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The Art of Teaching Methods in Biology: Strategies, and Aids in a Narrative View

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Abstract

Classroom procedure is a crucial aspect of effective teaching, involving careful consideration of instructional objectives, entering behavior, instructional procedures, and performance assessment. Instructional objectives outline what learners should achieve, guiding teachers in selecting lesson plans and methods. These objectives encompass cognitive, affective, and psychomotor domains, emphasizing knowledge acquisition, emotional growth, and skill development. Entering behavior connects new instruction to prior knowledge, while instructional procedures involve presenting lessons in an organized, step-wise manner. Performance assessment measures student achievement, informing future teaching strategies. Various teaching methods, such as lectures, demonstrations, discussions, and field trips, offer distinct advantages and disadvantages. Audio-visual teaching aids, including podcasts, videos, and interactive whiteboards, enhance learning by engaging multiple senses. By understanding these concepts, educators can create engaging, effective learning environments.

Keywords: *Classroom, teaching, methods, audio, visual, assessment*

1. Introduction

Biology is one of the major science courses needed by secondary school students to model them with appropriate knowledge to be able to study several courses at advanced level of education. Biology is a branch of science which envisages the study of living things and nonliving things (Koroka, 2004). It discusses pertaining plants and animals, their structures, functions, growth, and relationships with environment (Katto, 2004; Ashafa, 2015). Biology is a basic science subjects taught at most of the secondary schools in Sokoto state, Nigeria because it is pre-requisite to study medicine, pharmacy, nursing, science education, and other related science courses at Universities, polytechnics, colleges and other advanced schools (Ashafa, 2015).

Additionally, despite the popularity of biology subject in science and in the state among schools and students, several reports and studies are still depicting indices of poor performance in the subject (Ashafa, 2015). Albeit, many studies have successfully narrated several suggestions

responsible for poor biology performance, one of the reasons submitted was the teacher quality or variables (Ashafa, 2015; Balarabe et al., 2019). Therefore, this study's aim was to elucidate at biology teaching methods and the likes.

2. Biology and its significance

Biology is the study of living organisms, including their structure, function, growth, evolution, distribution, and interactions with the environment. It's a vast field that encompasses everything from the molecular mechanisms of cells to the complex interactions of ecosystems (Ashafa, 2015; Wushishi et al., 2016). Some key concepts in biology include:

1. Cell theory- The idea that all living things are composed of cells, which are the basic units of life.
2. Evolution-The process by which species change over time through natural selection and genetic variation.
3. Genetics-The study of heredity and variation, including the structure and function of DNA .
4. Ecology-The study of interactions between organisms and their environment, including ecosystems and biodiversity.
5. Homeostasis-The ability of living organisms to maintain a stable internal environment despite changes in the external environment.
6. Metabolism-The process by which cells convert energy and nutrients into the components of living organisms.
7. Biodiversity-The variety of different species, ecosystems, and genes within a given area (Ashafa, 2015).

These concepts form the foundation of biology and are interconnected in complex ways. Biology has numerous applications in various fields, impacting our daily lives in many ways. Here are some examples:

1. Medicine-Biology is crucial for understanding human diseases, developing treatments, and creating vaccines.
2. Agriculture-Biology helps improve crop yields, disease resistance, and nutritional content, ensuring global food security.
3. Conservation-Biology informs conservation efforts, protecting endangered species, and preserving ecosystems.
4. Biotechnology-Biology is used to develop new products, such as biofuels, bioplastics, and pharmaceuticals.
5. Environmental Science-Biology helps us understand and mitigate the impact of human activities on the environment.
6. Food Science-Biology is applied in food production, processing, and safety, ensuring nutritious and safe food.
7. Forensic Science-Biology is used in crime scene investigation, helping solve crimes and identify individuals.

8. Genetic Engineering-Biology enables the development of genetically modified organisms (GMOs) with improved traits.
9. Ecological Restoration-Biology is used to restore damaged ecosystems and promote biodiversity.
10. Pharmaceuticals-Biology is crucial for discovering and developing new medicines (Ashafa, 2015; Earla, 2015). These are just a few examples of the many applications of biology. Its impact is felt across various industries and aspects of our lives.

3. Classroom procedure

Classroom procedure is ensured upon considering a lot of factors, such as instructions objectives, entering, instructions procedure, and assessment (Adzongo & Olaitan, 2019).

Instructions objectives

Instructions objectives are what the leaner should get or attain at the completion of the instruction. It requires complete following of the curriculum of the subject matter. Objectives are reasons why the students learn the subject. Objectives are guide that help the teacher during the instruction business or activities. Objectives are helpful on selecting lesson plan, lesson methods, etc. Objectives are mostly clearly started in terms of cognitive knowledge or domain, attitude (affective domain), and psychomotor domain (skills) (Karmila, 2019; Kaur, 2024).

Cognitive domain

Cognitive domain they are objectives that emphasize on remembering of knowledge or something that was learnt. They are tied with intellectual skills or tasks. Cognitive involved how the learner could apply the knowledge, comprehension, analysis, and synthesis of knowledge being taught. It also involves evaluative capacity as the highest level of intelligence (Okoro & Haruna, 2006).

Affective domain

Affective domain refers to the how the knowledge received changed the behaviors of learners, and how the learners are able to affect others positively. A learners should be able to have good emotions such as acceptances of learning, sympathy, empathy, etc. Generally, affective domain is divided into receiving, responding, valuing, organization, and characterization (Okoro & Haruna, 2006).

Psychomotor domain

Psychomotor domain refers to the skills or performance gain due to learning or teaching. This domain has features such as reflex movement, perception abilities, skilled movement, non-discursive communication, and basic fundamental movement (Okoro & Haruna, 2006).

Entering Behavior

Entering Behavior is relevant to dispose that making a new instruction or teaching has to be linked to the previous observations or knowledge. The teacher has to understand the previous observations or knowledge of the students and use that to impart new concept of knowledge upon the students (Karmila, 2019; Kaur, 2024).

Instructional Procedure

Instructional Procedure refers to the teaching process that is unveiled by the teacher. Instructional Procedure refers to the manner or way in which the teacher presents new materials or lesson to the students. The presentation of lesson should be in order, step-wise manner, and involved student activity of participation (Karmila, 2019; Kaur, 2024).

Performance assessment

Performance assessment involved measuring the success of the lesson delivered. It also means measuring the level of achievement of students after what they have been taught. Performance assessment is done within and after the lessons so that corrections can be made (Karmila, 2019; Kaur, 2024).

4. Teaching aids

Audio teaching aids are tools used to support learning through sound. Audio teaching aids are meant or designed to engage students, convey information, and enhance understanding in various subjects (Adzongo & Olaitan, 2019). Therewith, enumerated are some examples:

1. Podcasts-Audio recordings on specific topics, often featuring interviews, discussions, or lectures.
2. Audiobooks-Recorded versions of books, helping students with reading comprehension and accessibility.
3. Lecture recordings-Audio recordings of classroom lectures, useful for review and revision.
4. Audio flashcards-Recorded vocabulary or key terms, aiding language learning and memorization.
5. Sound effects and simulations-Audio clips that recreate real-world scenarios, useful for subjects like science, history, or language learning.
6. Music and songs-Educational songs and melodies that teach concepts, such as alphabet, numbers, or historical events.
7. Audio quizzes and assessments-Recorded questions or exercises that test students' knowledge and understanding.

However, the benefits of audio teaching aids include the followings:

-Multisensory learning-Engages students through listening, enhancing retention and understanding.

- Accessibility-Supports students with different learning styles or abilities, such as visual impairments.
- Flexibility-Can be used anywhere, anytime, making learning more convenient.
- Engagement-Makes learning more enjoyable and interactive (Deshmukh, & Patankar, 2021; Ordu, 2021).

Visual teaching

Visual teaching aids are tools used to enhance learning and understanding through images, diagrams, charts, and other visual representations. In this vein enumerated are some common types:

1. Diagrams-Simple drawings that illustrate concepts, processes, or structures, like the human body or cell structure.
2. Charts and Graphs-Visual representations of data, such as bar charts, pie charts, or line graphs, used to compare or show trends.
3. Infographics-Engaging visuals that combine text, images, and data to explain complex topics or present information.
4. Models-3D representations of objects or concepts, like molecular models or anatomical models.
5. Videos and Animations-Dynamic visuals that demonstrate processes, experiments, or concepts, making learning more engaging.
6. Slideshows and Presentations-Sequences of slides with text, images, and other media used to convey information or teach concepts.
7. Posters-Large visuals that summarize key points or concepts, often used in classrooms or conferences.
8. Illustrations and Images-Detailed drawings or photographs used to explain concepts or show examples (Ordu, 2021).

Audio-visual aids

Audio-visual teaching aids are tools used to enhance learning by engaging both sight and sound. Audio are very helpful for making complex concepts more understandable and memorable. In this vein here are some common types:

1. Projectors-Display images or videos onto a screen, making it easier for a large group to see.
2. Videos/Films-Show real-life scenarios, animations, or demonstrations to explain topics vividly.
3. PowerPoint presentations-Combine text, images, and videos to make lessons more engaging.
4. Audio recordings-Use sounds, music, or podcasts to teach language, music, or other subjects.
5. Interactive whiteboards- Allow teachers and students to interact with digital content, making lessons more dynamic.
6. Educational apps-Use mobile apps to make learning fun and accessible on tablets or smartphones.
7. Overhead transparencies-Display images or text onto a screen using an overhead projector. These tools help cater to different learning styles and make lessons more interesting (Okoro & Haruna, 2006)..

5. Teaching methods and their merits

Teaching is an important major aspect of learning or education that facilitates modelling of learners to acquire character and knowledge. If the teachers are having a better perception of teaching, there is going to be good outcomes possibly, but poor perception pertaining teaching causes loopholes regards to learning outcomes in students (Okoro & Haruna, 2006). Teaching is a process or activity or carrier that involves guiding students through planned activities so that they can obtain the richest learning possible through their experiences. Teaching is also

regarded as an attempt that help students or people acquire or transform skills, knowledge, attitudes, idea, and appreciation. Teaching influences human and in turn lead to desirable behavior change. Thus, a good teacher is expected to bring about records of behavioral objectives achievement (Okoro & Haruna, 2006). There are several teaching methods that are useful in teaching and learning. However, each one of them is identified with merits and merits as will be broached in this section.

Lecture Method

Lecture method is a method that involves passing instructions from the teacher to the students. The teacher speaks while the students listen. During lectures the following tips are maintained:

- It should be in an organized manner
- The teacher lay much emphasis on important points of the lesson or subject matter
- Questions are asked within and after the lesson in order to assess understanding. Additionally, students asked questions on where they need more explanation
- Use of simple understandable language is important
- Use of other method to complement lectures is good
- Arrangements of teaching aids must be organized and properly carried out

However, the merits of lectures are as follows:

- It cover wide range of areas of the subject
- It helps students to learn uniformly
- The teacher has greater control of what students learn
- Large audience are taught using this method
- It encourages free expression of ideas
- It is less expensive or cheap method of instruction

Therein, the disadvantages of lectures include the following statements;

- It is not convenient for all subjects
- It is mostly teacher -inclined
- It is not convenient for young learners sometimes

Evaluation of lesson objectives may not always easy (Okoro & Haruna, 2006).

Demonstration method

Demonstration is methods to that encourage students to use sight and hearing during learning. It involves physical display of things and methods so that students can observe and manipulate them for learning purpose. Demonstration method may involves graphs, pictures, laboratory, instruments, procedures, items, etc that are helpful during the presentation or learning. Merits of this method could be specified as follows:

- It is a kind of realistic learning methodology that applied the manipulation of given objects to achieve objectives
- It ginger the interest and create an active learning room or environment
- It makes an economy of time

- It captures the attention of learners
- It satisfies learners especially the slow ones

Therein, the demerits of this method include the following statements:

- It has to be done using skills, patience, and considering all learners
- It requires expertise before being practiced
- It requires exhaustive planning and arrangements (Okoro & Haruna, 2006).

Discovery or problem solving method

This method teaching requires asking for information or questions or investigating something. In this fashion the students are spurred to analyze a problem, make questions, and propel a proper solution to the given problem. Almost all categories or levels of students can make use of this method in learning (Okoro & Haruna, 2006; Bello, 2025). Steps in this method include identifying the problem, making hypothesis, investigating the hypothesis, and making inferences due to findings.

Advantages of inquiry teaching method are summarized below:

- Students activeness is important, so it is encouraged.
- Students are encouraged to have skills in observations, investigating, asking, and thinking
- It encourages creativity, analysis, and logical learning
- It spur students interest in learning

Therein, the demerits of this type of method include:

- It is expensive and time -requiring
- Too much application of the method makes it boring.
- Learners may find it tedious because they make a lot of works (NICERT, 2009).

Discussion method

Discussion is a kind of instruction methodology that requires an exchange of views between people on a given topic or subject. It is used where there are no communication barriers. This method of communication allows all members to render their contribution and display efforts. The students argue, listen, reply, accept, reject, and suggest through discussion methods of learning. The teacher could categorize students in organized groups so that they can chat on a subject matter rendering their opinions, ideas, views, and appreciations. For making a good discussion, there is need for proper environment, prepared actors, set objectives, and a teacher that may monitor the participants. The merits of this method are summarized below:

- It is a good room for ideas sharing
- It encourages understanding and critical thinking
- It encourages oral communication and skills
- It encourages respect for different opinions
- The demerits of this method include the following:
- It is ideally time consuming

- It is cumbersome for large audience
- It may give bright students more opportunities
- It cannot be utilized in all subjects areas (Ajaja, 2023).

Dramatization of role play

Dramatization or role play is a type of teaching methods that allow a person to assume a position of someone. Students are engaged to initiate roles in planning, organizing, and guiding. Dramatization requires identifying problems, selecting actors, explaining problems to the class audience, selecting participants and roles, as well as rehearsal. Dramatization considers purpose, time, and discussion of important points at the end of lessons (Patnaik, 2019; Bello, 2025). The advantages of dramatization are as follows:

- It makes learning stimulating and less boring
- It encourages creativity and understanding of lessons
- In give students ability to express themselves freely
- It is practical and realistic in nature, therefore students –centered (Ajaja, 2023; Bello, 2025).

Therewith, the disadvantages of dramatization are as follows:

- It consumes time
- It is costly
- It may disorganized school timetable
- Learners may lose opportunity to learn lessons (Bello, 2025).

Field trip

Field trip is a teaching plot that involves students being engaged in learning by visiting certain places. Field trip must involve adequate planning, selecting the field and seeking permission, and proper organization (Lemu, 2005). Advantages of this method include the following:

- It is a method that encourage students creative thinking ability
- It exposes students to practical things
- It encourages relationship between schools and workplaces
- It provide students with firsthand information or experience

The demerits of this method may involve the following:

- It is time consuming and costly
- It is difficult to evaluate the level of achievement of students (Durdanovic, 2015; Bello, 2025).

Conclusion

Effective teaching involves carefully considering instructional objectives, entering behavior, instructional procedures, and performance assessment. By understanding and applying various teaching methods, such as lectures, demonstrations, discussions, and field trips, educators can cater to diverse learning styles and create engaging learning environments. The strategic use of audio-visual teaching aids, including podcasts, videos, and interactive whiteboards, further

enhances student understanding and retention. Ultimately, a well-planned classroom procedure, supported by a range of teaching methods and tools, is essential for fostering academic success and promoting lifelong learning.

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