AIP Conference Proceedings*, *2982*(1), 040030. https://doi.org/10.1063/5.0182936

Johnson, D. W. & Johnson, R. (2016). Cooperative learning and teaching citizenship in democracies. *International Journal of Educational Research*, *76*, 162-177.

Kayal, M. A. & Rahaman, K. H. (2025). Study habits and academic achievement: A correlational study among higher secondary students. *International Educational Scientific Research Journal*, *11*(6), 8-12. https://doi.org/10.5281/zenodo.15649538

Melon, E. C., Calisang, C. P., Lagrada, R. O., Bendijo, A. J., Bendijo, J. H., Gumba, J. L., Lames, D., Lasola, A. B., Maruhom, M. & Simborio, C. J. (2025). Students' study habits and its impacts on their academic performance. *Ignatian International Journal for Multidisciplinary Research*, *3*(4), 473-477. https://doi.org/10.5281/zenodo.15205109

Mera Cabezas, L. A., Basantes Vaca, C. V., Benavides Enriquez, C. V. & Parra Alvarez, P. F. (2024). Innovative strategies to strengthen teaching-researching skills in chemistry and biology education: A systematic literature review. *Frontiers in Education*, *9*, 1363132.

Nguyen, N. (2020). What exactly is collaborative learning? FeedbackFruits. https://feedbackfruits.com

Salame, I. I. & Thompson, A. (2020). Students` views on strategic notetaking and its impact on performance, achievement and learning. *International Journal of Instruction*, *13*(2), 1-16.

Salame, I. I., Tuba, M. & Nujhat, M. (2024). Notetaking and its impact on learning, academic performance and memory. *International Journal of Instruction*, *17*(3), 599-616.

Sukhendu, M. (2019). Study habits. *Journal of Emerging Technologies and Innovation Research*, *6*(6), 921-924.

Umate, B. A., Aminu, T., Sa`adu, I. & Ezeanya, C. M. (2025). Qualitative study on collaborative instructional strategies on academic performance in chemistry: A systematic approach. *Zamafara International Journal of Science, Technology Education and Mathematics*, *2*(3), 152-165.

Voyer, D., Ronis, S. T. & Byers, N. (2022). The effect of notetaking method on academic performance: A systematic review and meta-analysis. *Contemporary Educational Psychology*, *68*(1), 56-62.

Wullschleger, A., Maag Merki, K., Grob, U., Rechsteiner, B., Compagnoni, M. & Vörös, A. (2025). Teacher collaboration to elevate student achievement? Learning and Instruction, 97, 102104. https://doi.org/10.1016/j.learninstruc.2025.102104

Yang, X. (2023). A historical review of collaborative learning and cooperative learning. *TechTrends, 67*, 718-728.

Zimmerman, B. J. (2000). Attainment of self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13-39). San Diego, CA: Academic Press.