

*Comparative Analysis Between ... Fatusi, O. A. (2025)*

## Comparative Analysis between Textbooks Availability and Utilisation on Achievement in Chemistry among Secondary School Students in Abuja Municipal Area Council, Abuja, Nigeria

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### Abstract

*This study investigated correlation among availability, utilisation of textbooks and students' achievement in chemistry in Senior Secondary Schools in AMAC, Abuja. The study adopted the descriptive research design of the correlational type. Ten public secondary schools were randomly selected from public secondary schools in AMAC, Abuja. Simple random sampling technique was used to select 30 SS II students from each school, making a total of 300 SS II students. In all, 300 SS II students participated in the study. Three research instruments were used for data collection: Questionnaire on Text Availability ( $r=.76$ ), Questionnaire on Text Utilisation ( $r=.78$ ) and Achievement Test in Chemistry ( $r=.87$ ). Data collected were analysed using Pearson Product Moment Correlation and Multiple Regression Analysis. Findings of the study revealed that text availability had a negative relationship with students' achievement in chemistry ( $r = -.065$ ), text utilisation had a positive relationship with students' achievement in chemistry ( $r = .091$ ). The joint contribution of text availability and utilisation to students' achievement in chemistry was not significant ( $F_{(2, 297)} = 2.469$ ; Adj.  $R^2 = .010$ ;  $p>0.05$ ). Also, text utilisation ( $\beta = .114$ ) had more relative contribution to students' achievement in chemistry than text availability ( $\beta = -.093$ ). Based on the findings, it was recommended that students who wish to excel in chemistry, must be ready to utilise all the recommended texts. Ministry of Education and external examination bodies should try to always recommend chemistry textbooks whose approach is simple and that can easily be understood by students. Teachers of chemistry should encourage students to read the prescribed textbooks and ensure that students read all the recommended textbooks.*

**Keywords:** Availability, Utilisation, Textbooks, achievement, Chemistry

### Introduction

Chemistry is a basic area of study which is concerned with the composition, structure, characteristics, and changes of matter. Standing in the center of scientific research, it is frequently referred to as the "central science" because to the vital link it creates between the biological and physical sciences, which supports and enhances disciplines like biology, physics, medicine, engineering, environmental science, and materials science. Therefore, having a solid foundation in chemical principles offers a strong basis for scientific literacy, creativity, and technological advancement. Chemistry is essential for young students, especially those who want to work in science, engineering, health sciences, and technology-related fields, because it develops critical thinking, problem-solving skills, and creativity in scientific research (Omoifo, 2012; Kasper, 2024).

Chemistry is relevant in many aspects of daily life, not just theoretical research. Common family habits, interactions in the marketplace, agricultural pursuits, health care routines, and even technical applications seen in social media material all incorporate its themes. Even when people are not aware that they are participating in chemical processes, many everyday activities depend on chemical reactions and principles. For instance, heat-induced chemical reactions during cooking cause molecules to break down and recombine, improving the food's flavor, texture, and nutritional content. The process of washing garments with detergents demonstrates how surfactants work by emulsifying and dissolving oil and grime. By changing the pH levels and changing the chemical connections in plant fibers, adding limestone (calcium compounds) to beans or unripe plantains softens the food and increases nutritional availability and cooking efficiency. Chemistry is ubiquitous, as seen by other everyday activities. Using a stainless-steel spoon to help transfer heat while boiling meat might also affect the cooking process by interacting with trace minerals. Kerosene or gasoline can be separated from water to show that liquids are immiscible due to variations in density and polarity. The fermentation process, a biological process in which microorganisms break down carbs to produce flavor and enhanced digestibility, is used to prepare pap (ogi) from ground maize. The same is true for the ripening of fruits, the browning of bread, the corrosion of metals, the purification of water, the manufacture of cosmetics, and the use of batteries. Essentially, chemistry is a fundamental aspect of everyday life and is not limited to labs or scholarly debates. A greater understanding of these common chemical processes fosters



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scientific curiosity, informed decision-making, and an improved capacity for students to relate what they learn in the classroom to practical applications. Chemistry continues to be essential to human advancement and sustainable development as civilisations innovate in fields including agriculture, nanotechnology, pharmaceuticals, renewable energy, and environmental management. Similarly, the application of pesticides to eradicate pests is an example of environmental chemistry and applied toxicology, showing how chemical compounds are designed to interfere with insect biological processes. Ice blocks melting to produce drinking water highlights physical processes controlled by heat energy and represents a basic phase transition from solid to liquid. The traditional method of making African fufu from cassava demonstrates both biochemical and physical processes, including starch gelatinisation, enzymatic hydrolysis, and mechanical transformation. Combustion and oxidation reactions, which release energy and create new chemicals, are analogous to the burning of materials in air. One common illustration of oxidation and corrosion is the rusting of an iron nail in the presence of oxygen and moisture. These commonplace observations support the idea that chemistry is not a separate field but rather a fundamental aspect of human life, permeating everyday activities, cultural customs, agriculture, technology, and interactions with the environment (Forrester, 2012; Tatiana, 2023). Chemistry plays a fundamental role in everyday life and the advancement of the country, however students' performance in the subject at all educational levels continues to be a source of concern. Research has repeatedly connected this difficulty to a number of causes, such as a lack of access to up-to-date and pertinent textbooks, a lack of lab space and teaching resources, and the persistence of teacher-centered and ineffectual teaching methods (Eya & Ezech, 2020; Iyiola & Ezech, 2024). Additionally, it has been determined that demographic and affective factors, such as gender differences and learners' interest, are important indicators of chemical performance. It is often known that interest in particular is a strong motivating factor that affects students' engagement, perseverance, curiosity, and general academic success. Additionally, empirical research shows that gender accounts for a small but significant percentage of the variation in chemistry achievement, indicating that attitude and gender dynamics are significant factors in determining students' cognitive and affective outcomes in the subject (Eya & Ezech, 2020; Iyiola & Ezech, 2024). In an effort to address the persistent problem of students' poor performance in chemistry, a considerable body of scholarly research has focused on identifying effective instructional approaches, strategies, and pedagogical innovations. While these studies have contributed meaningfully to improving the teaching and learning of chemistry, a notable research gap remains in determining the relationship among the availability, utilisation of textbooks and students' achievement in chemistry, particularly in senior secondary schools in Abuja Municipal Area Council (AMAC). This gap highlights the need to broaden the scope of inquiry beyond pedagogical methods alone. As Obemeata (1995) rightly observes, enhancing teaching methods and instructional strategies, though valuable, cannot solely resolve the persistent challenge of poor academic performance. The implication is that systemic and resource-related factors, including the provision and use of quality instructional materials, must also be carefully examined.

A textbook, often known as a text-based instructional resource, is one of the most widely used and acknowledged teaching and learning aids (Rahmad, 2016). According to Ogunsiji (2015), textbooks are an essential component of educational resources and the main means of efficiently disseminating knowledge within the educational system. In addition to providing teachers and students with instructional structure and security, textbooks offer a thorough, well-organized source of content and make information retrieval easier. They also assist with lesson planning, direct the implementation of the curriculum, and broaden the scope and structure of the material in ways that improve understanding. The value of textbooks is further highlighted by Garinger (2010), who points out that they greatly lessen the workload for teachers by reducing preparation time, providing pre-made learning activities, and offering a clear record of classroom progress to meet the needs of both internal and external stakeholders. The core of the educational process, according to Chambliss and Calfee (1998), is the textbook, which provides students with a multitude of factual knowledge while also providing them with opportunities to encounter new ideas, thoughts, and experiences. The same is true for textbooks, which Mohammad and Kumari (2007) contend are essential to educational reform and quality improvement. Textbooks that are well-designed benefit teachers and students in their learning process by acting as organized teaching guides and useful learning aids (Frederick, 2007). However, the effectiveness with which textbooks are used determines their actual educational worth. A textbook without an active reader, according to Giorgi and Nancy (2003), is just printed material; it only acquires academic significance when students interact with its content through curiosity, interpretation, and past experiences. Selden and Widdowson (1993) support this viewpoint by underlining the learner's role in meaning construction and emphasizing that



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interacting with text is a dynamic cognitive process that involves interpretation, critical thinking, and reflection. This supports the notion that textbook availability and intentional use are crucial elements of successful learning, especially in a topic as conceptually complex as chemistry. Student outcomes are impacted by textbook availability and use, according to recent empirical studies. In quantitative research of recently released textbooks, Li & Wang (2024), for instance, discovered a strong positive impact of high school chemistry textbook use on students' interest, attitudes, and achievement in chemistry. Their results show a relationship between achievement and the frequency, purpose, belief, and willingness with which students use textbooks. The efficient use of textbooks had a significant impact on students' academic performance in public secondary schools in Kenya, as Mwikali, Kiende, and Ogeta (2024) revealed. Furthermore, a study conducted in Southwest Nigeria by Ajiboye and Tunde (2022) discovered a favorable and statistically significant correlation between students' academic performance in teacher-education colleges and the availability of material resources, including textbooks. The significance of textbook availability and use in promoting academic success is reaffirmed by these recent studies.

In line with these findings, many key propositions emerge. First, in resource-constrained settings like AMAC, it is not enough simply to procure textbooks; schools must ensure that textbooks are available to students when needed, in sufficient quantity, and that they are of appropriate quality (updated editions, readable language, aligned with curriculum). For instance, Fatoba (2020) found that poor readability of recommended chemistry textbooks in Nigerian schools was a limiting factor in student achievement. Second, the utilisation of textbooks by students should be monitored and encouraged: frequent use of textbooks for reading, homework, self-study, revision and reference fosters better learning outcomes. Studies show that merely owning textbooks is insufficient if students do not engage with them. Third, there should be a conceptual shift in research and practice to examine correlations and mediating mechanisms; for example, how availability leads to utilisation, how teacher encouragement affects the extent of textbook use, how student attitude mediates the relationship between textbook use and achievement. Given this context, the proposed study focusing on chemistry in senior secondary schools in AMAC is timely and necessary. It moves the focus beyond pedagogy into the domain of instructional resources. Specifically, the study investigates: (a) the extent of availability of chemistry textbooks in senior secondary schools in AMAC; (b) the extent to which those textbooks are utilised by both teachers and students; and (c) the relationship between availability, utilisation of textbooks and students' achievement in chemistry. By doing so, the study complements previous research on teaching strategies by highlighting the resource-factor dimension of chemistry learning.

In summary, while improvements in teaching methods and strategies remain vital, they are not sufficient in isolation. Textbooks, when available in adequate number, of suitable quality, and actively utilised by learners, can play a significant role in improving students' achievement in chemistry. As the recent literature suggests, the presence and effective use of textbooks are correlated with better learning outcomes (Li & Wang, 2024; Mwikali et al., 2024; Ajiboye & Tunde, 2022). Thus, to enhance chemistry education in senior secondary schools especially in contexts such as AMAC, teachers, curriculum planners and policymakers must give due attention to ensuring textbook availability and fostering active utilisation as part of a broader strategy to raise achievement in chemistry. Many studies have shown that text availability and utilisation are strong determinants of students' achievement in English language, Mathematics, Economics and Biology but to the best knowledge of the researcher, these factors have not been significantly linked to chemistry at senior secondary school level especially in AMAC, Abuja. Therefore, this study investigated correlation among availability, utilisation of textbooks and students' achievement in chemistry in senior secondary schools in AMAC, Abuja.

### **Statement of the Problem**

Chemistry is a fundamental branch of science that focuses on the structure, composition, properties, and transformations of matter. Positioned at the heart of scientific inquiry, it is often described as the central science because it forms a critical bridge between the physical and life sciences, supporting and enriching fields such as physics, biology, medicine, engineering, environmental science, and materials science. Despite the importance attached to chemistry in the senior secondary school curriculum in Nigeria, students' performance in the subject yearly is below average. Reports from WAEC and NECO have shown that students' persistent poor performance in chemistry is as a result of so many factors. As a way of addressing this problem, numerous studies have been carried on methods and strategies of teaching chemistry with less emphasis on correlation among availability, utilisation of textbooks and students' achievement in chemistry in senior



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secondary schools in AMAC, Abuja. Therefore, this study investigated correlation among availability, utilisation of textbooks and students' achievement in chemistry in senior secondary schools in AMAC, Abuja.

### Research Questions

1. What relationship exists among text availability, utilisation and students' achievement in chemistry?
2. What is the relative contribution of text availability, utilisation and students' achievement in chemistry?
3. What is the joint contribution of text availability, utilisation and students' achievement in chemistry?

### Methodology

The study adopted the descriptive research design of the correlational type. Ten public secondary schools were randomly selected from public secondary schools in AMAC, Abuja. Simple random sampling technique was used to select 30 SS II students from each school, making a total of 300 SS II students. In all, 300 SS II students participated in the study. Three research instruments were used for data collection: Questionnaire on Text Availability ( $r=.76$ ), Questionnaire on Text Utilisation ( $r=.78$ ) and Achievement Test in Chemistry ( $r=.87$ ). Data collected were analysed using Pearson Product Moment Correlation and Multiple Regression Analysis.

### Presentation of Results

**Research Question 1:** What relationship exists among text availability, utilisation and students' achievement in chemistry?

**Table 1: Correlation Matrix of the Independent Variables (text availability and utilisation of textbooks) and Students' Achievement in Chemistry**

Variables	Students' Achievement in Chemistry	Text Availability	Text Utilisation
Students' Achievement in Chemistry	1		
Text Availability	-.065 (.264)	1	
Text Utilisation	.091 (.117)	.249 (.000)	1
N	300	300	300
Mean	15.49	14.20	39.96
Standard Dev.	4.40	1.10	4.11

Table 1 shows the relationship that exists between the independent variables (text availability and utilisation) and students' achievement in chemistry. The result indicates that text availability had a negative relationship with students' achievement in chemistry ( $r = -.065$ ). This implies that the more text availability, the less students' achievement in chemistry. However, text utilisation had a positive relationship with students' achievement in chemistry ( $r = .091$ ). This implies that the more of the students utilised the available texts, the more their achievement in chemistry increased. Hence, text utilisation correlated directly with students' achievement in chemistry.

**Research Question 2:** What is the relative contribution of text availability, utilisation and students' achievement in chemistry?

**Table 2: Summary of the Regression Analysis of the Joint Contribution of the Independent Variables to Students' Achievement in Chemistry**

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	94.804	2	47.402	2.469	.086 <sup>b</sup>
	Residual	5702.192	297	19.199		
	Total	5796.997	299			

$R = .128^a$ ;  $R \text{ Square} = .016$ ;  $\text{Adjusted } R \text{ Square} = .010$ ;  $\text{Std. Error of the Estimate} = 4.38170$

Table 2 shows the joint contribution of the independent variables (text availability and utilisation) to students' achievement in chemistry. The result indicates that the joint contribution of text availability and utilisation to students' achievement in chemistry was not significant ( $F_{(2; 297)} = 2.469$ ;  $\text{Adj. } R^2 = .010$ ;  $p > 0.05$ ). This implies that the two independent variables, when taken together, did not significantly contribute to students' achievement in chemistry. However, the result also shows that  $\text{Adj. } R^2 = .010$ , which implies that 10% of the variance in students' achievement in chemistry was accounted for by



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the joint contribution of the two independent variables, while other variables not included in this model may have accounted for the remaining 90% variance.

**Research Question 3:** What is the joint contribution of text availability, utilisation and students' achievement in chemistry?

**Table 3: Summary of the Regression Analysis of the Relative Contribution of the Independent Variables to Students' Achievement in Chemistry**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			Std. Error	Beta		
1	(Constant)	15.912	3.696		4.305	.000
	Text Availability	-.372	.238	-.093	-1.566	.118
	Text Utilisation	.122	.064	.114	1.916	.056

Table 3 shows the relative contribution of each of the independent variables (text availability and utilization) to students' achievement in chemistry as expressed in standardized coefficient of beta weight. The result indicates that text utilisation ( $\beta = .114$ ) had more relative contribution to students' achievement in chemistry than text availability ( $\beta = -.093$ ). This implies that text utilisation is the variable that would predict students' achievement in chemistry.

### Discussion of Findings

Table I showed that students' achievement in chemistry had a positive low and non-significant relationship with text availability and text utilisation. However, text availability and utilisation had a positive high significant relationship. This implies that the more text availability increased, the more the text utilisation also increased. This is in line with the study of Oduwale (2011) who revealed that text availability and utilisation had a positive high significant relationship. This is against the finding of Christopher (2010) who revealed in his study that text availability and utilisation had no positive significant relationship. Table II showed that text availability and utilisation had not significant joint contribution to students' achievement in chemistry. This implies that the joint contribution of text availability and text utilisation did not bring about a significant variance in students' achievement in chemistry. This is in line with the study of Christopher (2010) who revealed in his study that text availability and utilisation did not predict students' achievement. This is against the finding of Heyneman, Farrell and Sepulveda-Stuardo (1978) who revealed that text availability and utilisation would jointly predict students' academic achievement. Table III indicated that text utilisation had a more relative contribution to students' achievement in chemistry. However, the relative contribution of each of both variables was not significant. This is in line with the study of Christopher (2010) who revealed in his study that text availability and utilisation did not predict students' achievement. This is against the finding of Heyneman, Farrell and Sepulveda-Stuardo (1978) who revealed that text availability and utilisation would jointly predict students' academic achievement.

### Conclusion

It can be concluded from the study that text availability cannot only guarantee students' achievement in chemistry. So, effective utilisation of recommended textbooks is crucial to students' achievement in chemistry. The study has provided the better understanding of the two variables that could enhance students' achievement in chemistry in AMAC, Abuja.

### Recommendations

Based on the findings of this study, it was recommended that:

1. Students who wish to excel in chemistry, must be ready to utilise all the recommended textbooks.
2. Ministry of Education and external examination bodies should try to always recommend chemistry textbooks.
3. Teachers of chemistry should encourage students to read the prescribed chemistry textbooks and ensure that students read all the recommended chemistry textbooks.
4. Students should inculcate good reading habit; they should try to read all the recommended chemistry textbooks.
5. Parents should buy all the recommended chemistry textbooks for their children and good environment that is suitable for reading should be created for the children.

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