**CHAPTER FOUR**

**DATA PRESENTATION, ANALYSIS AND DISCUSSIONS**

**4.1 Introduction**

This chapter presents the data collected from a structured questionnaire designed to assess the impact of instructional material improvisation on the teaching of selected Biology topics in senior secondary schools in Kaduna South Local Government Area. This study employs a descriptive survey research design, gathering data exclusively from questionnaire responses provided by SS2 Biology students and teachers.

This analysis examines the utilization of instructional materials, including improvised resources, in Biology lessons and their perceived impact on student learning.

**4.2 Data Presentation**

This section present the data collected from the questionnaire responses are presented in tables and charts to illustrate key findings on the use and impact of instructional materials, specifically improvised resources, in teaching Biology.

**4.2.1 Demographic Information**

This subsection provides an overview of the demographic characteristics of the respondents, including gender, age, class level, and for teachers, years of teaching experience. These demographics help contextualize the perspectives gathered and enable a better understanding of any patterns or trends in the data.

**TABLE 4.1 GENDER DISTRIBUTION OF RESPONDENTS**

|  |  |  |
| --- | --- | --- |
| **GENDER** | **FREQUENCY** | **PERCENTAGE (%)** |
| Male | 42 | 48.8% |
| Female | 44 | 51.2% |
| Total | 86 | 100% |

Table 4.1 shows the gender distribution of the respondents, with a nearly equal representation of males and females. This balanced distribution ensures that the study captures diverse perspectives on the use of instructional materials in Biology, as gender may influence perceptions of teaching methods or access to resources.

**TABLE 4.2 AGE DISTRIBUTION OF RESPONDENTS**

|  |  |  |
| --- | --- | --- |
| **AGE GROUP** | **FREQUENCY** | **PERCENTAGE (%)** |
| 15 years and below | 10 | 11.6% |
| 16 - 17 years | 40 | 46.5% |
| 18 - 19 years | 32 | 37.2% |
| 20 years and above | 2 | 4.7% |
| TOTAL | 86 | 100% |

Table 4.2 provides the age distribution of the respondents. This distribution reflects the typical age range of SS2 students in Nigeria's education system, reinforcing the relevance of the study sample to the research objectives.

**TABLE 4.3 CLASS LEVEL OF RESPONDENTS**

|  |  |  |
| --- | --- | --- |
| **CLASS LEVEL** | **FREQUENCY** | **PERCENTAGE (%)** |
| S.S 2 | 86 | 100% |

Table 4.3 confirms that all 86 respondents were SS2 students, the chosen class for this study.

**TABLE 4.4 TEACHING EXPERIENCE OF BIOLOGY TEACHERS**

|  |  |  |
| --- | --- | --- |
| **TEACHING EXPERIENCE (YEARS)** | **FREQUENCY** | **PERCENTAGE (%)** |
| Less than 5 years | 3 | 30% |
| 5 - 10 years | 5 | 50% |
| Above 10 years | 2 | 20% |
| TOTAL | 10 | 100% |

Table 4.4 shows that this range of teaching experience suggests that the study benefited from a mix of newer and more experienced educators, providing a balanced perspective on the use of improvised instructional materials.

**4.2.2 Frequency of Instructional Materials Use**

This subsection presents the frequency with which different types of instructional materials are used in Biology lessons. Responses here help highlight the extent to which instructional materials, both traditional and improvised, are integrated into classroom instruction.

**TABLE 4.5 FREQUENCY OF USE OF TRADITIONAL INSTRUCTIONAL MATERIALS**

|  |  |  |
| --- | --- | --- |
| **FREQUENCY OF USE** | **NUMBER OF RESPONSES (STUDENTS)** | **PERCENTAGE (%)** |
| **Always** | 25 | 29.1% |
| **Often** | 40 | 46.5% |
| **Rarely** | 15 | 17.4% |
| **Never** | 6 | 7.0% |
| **TOTAL** | **86** | **100%** |

Table 4.5 illustrates the frequency of traditional instructional materials in Biology lessons. This suggests that while traditional materials such as charts, diagrams, and models are commonly employed, some gaps remain in consistent application across lessons. Understanding this variation is essential for addressing discrepancies in resource utilization.

**TABLE 4.6 - FREQUENCY OF USE OF IMPROVISED INSTRUCTIONAL MATERIALS**

|  |  |  |
| --- | --- | --- |
| **FREQUENCY OF USE** | **NUMBER OF RESPONSES (STUDENTS)** | **PERCENTAGE (%)** |
| **Always** | 15 | 17.4% |
| **Often** | 25 | 29.1% |
| **Rarely** | 35 | 40.7% |
| **Never** | 11 | 12.8% |
| **TOTAL** | **86** | **100%** |

Table 4.6 highlights the usage frequency of improvised instructional materials during Biology lessons. This disparity underscores potential challenges in resource availability or teacher readiness to employ improvisation techniques, suggesting an opportunity to improve training and support for improvisation in classroom settings.

**Teacher Responses on Frequency of Material Use**

To complement the students' perspectives, teachers were also surveyed on their use of both traditional and improvised instructional materials. Their responses align closely with those of the students, as shown in Table 4.7.

**TABLE 4.7 - TEACHER RESPONSES ON FREQUENCY OF MATERIAL USE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of material** | **Always** | **Often** | **Rarely** | **Never** |
| Traditional materials | 3 | 5 | 2 | 0 |
| Improvised materials | 2 | 3 | 4 | 1 |

Table 4.7 shows that most teachers use traditional instructional materials either always (3 teachers) or often (5 teachers)or rarely(2 teachers), with none indicating that they never use such materials. On the other hand, the use of improvised materials is somewhat less frequent, with 2 teachers using them always, 3 using them often, 4 using them rarely and 1 teacher reporting that they never use improvised materials in their lessons.

**4.2.3 Types of Instructional Materials Use**

This section categorizes the types of instructional materials most frequently used in Biology lessons, highlighting the importance of both conventional and improvised resources.

**Table 4.8: Types of Instructional Materials Used**

|  |  |  |
| --- | --- | --- |
| **Type of material** | **Frequency** | **Percentage (%)** |
| Charts and diagrams | 30 | 34.9% |
| Models | 23 | 26.7% |
| Real life specimens | 8 | 9.3% |
| Video or animations | 10 | 11.6% |
| Improvised/Local materials | 15 | 17.4% |

Based on the data presented in Table 4.8, charts and diagrams are the most commonly used instructional materials in Biology lessons, representing 34.9% of the total. Models follow at 26.7%, reflecting their widespread application for demonstrating concepts. Improvised or local materials account for 17.4%, showcasing their potential despite limited adoption. Videos or animations constitute 11.6% of the materials used, likely due to technological or resource limitations. Real-life specimens are the least utilized, comprising only 9.3%, possibly due to challenges such as cost and accessibility. The findings highlight a preference for visual aids, with improvisation and real-life examples being underutilized despite their educational value.

**4.2.4 Impact of Improvised Instructional Materials on Learning**

Here, responses regarding students’ and teachers’ perceptions of the effectiveness of improvised instructional materials are summarized, focusing on perceived impacts on understanding, engagement, and interest.

**Table 4.9: Perceived Effectiveness of Improvised Materials**

|  |  |  |
| --- | --- | --- |
| **Response** | **Frequency** | **Percentage (%)** |
| Strongly Agree | 50 | 58.14% |
| Agree | 25 | 29.07% |
| Disagree | 8 | 9.30% |
| Strongly Disagree | 3 | 3.49% |

Table 4.9 summarizes perceptions of the effectiveness of improvised instructional materials. The majority of respondents (58.14%) strongly agree that these materials make Biology lessons more engaging and understandable. A further 29.07% agree, bringing the total positive responses to over 87%. Only 9.3% disagree, and a minimal 3.49% strongly disagree. These findings suggest broad recognition of the value of improvised materials in fostering student interest, clarifying complex topics, and encouraging active participation in lessons.

**Table 4.10: Perceived Effectiveness of Improvised Materials(Mean score)**

|  |  |
| --- | --- |
| **STATEMENT** | **MEAN SCORE (1-4)** |
| Improvised materials make Biology lessons more interesting | 3.42 |
| Students understand Biology concepts better with improvised materials | 3.35 |
| Improvised materials aid in teaching complex topics | 3.33 |
| Using improvised materials encourages student participation | 3.55 |

**4.2.5 Challenges Faced in Using Improvised Instructional Materials**

This subsection addresses common challenges in using improvised materials, such as resource limitations, lack of training, and time constraints, based on questionnaire responses.

**Table 4.11: Challenges in Using Improvised Instructional Materials**

|  |  |  |
| --- | --- | --- |
| **CHALLENGES** | **FREQUENCY** | **PERCENTAGE (%)** |
| Lack of time | 30 | 34.9% |
| Inadequate skills | 25 | 29.1% |
| Lack of resources | 20 | 23.3% |
| Students disinterest | 11 | 12.8% |

**4.2.6 Suggestions for Improvement**

Respondents offered various strategies to enhance the use of instructional materials

**Table 4.12: Suggestions for Improving the Use of Instructional Materials**

|  |  |  |
| --- | --- | --- |
| **SUGGESTION** | **FREQUENCY** | **PERCENTAGE (%)** |
| Increase funding for resources | 35 | 40.7% |
| Provide more teacher experience | 30 | 34.9% |
| Ensures availability of materials | 21 | 24.4% |

**4.3 Data Analysis**

This section analyzes the data collected through questionnaire responses, focusing on patterns and trends that address the study's research questions. The analysis uses descriptive statistics such as frequencies, percentages, and mean scores to interpret the responses regarding the availability, use, and perceived impact of instructional materials in teaching Biology.

**4.3.1 Analysis of Instructional Material Use**

The frequency of instructional material use was examined based on the data presented in Tables 4.5 and 4.6. The findings indicate that:

1. Traditional Materials Usage: Traditional instructional materials, such as charts and models, are used regularly by teachers, with 46.5% of students reporting that these materials are "often" utilized and 29.1% stating they are "always" used. These results suggest that traditional materials form a cornerstone of Biology teaching, providing a familiar and accessible resource for educators.
2. Improvised Materials Usage: In contrast, improvised instructional materials are less frequently employed. Only 17.4% of students reported their "always" usage, while 40.7% indicated they are "rarely" used. This gap highlights potential challenges such as resource constraints or limited teacher expertise in creating and using improvised aids.
3. Implication: The data suggests that while traditional materials are more frequently used, there is a growing recognition of the need for improvisation, especially in contexts with limited access to standard resources.

**4.3.2 Types of Instructional Materials Most Frequently Used**

The types of instructional materials used in Biology lessons were analyzed, as shown in Table 4.8. Key observations include:

1. Charts and Diagrams:These are the most frequently used instructional materials, with 34.9% of respondents reporting their use. Their prevalence can be attributed to their effectiveness in visually simplifying complex biological concepts.
2. Models:Representing 26.7% of usage, models are also commonly employed, likely due to their ability to provide tangible representations of biological structures and processes.
3. Improvised/Local Materials:Accounting for 17.4%, improvised materials are moderately used, reflecting their importance in resource-constrained environments where standard materials may not always be available.
4. Videos/Animations:These account for 11.6% of instructional material usage, possibly due to limited access to the necessary technological resources in some schools.
5. Real-Life Specimens:Representing 9.3%, real-life specimens are the least utilized instructional material, which could be attributed to challenges such as cost, preservation, and ethical considerations.
6. Implication:The data underscores the need to expand the range of teaching resources by incorporating more interactive and engaging tools, such as real-life specimens and multimedia (videos and animations). These resources can potentially foster better student understanding and engagement in Biology lessons.

**4.3.3 Perceptions on the Effectiveness of Improvised Instructional Materials**

Responses regarding the effectiveness of improvised instructional materials, summarized in Table 4.9, and mean score in Table 4.10 reveal strong positive perceptions:

1. Engagement: 58.14% of respondents strongly agreed that improvised materials make lessons more interesting, while 29.07% agreed.
2. Understanding Complex Topics: Improvised materials were particularly effective for teaching complex topics, with a mean score of 3.33 (on a 4-point scale).
3. Student Participation: The highest mean score (3.55) indicates that improvised materials encourage active student involvement.
4. Implication: These findings align with the constructivist theory of learning, which emphasizes hands-on, experiential approaches to enhance understanding.

**4.3.4 Challenges Faced in Using Improvised Instructional Materials**

This subsection addresses common challenges in using improvised materials, such as resource limitations, lack of training, and time constraints, based on questionnaire responses. Table 4.11 highlights key challenges faced by teachers when using improvised instructional materials:

1. Time Constraints: A significant proportion (34.9%) cited lack of time as a major barrier.
2. Inadequate Skills and Resources: Insufficient training (29.1%) and lack of resources (23.3%) also limit the regular use of improvised materials.
3. Implication: Addressing these challenges through targeted interventions, such as teacher training programs and increased funding, could improve the frequency and effectiveness of improvised material usage.

**4.3.5 Suggestions for Improvement**

Respondents offered various strategies to enhance the use of instructional materials, summarized in Table 4.12:

1. Increased Funding: The most common suggestion (40.7%) was to allocate more funds for instructional materials.
2. Teacher Training: Providing more professional development opportunities (34.9%) was also emphasized.
3. Resource Availability: Ensuring a steady supply of materials (24.4%) could further support the integration of both traditional and improvised resources in teaching.
4. Implication: Implementing these suggestions would address the challenges identified and improve the overall quality of Biology education.

**4.4 Answers to Research Questions**

This section provides answers to the research questions by interpreting the responses gathered from the questionnaire. The findings from the descriptive data offer insights into the extent of instructional material use, the role of improvisation, and the perceptions of both teachers and students regarding its effectiveness in teaching Biology.

Research Question 1: How frequently are instructional materials used in Biology lessons?

Based on the data analyzed in Section 4.3, a substantial number of respondents indicated that instructional materials are used regularly in Biology lessons, although the frequency varies. Traditional materials, such as textbooks, models, and diagrams, were commonly cited, with a majority reporting "often" or "always" for usage. However, improvised materials were less consistently used, highlighting potential challenges in availability or teacher familiarity with these resources.

Research Question 2: What types of instructional materials are most commonly used, and to what extent is improvisation involved?

The findings show that charts, diagrams, and models are among the most frequently used instructional materials in Biology classes. Improvised materials, while present, are used less frequently compared to traditional resources. Responses suggest that while teachers acknowledge the importance of improvisation in engaging students, factors such as limited resources and time may limit its application in day-to-day lessons.

Research Question 3: What are the perceived effects of improvised instructional materials on student understanding and engagement?

Most respondents agreed that improvised instructional materials positively impact student learning. High mean scores in Table 4.8 indicate that students and teachers perceive these materials as helpful in making Biology concepts clearer, especially complex topics. Improvised materials were also associated with increased student engagement and participation, as students reported finding lessons more interesting and easier to understand with hands-on resources.

Research Question 4: What challenges are associated with the use of improvised instructional materials in Biology lessons?

Challenges highlighted by respondents include lack of time, limited availability of materials, and insufficient training in creating and using improvised resources. These barriers, shown in Table 4.9, suggest that while teachers see value in improvisation, practical constraints often inhibit its regular use. Addressing these challenges could enhance the frequency and effectiveness of improvised material use in classrooms.

Research Question 5: What strategies do teachers and students suggest for improving the use of instructional materials, particularly improvised ones, in Biology teaching?

Suggestions from respondents included increasing funding for instructional resources, offering more teacher training in improvisation techniques, and ensuring a steady supply of materials necessary for creating improvised aids. These recommendations, summarized in Table 4.10, point to a need for institutional support to enable teachers to integrate improvisation more fully into their teaching practices.

**4.5 Testing of Hypotheses**

H₀₁: There is no significant relationship between the use of improvised instructional materials and students' academic performance in Biology in senior secondary schools.

Supporting Data:

Table 4.9 (Perceived Effectiveness of Improvised Materials): 87.21% of respondents (58.14% strongly agree and 29.07% agree) reported that improvised materials improve understanding and engagement, directly influencing academic performance.

Implication in Section 4.3.3: The use of improvised materials is linked to better student comprehension and active learning.

Conclusion: The null hypothesis is rejected, as the findings strongly indicate a significant relationship between the use of improvised instructional materials and academic performance.

2. H₀₂: The use of improvised instructional materials does not significantly enhance students' understanding of complex biological concepts in senior secondary schools.

Supporting Data:

Table 4.10 (Mean Scores for Perceived Effectiveness): Statements such as "Improvised materials aid in teaching complex topics" had a mean score of 3.33 (on a 4-point scale), demonstrating high effectiveness.

Implication in Section 4.3.3: Improvised materials are particularly effective in clarifying abstract and complex concepts.

Conclusion: This null hypothesis is rejected, as the data strongly supports the use of improvised materials in enhancing understanding of complex biological topics.

3. H₀₃: The challenges faced by teachers in improvising instructional materials do not significantly affect their effectiveness in teaching Biology in senior secondary schools.

Supporting Data:

Table 4.11 (Challenges in Using Improvised Materials): 34.9% of respondents identified lack of time, while 29.1% mentioned inadequate skills, as major barriers to improvisation. These challenges impact teachers’ ability to effectively use improvised materials.

Implication in Section 4.3.4: These constraints directly influence the frequency and quality of using improvised instructional materials.

Conclusion: The null hypothesis is rejected, as evidence shows that challenges significantly affect the effectiveness of improvisation.

4. H₀₄: Teacher training programs do not significantly influence the effectiveness of improvising instructional materials for Biology education in senior secondary schools.

Supporting Data:

Table 4.12 (Suggestions for Improvement): 34.9% of respondents suggested more teacher training as a key strategy for improving the use of improvised materials.

Implication in Section 4.3.5: Adequate training enhances teachers' ability to create and effectively use improvised instructional materials.

Conclusion: The null hypothesis is rejected, as findings highlight the significant role of training programs in enhancing effectiveness.

**4.5 Discussion of Findings**

This section discusses the major findings from the data analysis, interpreting the results in light of the study's objectives and relevant literature. The insights gained from the descriptive survey data offer valuable perspectives on the use of instructional materials, particularly improvised resources, in teaching Biology in senior secondary schools.

**4.5.1 Frequency and Types of Instructional Material Use**

The study found that traditional instructional materials, such as charts, diagrams, and models, are frequently used in Biology lessons, whereas improvised materials are used less consistently. This aligns with previous research indicating that teachers often rely on available, pre-made resources due to convenience and familiarity. Limited use of improvised materials could stem from challenges like lack of resources, time, or training, which have been noted as barriers in similar studies (e.g., Aina, 2013; Aladejana, 2010). These findings suggest that while teachers recognize the potential benefits of improvisation, practical constraints may limit its application.

**4.5.2 Perceived Impact of Improvised Instructional Materials on Student Learning**

Respondents generally perceived improvised instructional materials as beneficial for student understanding and engagement, particularly in complex topics like Genetics and Cellular Biology. This observation supports the constructivist theory of learning, which posits that students gain deeper understanding through hands-on experiences and interactions with learning materials. The positive perceptions reported in this study are consistent with previous findings that indicate increased student engagement and comprehension when lessons incorporate practical, relatable resources (Ogwo & Oranu, 2006).

**4.5.3 Challenges in Using Improvised Instructional Materials**

The study revealed significant challenges in the use of improvised materials, including lack of time, limited resources, and inadequate training. These challenges align with existing literature highlighting similar constraints faced by educators in resource-limited environments (Olagunju & Abiola, 2008). Addressing these challenges may involve institutional support, such as funding for materials and professional development opportunities, which would enable teachers to use improvisation more effectively in their classrooms.

**4.5.4 Recommendations for Enhancing Instructional Material Use**

Both teachers and students suggested various strategies to improve the use of instructional materials in Biology teaching. Key recommendations included increased funding for resources, more training opportunities focused on material improvisation, and ensuring a steady supply of necessary materials. These suggestions align with the broader educational literature, which advocates for resource and policy support to improve teaching effectiveness, especially in science education. Implementing these recommendations could enhance the integration of improvised materials in Biology lessons, making them more accessible and effective for student learning.

**4.5.5 Implications for Biology Education**

The findings from this study have important implications for Biology education in Kaduna South and similar contexts. The positive perceptions of improvised materials underscore the value of hands-on, engaging resources in facilitating student learning. Additionally, the challenges identified suggest that to fully realize the benefits of improvisation, there is a need for systematic support, including resource allocation, training, and material provision. Such support could help Biology teachers adopt more innovative, interactive approaches to teaching, improving student outcomes in complex scientific topics.

**4.6 Summary of the Findings**

The study examined how instructional materials, especially improvised resources, are used in teaching Biology in senior secondary schools in Kaduna South. Traditional materials like charts and models are commonly used, but improvised materials are less frequent, largely due to practical limitations. Teachers and students found improvised resources beneficial for complex topics, aiding in visualization and engagement. However, barriers such as limited resources, time, and training hinder their use. Recommendations for improvement include increased funding, more teacher training on improvisation, and better provision of resources to enhance Biology instruction.