

# Availability and Utilization of Instructional Materials in Teaching and Learning of Biology in Senior Secondary Schools

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## ABSTRACT

This study investigated the availability and utilization of instructional materials in the teaching and learning of biology in senior secondary schools in Talata Mafara Town, Zamfara State. A descriptive survey research design was adopted for the study using quantitative data. The population comprised all the heads of department of biology in the senior secondary schools (six public and four private) in Talata Mafara Town. The entire population constituted the sample of the study due to its small size. A validated questionnaire with reliability index of 0.63 obtained using Cronbach's alpha was used as instrument for data collection. The data collected were analyzed using frequency counts and percentages presented in tables and charts. Five research questions guided the study. The findings of the study revealed that some of the required instructional materials are fairly available but are not regularly use by biology teachers. Biology laboratories and instructional materials relating to multimedia are lacking in most of the schools in Talata Mafara Town. Lack of fund for procurement and large class size coupled with lack of in-service training for serving biology teachers were major factors identified to inhibit effective provision and utilization of instructional materials respectively. Based on these findings, the study recommended among others that biology teachers in Talata Mafara Town should make effort in utilizing available instructional materials. Zamfara Sate Government should build biology laboratories and make provision for instructional materials especially multimedia related in all senior secondary schools in Talata Mafara. Professional development of biology teachers should be encouraged and sponsored by government and other relevant stake holders.

**Keywords:** instructional materials, availability, utilization, teaching/learning biology

## INTRODUCTION

No country can afford to disregard science at any level of education due to its impact on national development. At the senior secondary school level, biology is one of the key science subjects required in senior secondary school certificate examination (SSCE) (Ogbuze & Okoli, 2020; Umar, 2011; Umar et al., 2020). Biology is a science subject that aims at equipping students with appropriate scientific attitude, competences, and ability to apply scientific knowledge to every challenges of life. The objective of biology curriculum at secondary school level is to inculcate scientific process and attitudes in students.

The objective is highlighted by Nigerian Educational Research and Development Council (NERDC, 2008) that objectives of secondary school biology curriculum is designed to enable students acquire suitable laboratory and field skills, meaningful and relevant knowledge in biology, scientific knowledge that is applicable, in health, agriculture, personal and community daily life matters and development of

functional scientific attitudes. Several topics in biology such as ecology, cell theory, metabolism, osmosis, and so on, require approaches promoting experimental problem-solving and process-based skills (Jeronen et al., 2017). According to Ogbuze and Okoli (2020), nearly all science and arts students choose biology as they enroll for senior secondary class. Reason being that biology serves as a prerequisite subject for many fields of study (Adesola et al., 2022) and professions such as medicine, nursing, pharmacy, microbiology, biomedical technology, biochemistry, and other related disciplines. Thus, it contributes immensely to the national development. Also, Matazu (2022) stressed that biology is a very important subject for technological development. The subject is fundamental for individual well-being, development of good living environment and acquisition of functional scientific attitudes. It is therefore imperative that secondary school students are well-grounded in biology for Nigeria to attain the state of national development it desires (Nuhu et al., 2021).

However, in spite of the relevance of biology, the manner of teaching and learning of the subject as well as the students'

academic performance have become sources of concern for all stakeholders (Ajemba et al., 2021; Ezeh et al., 2021; Matazu, 2022; Umar et al., 2020). The records of students' academic achievements in biology in both internal and external examinations have remained abysmal over the years (Umar et al., 2020). Thus, by implication, quite a number of students have been failing to meet the minimum requirement to further their studies in disciplines that required credit in biology. Many studies have attributed the poor achievement of students in biology to many factors such as lack of effective teachers, large class size, poor teaching methods, and lack of basic laboratory facilities among others.

Nevertheless, Matazu (2022) found a strong connection between utilization of instructional materials and students' performance in biology. Munnir and Musa (2020) also reported a similar result for physics. Ahmed et al. (2012) contend that secondary school students performed poorly in biology because instructional materials are not adequately available and sometimes might be available but are not adequately utilized. Nuhu et al. (2021) lamented that mastery of biology concepts might not be fully achieved without the use of instructional materials. Relevant and appropriate instructional materials help to arouse and sustain interest and help to concretize ideas and stimulate the imaginations of the students, thus enhances achievement of students in a subject (Mustapha et al., 2022).

According to Akanbi (2018), instructional materials are aids "designed to enrich the teaching and learning processes and hence contribute to better learning" (p. 15). Adesola et al. (2022) defined instructional materials as any animate materials or inanimate objects as well as human and non-human resources that a teacher may use in teaching and learning situations to facilitate desired learning outcomes. Similarly, Mustapha et al. (2022) defined instructional materials as teaching and learning materials that are used by a teacher to assist in providing information for the attainment of required learning experience. Therefore, instructional materials are all the things or materials that may be used by a teacher as part of instructional process in order to deliver effective and successful teaching that can facilitate positive students' learning outcomes. Thus, they are all materials intentionally used by a teacher to impact students' learning during instruction.

According to Olatunde-Aiyedun (2021, as cited in Ajemba et al., 2021), instructional materials include, modern textbooks, equipment, consumables like chemicals and reagents, models, charts etc. and the physical learning environments, which include the science classrooms and laboratories. Similarly, Adesola et al. (2022) gave examples of some instructional materials to include, cardboard paper, real objects, CD ROM, CD ROMs, charts, radio, DVDs, test tube holders, clinostat, reptile hook, models, diagrams, and pictures. Matazu (2022) identified prints, textbooks, magazines, newspapers, slides, photos, workbooks, and electronic media as examples of instructional resources. Instructional materials comprised locally made tools (such as improvised materials like mosquito net, wooden ring/iron, thread, and needle) or imported tools (e.g., aspirator and clinostat) that help to facilitate the teaching/learning process

(Chukwunazo et al., 2022; Effiong & Igiri, 2015). They could also be print or non-print objects.

For effective teaching of science subjects, the use of instructional materials to enrich instruction is very vital (Chukwunazo et al., 2022). According to Matazu (2022), instructional materials played an essential part in the teaching-learning processes among which are, as follows:

1. Improving students' memory levels.
2. To make the teaching-learning process easier.
3. To increase the rate of assimilation of students.
4. Serve as instruments for teachers to utilize in correcting incorrect impressions and illustrating ideas that students cannot easily forget.
5. Assist in giving the body of knowledge under debate a sense of actuality.
6. It personalizes teaching and stimulates teachers' inventiveness.
7. Allow students and teachers to participate in concrete learning activities that develop the concept of self-evaluation (p. 197).

For a science teaching to be effectively delivered, every student must be given an opportunity to handle the materials of science and experience science individually. Hence, it is practically impossible to science teach without instructional materials. This is because they constitute an important component in the teaching and learning environment (Ajemba et al., 2021; Matazu, 2022; Sodangi et al., 2022). They can be regarded as the vehicle that carry messages or information from a transmitting source (teacher) to the receiver (learner). Instructional materials are needed in teaching and learning of biology for students to acquire scientific process skills such as observing, measuring, classifying recording experimenting, analyzing inferring, etc.

Salaudin et al. (2020) expressed that secondary biology students cannot fully understand most of the concepts of biology when taught without instructional materials. As a subject of life and living things, biology must be taught practically and not only theoretically for it to be meaningful, understood and appreciated by students. Biology teachers should therefore expect to lay emphasis on the understanding of biology and not on collection of information or memorization. Similarly, Ajemba et al. (2021) stated that the quality of education a student receives largely depends on the quality of teaching/learning resources provided, thus, students learn fast when instructional materials are applied in the implementation of the teaching. Therefore, "teachers, who are to implement the curriculum, are expected to use a wide range and quality instructional materials for effective and efficient teaching and learning in the classroom activities" (Matazu, 2022, p. 196).

The availability and utilization of instructional materials are crucial in the teaching and learning of biology. Matazu (2021, as cited in Matazu, 2022) posited that meaningful teaching and learning can only be attained when there is appropriate and efficient availability and utilization of both human and material resources. More so, Ajemba et al. (2021) stated that the quality of knowledge a student receives largely depends on the quality of teaching/learning resources

available, because students learn fast when instructional materials are applied in the implementation of the teaching..

However, Ajemba et al. (2021) observed that shortage of instructional materials for science teaching and learning in Nigerian schools has been a major issue of concern. He argued that many science teachers do not have adequate instructional materials to deploy for teaching and this is affecting the learning processes of the students. In view of this, this study is set to investigate the availability and the level of utilization of the available instructional materials in teaching and learning of biology in senior secondary schools in Talata Mafara Town, Zamfara State, Nigeria.

### Statement of the Problem

Students' achievement in biology at senior secondary school level in Nigeria has been persistently poor of which students in Zamfara State under which Talata Mafara is a local government (the study area), have been performing more poorly in science subjects in external examinations yearly (Sodangi et al., 2022). West African Examinations Council chief examiners' report (WAEC, 2019) indicated that, for the past six years (2013-2019), the percentage of students that passed biology in SSCE at credit level and above were consistently less than 50% in the country. Various reasons have been attributed to this problem by scholars. However, it had been empirically supported by Adesola et al. (2022) and Matazu (2022) that the students taught biology utilizing relevant instructional materials performed better and also retained more knowledge than those taught without instructional materials. Similar finding was also reported for physics by Munnir and Musa (2020). Therefore, this could mean that the poor achievement being experienced by students in biology may not be unconnected to the state of instructional materials in schools, which are characterized by either available, non-available, inadequate, and non-utilization by many research findings. Thus, this study sought to investigate the availability and utilization of instructional materials or otherwise in senior secondary schools in Talata Mafara Town of Zamfara State.

### Objectives of the Study

The main objective of the study was to determine the availability and utilization of instructional materials in teaching and learning of biology in senior secondary schools in Talata Mafara Town. Specifically, the study sought to find out the followings:

1. The availability of instructional materials for teaching and learning of biology in senior secondary schools in the study area.
2. Whether the instructional materials available are adequate to facilitate teaching and learning of biology in senior secondary schools.
3. The extent to which biology teachers utilize the available instructional materials in teaching and learning of biology in senior secondary schools.
4. The factors hindering effective provision of instructional materials for teaching and learning of biology in senior secondary schools.

5. The factors inhibiting the effective utilization of instructional materials for teaching and learning of biology in senior secondary schools.

### Research Questions

The following research questions guided the study:

1. What are the available instructional materials for teaching and learning of biology in senior secondary schools in the study area?
2. Are the instructional materials available adequate to facilitate teaching and learning of biology in senior secondary schools?
3. To what extent do biology teachers utilize the available instructional materials in teaching and learning of biology in senior secondary schools?
4. What are the factors hindering effective provision of instructional materials for teaching and learning of biology in senior secondary schools?
5. What are the factors inhibiting the effective utilization of instructional materials for teaching and learning of biology in senior secondary schools?

## METHODOLOGY

A descriptive survey research design was adopted for the study using quantitative data. Survey describe and explain what is in existence or non-existence on the present status of phenomena being investigated (Nuhu et al., 2021). The adoption of the design was because the study described the characteristics features of a given population (Creswell, 2012). The target population comprised all the heads of department of biology (HODs) in both the public and private senior secondary schools in Talata Mafara Town of Zamfara State. There are ten senior secondary schools (six public and four private) in Talata Mafara Town.

Due to the small size of the population, all the HODs of biology of all the ten schools formed the sample of the study. The recommendation of Delice (2010) informed this decision. Delice (2010) stated that when the population size is small, the whole population can be used for such study.

Questionnaire was used as instrument for data collection for the study. It has two sections. Section A is comprised of a checklist containing a standard list of instructional materials for teaching and learning biology and also the questions relating to their availability and extent of utilization. The checklist seeks information on availability and adequacy of instructional materials to answer research question one to three. Section B of the instrument seeks information concerning the factors hindering effective provision and utilization of instructional materials for teaching biology. The items in section B were adapted from Achimugu (2017) to answer question four and five.

In all the schools, the researchers requested the HODs of biology for the inventory book to check the instructional materials in line with the prepared checklist for them to tick appropriately were available or not. On the availability of instructional materials, the checklist was set on the benchmark of 50%. Item with 50% response and above were

**Table 1.** Frequency & percentage of available instructional materials for biology teaching & learning in senior secondary schools

S/N	Instructional materials	Adequately available (%)	Inadequately available (%)	Not available
1	Chalk board	10 (100)		
2	Textbooks	5 (50)	5 (50)	
3	Real object/models	3 (30)	3 (30)	4 (40)
4	Televisions/motion pictures		2 (20)	8 (80)
5	Computers		2 (20)	8 (80)
6	Pictures & graphs/charts	3 (30)		7 (70)
7	Projectors		2 (20)	8 (80)
8	Audio record/tapes		2 (20)	8 (80)
9	Microscopes	5 (50)	2 (20)	3 (30)
10	Hand lens	5 (50)	2 (20)	3 (30)
11	Quadrats forceps	1 (10)	5 (50)	4 (40)
12	Forceps	1 (10)	4 (40)	5 (50)
13	Specimen of plants & animals	4 (40)	4 (40)	2 (30)
14	Bunsen burners/stoves	5 (50)	3 (30)	2 (20)
15	Beakers	3 (30)	4 (40)	3 (30)
16	Measuring cylinders	3 (30)	4 (40)	3 (30)
17	Distilled water	4 (40)	4 (40)	2 (20)
18	Reagents	4 (40)	5 (50)	1 (10)
19	Aquarium	1 (10)	3 (30)	6 (60)
20	Wind guage anemometer	1 (10)	3 (30)	6 (60)
21	Thermometer	1 (10)	2 (20)	7 (70)
22	Dissecting kits/board	3 (30)	3 (30)	4 (40)
23	Conical flasks	5 (50)	2 (20)	3 (30)
24	Test tubes	5 (50)	3 (30)	2 (20)
25	Boiling tubes	5 (50)	3 (30)	2 (20)
26	Slides/cover slips	2 (20)	1 (10)	7 (70)
27	Biology laboratory	3 (30)		7 (70)

Note. Source: Field work, 2022

regarded as available while items below 50% were regarded as not available.

Adequacy of the available instructional materials was weighed by one instructional material per student is adequate, one instructional material per 10 students is fairly adequate while one instructional material for more than 10 students is inadequate. The instrument was validated and also reliability index of 0.63 was obtained using Cronbach's alpha. The instrument was administered to the HODs of biology directly by the researchers and were 100% retrieved. The data collected were analyzed using frequency counts and percentages presented in tables and charts.

## RESULTS

### Research Question 1: What Are the Available Instructional Materials for Teaching and Learning of Biology in Senior Secondary Schools in the Study Area?

Table 1 reveals that out of the 27 instructional materials listed, only chalkboard is 100% available while six of them (textbooks, microscopes, hand lens, conical flasks, test tubes, and boiling tubes) are 50% available. HODs of biology indicated that 60-80% of the nine instructional materials out of 27 are not available in their schools of which televisions/motion pictures, computers, projectors, audio record/tapes recorded 80% non-availability. Biology laboratory is lacking in 70% of the schools.

### Research Question 2: Are the Instructional Materials Available Adequate to Facilitate Teaching and Learning of Biology in Senior Secondary Schools?

The result of the analysis presented in Table 2 shows that instructional materials are fairly available in some senior secondary schools in Talata Mafara Town. Charts, microscope, test tubes, boiling tubes, reagents, and so on were found to be fairly adequate. Instructional materials like cylinders, Bunsen burners, measuring cylinders, distilled waters and so on were inadequately available while some of these instructional materials like televisions/motion pictures, projectors, and audio recorder/tapes were least available in secondary schools as responded by the HODs of biology.

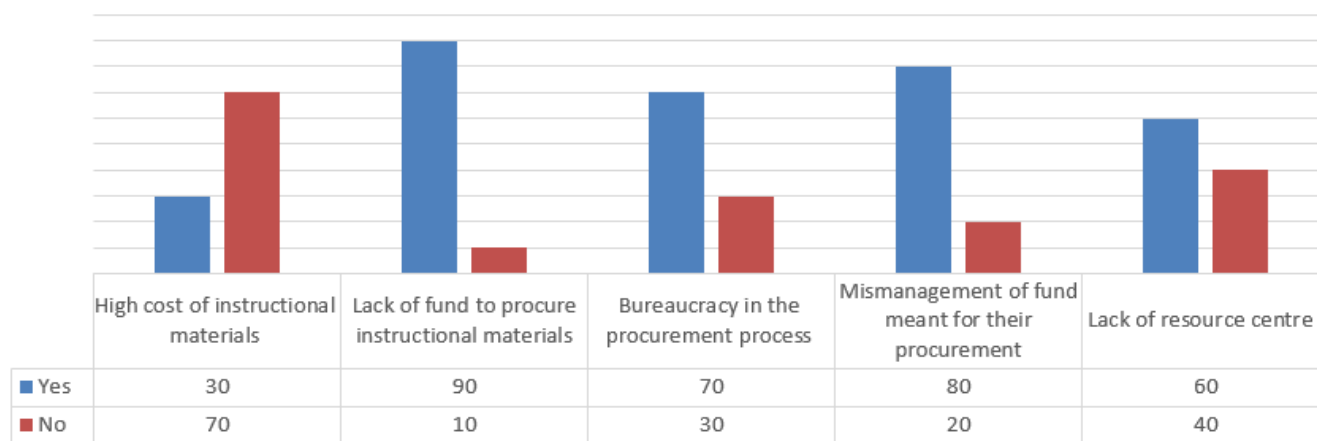
### Research Question 3: To What Extent Do Biology Teachers Utilize the Available Instructional Materials in Teaching and Learning of Biology in Senior Secondary Schools?

Table 2 shows that all of the available instructional materials except two are not being utilized by biology teachers. Only chalkboard (100%) and textbooks (80%) are regularly put into use while the remaining instructional materials are rarely utilized in teaching and learning of biology in the secondary schools in Talata Mafara Town.

**Table 2.** Frequency & percentage of the extent in which biology teachers utilize the available instructional materials in biology teaching & learning in senior secondary

S/N	Instructional materials	Regularly used (%)	Not regularly used (%)	Decision
1	Chalk board	10 (100)		Utilized
2	Textbooks	8 (80)	2 (20)	Utilized
3	Real object/models	3 (30)	7 (70)	Not utilized
4	Television/motion pictures		10 (100)	Not utilized
5	Computers	1 (10)	9 (90)	Not utilized
6	Projectors		10 (100)	Not utilized
7	Audio-record		10 (100)	Not utilized
8	Microscope	3 (30)	7 (70)	Not utilized
9	Hand lens	3 (30)	7 (70)	Not utilized
10	Quadrat		10 (100)	Not utilized
11	Forceps	1 (10)	9 (90)	Not utilized
12	Preserved specimen of plants & animals	3 (30)	7 (70)	Not utilized
13	Bunsen burners/stoves	3 (30)	7 (70)	Not utilized
14	Measuring cylinders	3 (30)	7 (70)	Not utilized
15	Beakers	3 (30)	7 (70)	Not utilized
16	Distilled water	3 (30)	7 (70)	Not utilized
17	Reagents	3 (30)	7 (70)	Not utilized
18	Aquarium		10 (100)	Not utilized
19	Wind gauge		10 (100)	Not utilized
20	Rain gauge		10 (100)	Not utilized
21	Anemometer		10 (100)	Not utilized
22	Dissecting kits/board		10 (100)	Not utilized
23	Conical flasks		10 (100)	Not utilized
24	Test tubes	3 (30)	7 (70)	Not utilized
25	Boiling tube	3 (30)	7 (70)	Not utilized
26	Slides/cover slips	3 (30)	7 (70)	Not utilized
27	Biology laboratory	3 (30)	7 (70)	Not utilized

Note. Source: Field work, 2022



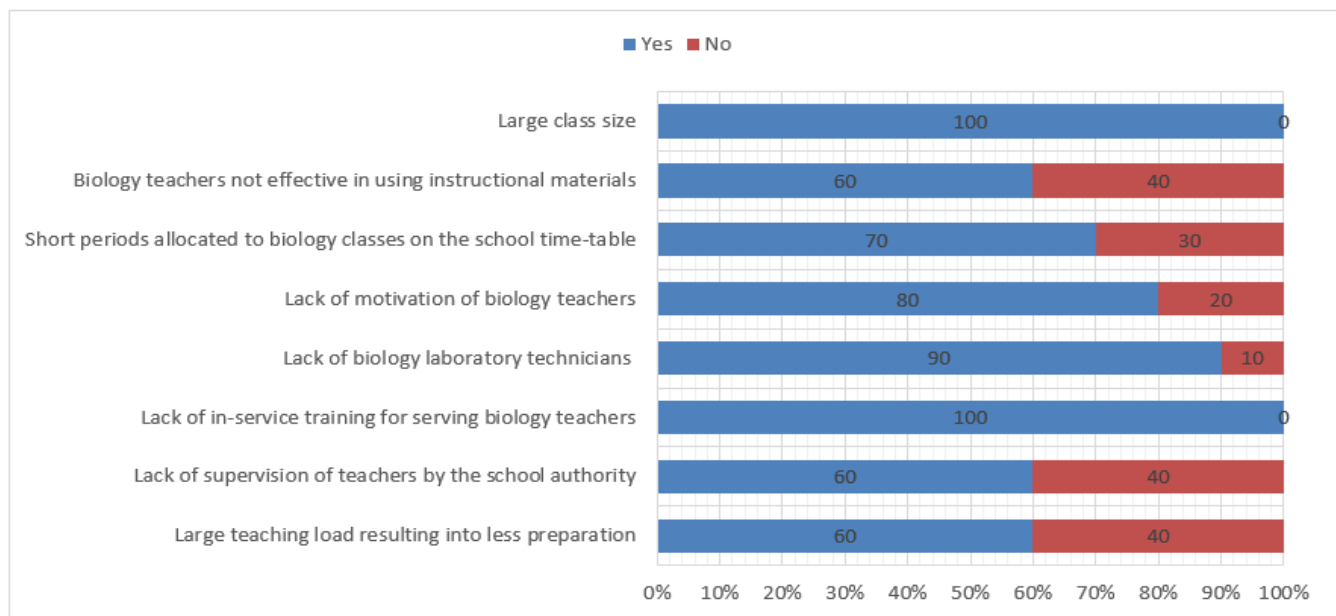
**Figure 1.** HODs' responses on the factors inhibiting effective provision of instructional materials for teaching biology in senior secondary schools (Source: Field work, 2022)

**Research Question 4: What Are the Factors Hindering Effective Provision of Instructional Materials for Teaching and Learning of Biology in Senior Secondary Schools?**

The result in **Figure 1** shows that 50-90% of the HODs affirmed to all the listed factors that inhibit effective provision of instructional material for teaching and learning biology except one (i.e., high cost of instructional materials). This implies that majority of the HODs (70%) did not consider instructional materials as too expensive to procure.

**Research Question 5: What Are the Factors Inhibiting the Effective Utilization of Instructional Materials for Teaching and Learning of Biology in Senior Secondary Schools?**

**Figure 2** indicates that all the items stated on the factors inhibiting effective utilization of instructional materials by biology teachers have 60-100% "yes" responses of the HODs. This shows that they believed that all the factors mentioned impede effective utilization of instructional materials for teaching biology in senior secondary schools in Talata Mafara Town. Large class size and lack of in-service training for the serving biology teachers were major inhibitors (100%).



**Figure 2.** HODs' responses on the factors that inhibit effective utilization of instructional materials (Source: Field work, 2022)

### Discussion of the Results

Findings from this study revealed that instructional materials are fairly available in most senior secondary schools in Talata Mafara Town for the teaching and learning of biology. This finding is in line with that of study conducted Ogbuze and Okoli (2020) who found that secondary schools in Anambra State have instructional materials and equipment for teaching biology. Munnir and Musa (2020) also revealed a similar finding for physics, where they reported availability of instructional materials required for teaching the subject in Katsina Metropolis. The study also revealed that, 60% of senior secondary schools in Talata Mafara Town lack physical laboratories for conducting biology practical. This means that, non-availability of biology laboratory implies that biology practical is not being conducted in such schools. Again, this situation necessitate the use of principal offices for the storage of laboratory equipment and other instructional materials in some schools. By implication, the teacher and the students will have to constantly convey the instructional materials to the classrooms if they are to be used. The stress involved in this kind of situation may discouraged biology teachers to use available instructional materials.

The finding of this study also revealed that instructional materials available are fairly adequate for effective teaching and learning of biology in senior secondary schools in Talata Mafara Town. This implies that the availability and adequacy of the instructional materials should have positive impact on the effective teaching and learning of biology thereby improving the academic performance of secondary school students in Talata Mafara if they are properly being utilized. Unfortunately, the finding of this study revealed that chalkboard is the only instructional material that is 100% available and fully utilize (100%) followed by textbooks with 80% utilization. This may likely suggest that chalk-and-talk method of teaching is predominantly used in teaching biology in Talata Mafara Town.

The study also revealed that instructional materials for conducting practical such as microscopes, hand lens, conical flasks, test tubes, bunsen burners and boiling tubes are adequately available but not being put into proper use. This finding corroborates that of Musah and Umar (2017) and Ibrahim et al. (2021) who found that instructional materials in biology laboratory are fairly available and are underutilized in secondary schools in Yobe and Borno States, respectively. Similar finding was also reported for chemistry in Nsukka Local Government by Ngozi and Cliff (2022) that teachers do not utilize even the few available instructional materials for teaching and learning. Ogbuze and Okoli (2020) found a moderate utilization of instructional materials by biology teachers in Anambra State. However, the study conducted by Munnir and Musa (2020) revealed a contradictory result for physics subject that most of the instructional materials required for teaching and learning of physics in Katsina State are being utilized in the schools sampled. This supported by the finding of Nuhu et al. (2021) who also found that instructional materials for teaching and learning are available for teaching biology in private secondary schools in Potiskum. The attitude of having instructional materials in schools and teachers not utilizing them during instruction could be because, they are kept only to be use when extremely needed or for the purpose of SSCE examinations.

The finding of this study also revealed that audio-visual instructional materials (multimedia related) such as televisions/motion pictures, computers, projectors, and audio record/tapes have the highest percentage (80%) of non-availability in senior secondary schools in Talata Mafara Town. This agrees with the findings of Achimugu (2017) and Ngozi and Cliff (2022) who found that instructional materials relating to audio-visuals (multimedia) are mostly not available in most secondary schools, but where they are found available they are inadequate and not being utilized by teachers. The audio-visual materials (multimedia) are important in the teaching and learning process because with them "the barrier of communication and distance is broken" (Ezeh et al., 2021,

p. 15) and very effective in improving academic performance and retention (Bello et al., 2022).

This study also revealed that the HODs responded that lack of fund to procure instructional materials, bureaucracy in the procurement process, mismanagement of fund meant for their procurement and lack of resource centre are factors inhibiting effective provision of instructional materials for teaching and learning of biology in senior secondary schools in Talata Mafara Town, but surprisingly they did not consider "high cost of instructional materials" as an inhibiting factor. On the factors inhibiting the effective utilization of instructional materials by biology teachers, all the HODs (100%) were of the opinion that large class size and lack of in-service training for serving biology teachers were the major factors. Also, nearly all of them (60-90%) believed that inefficiency of biology teachers in using instructional materials, short periods allocated to biology classes, lack of motivation and lack of biology laboratory technicians factored in inhibiting the effective utilization of instructional materials in the study area. These findings corroborates with the study of Achimugu (2017) whose work also found similar factors affecting the effectiveness of provision and utilization of instructional materials in senior secondary schools. The state of the availability and utilization of instructional materials could be related to the persistent poor performance in biology in Talata Mafara, Zamfara State as there is significant effect of such on students' academic performance in biology (Moses, 2020; Mustapha et al., 2022).

### Summary of the Findings

The findings can be summarized, as follows:

1. Some of the required instructional materials for teaching and learning biology are fairly available in senior secondary schools in Talata Mafara Town.
2. The instructional materials available are underutilized by biology teachers in Talata Mafara Town.
3. Lack of fund for procurement of instructional materials is one of the major factors inhibiting effective provision of instructional materials in senior secondary schools in Talata Mafara Town.
4. Large class size and lack of in-service training for serving biology teachers were identified as major factors inhibiting effective utilization of instructional materials in Talata Mafara Town.

### CONCLUSION

Based on the research findings of this study, it is concluded that some of the required instructional materials to carryout effective teaching and learning of biology are fairly available while others are not. These fairly available of instructional materials are not regularly utilized by biology teachers. Several factors were found to inhibit effective provision and utilization of instructional materials in senior secondary schools in Talata Mafara Town, Zamfara State.

### Recommendations

The following recommendations were made by the researchers based on the findings of this study:

1. Zamfara Sate Government through Ministry of Education should make provision for instructional materials especially audio-visuals (multimedia) and also build biology laboratories in all senior secondary schools in Talata Mafara in order to for improve teaching effectiveness of biology teachers.
2. Biology teachers should make effort in the utilization of available instructional materials and endeavour to improvise those not available or inadequate.
3. Professional development of biology teachers should be emphasized and sponsor by government and other related stake holders with emphasis on instructional materials, resources production, utilization, and management.
4. There is need for the establishment of resource centre for effective provision and ease accessibility of biology instructional materials in Talata Mafara.
5. Zamfara Sate Government should construct more classrooms to reduce over population alongside recruitment of more biology teacher to reduce workload to ease their stress in the utilization of instructional materials in senior secondary schools in Talata Mafara.

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**Availability of data and materials:** All data generated or analyzed during this study are available for sharing when appropriate request is directed to corresponding author.

### REFERENCES

- Achimugu, L. (2017). Availability and utilization of instructional materials for teaching chemistry in senior secondary schools. *International Journal of Novel Research in Education and Learning*, 4(3), 33-43.
- Adesola, M. O., Olorode, G. B., & Aranmolate, T. R. (2022). Effect of instructional materials on biology instructions among high achieving secondary school students in SPED international secondary school, Oyo, Nigeria. *Journal of Educational Research in Developing Areas*, 3(2), 237-245.
- Ahmed, M. A., Abimbola, I. O., Omosewo, O. E., & Akanbi, A. O. (2012). Availability and utilization of instructional resources for teaching basic science and technology in secondary schools in Korin, Nigeria. In *Proceedings of the 53<sup>rd</sup> Annual Conference of Science Teachers* (pp. 203-214). Science Teachers Association of Nigeria.

- Ajemba, H. E., Ahmed F. M., Ogunode N. J., & Olatunde-Aiyedun, T. G. (2021). Problems facing science teachers in public secondary schools in Nigeria and way forward. *International Journal of Discoveries and Innovations in Applied Sciences*, 1(5), 118-129.
- Akanbi, K. (2018). *Selection, utilization, and evaluation of instructional media*. Y Books Press.
- Bello, S., Kamar, Y. M., Yushau, M. A., & Abubakar, H. S. (2022). Efficacy of computer assisted multimedia instruction on students' academic performance and retention of ecology in some northwestern states, Nigeria. *Journal of Educational Research in Developing Areas*, 3(2), 127-140. <https://doi.org/10.47434/JEREDA.3.2.2022.127>
- Chukwunazo, O. M., Okwuchukwu, O. K., & Chikendu, R. E. (2022). Interaction effects on teaching with improvised instructional materials and standard instructional materials in secondary school chemistry. *ISSRA Journal of Education, Linguistics and Literature*, 2(2), 19-25. <https://doi.org/10.5281/zenodo.6476197>
- Delice, A. (2010). The sampling issues in quantitative research. *Educational Sciences: Theory and Practice*, 10(4), 2001-2018.
- Effiong, O. E., & Igiri, C. E. (2015). Impact of instructional materials in teaching and learning of biology in senior secondary schools. *International Letters of Social and Humanistic Sciences*, 62, 27-33. <https://doi.org/10.18052/www.sci.press.com/ILSHS.62.27>
- Ezeh, O. V., Nwobodo, D., & Ishiwu, I. U. (2021). Extent of implementation of biology curriculum in senior secondary schools in Nsukka and Obollo-Afor education zones of Enugu State, Nigeria. *British International Journal of Education and Social Sciences*, 8(7), 13-18.
- Ibrahim, J. N., Musa, O. D., & Adamu, G. J. (2021). Utilization of biology laboratory teaching facilities and equipment in senior secondary schools in Borno State, Nigeria. *Journal of Science Technology and Education*, 9(4), 152-170.
- Jeronen, E., Palmberg, I., & Yli-Panula, E. (2017). Teaching methods in biology education and sustainability education including outdoor education for promoting sustainability-A literature review. *Education Sciences*, 7(1), 1-7. <https://doi.org/10.3390/educsci7010001>
- Matazu, S. S. (2022). Enhancing secondary school students' academic performance and retention in biology using instructional materials. In *Proceedings of the 62<sup>nd</sup> Annual Conference of Science teachers* (pp. 196-206). Science Teachers Association of Nigeria.
- Moses, V. (2020). Influence of instructional materials on students' academic performance in biology in Calabar South local government area, Cross River State. *Social Science Research Network*. <https://doi.org/10.2159/ssrn.3531233>
- Munnir, A., & Musa, L. (2020). Assessment of availability, utilization, and impact of instructional materials on performance of physics students in Katsina Metropolis, Nigeria. *Journal of the General Studies Unit Federal University Wukari*, 2(3), 44-54.
- Musah, A., & Umar, A. A. (2017). Effects of availability and utilization of biology laboratory facilities and students' academic achievements in secondary schools in Yobe State, Nigeria. *International Journal of Innovative Social & Science Education Research*, 5(2), 1-8.
- Mustapha, A., Aminu, B. K., Abdu, S. B., & Dauda, A. (2022). Availability of instructional materials on students' academic performance in senior secondary schools in Maiduguri Metropolis, Borno State. *Asian Journal of Advanced Research and Reports*, 14(2), 11-17. <https://doi.org/10.9734/AJARR/2020/v14i230325>
- NERDC. (2008). *Senior secondary school curriculum: Biology for senior secondary schools 1-3*. Nigerian Educational Research and Development Council Press.
- Ngozi, M. E., & Cliff, I. O. (2022). Availability and utilization of multimedia tools in chemistry instruction. In *Proceedings of the 62<sup>nd</sup> Annual Conference of Science teachers* (pp. 72-81). Science Teachers Association of Nigeria
- Nuhu, I., Abba, Alhaji, M., Musa, A., Uzoma, G. I., & Gambo, B. M. (2021). The attitude of biology teachers towards improvisation and utilization of instructional materials in teaching and learning biology in private secondary schools in Potiskum local government area. *GSC Advanced Research and Reviews*, 8(1), 28-40. <https://doi.org/10.30574/gscarr.2021.8.1.0112>
- Ogbuze, C. O., & Okoli, J. N. (2020). Extent of use of practical works by biology teachers in public secondary schools in Anambra State, Nigeria. *UNIZIK Journal of STM Education*, 3(2), 168-181.
- Salaudin, K., Muhammed, I., & Jubrin, A. G. (2020). Exploring the relationship between biology teachers' qualifications and resource knowledge for teaching biology in senior secondary schools in Bauchi State. *Journal of Education in Developing Areas*, 28(2), 48-60.
- Sodangi, U., Isma'il, A., & Abdulrahman, A. (2022). Perception of secondary school science and mathematics teachers on professional development participation in Zamfara State, Nigeria. *Integrity Journal of Education and Training*, 6(2), 37-45. <https://doi.org/10.31248/IJET2022.138>
- Umar, A. A. (2011). Effects of biology practical activities on students' process skills acquisition in Minna, Niger state, Nigeria. *Journal of Science, Technology, Mathematics and Education*, 7(2), 118-126.
- Umar, S., Sani, M. Y., & Isma'il, A. (2020). Impact of interactive teaching strategy on interest and performance in ecology among secondary school students in Kano State, Nigeria. *Journal of Science Technology and Education*, 8(4), 123-131.
- WAEC. (2019). Chief examiner's report. *West African Examinations Council*. <http://www.waecgh.org/examiners-report>