

SUMMARY OF SOME KEY ASPECTS OF:

SED 402: NIGERIAN SECONDARY SCHOOL BIOLOGY CURRICULUM

Definition of Curriculum

The word “curriculum” comes from the Latin word “curere” which means “to run a course”. That is a “course of study” which contains a body of subject matter approved for teaching in schools by the society. Curriculum is a comprehensive framework that encompasses all planned educational activities and experiences within an institution, including the content, methods, objectives, assessments, and resources used to facilitate teaching and learning. It provides a holistic view of the educational program, guiding the selection and organization of learning experiences to achieve specific educational goals and outcomes. Different experts view curriculum from different perspectives. Here are some of the definitions.

- i. Curriculum is a plan for achieving intended learning outcomes, with what is to be learned and the results of instruction. (Unruh and Unruh, 1984)
- ii. A curriculum usually contains a statement of aims and specific objectives. It indicates some selection and organization of content; it either implies or manifests certain patterns of learning and teaching, finally it includes a programme of evaluation of the outcomes. (Taba, 1962)
- iii. The planned and guided learning experiences and intended outcomes, formulated through the systematic reconstruction of knowledge and experience, under the auspices of the school, for the learner’s continuous and willful growth in personal-social competence. (Tanner & Tanner).

Components of Curriculum

An expert in curriculum called Tyler (1999) was among the first to **suggest four (4) fundamental questions** which must be answered, when talking about the nature of curriculum in school which leads to the foundation of curriculum components. These questions are:

- i. What educational purpose should the school seek to attain? (**the objectives**)

- ii. What educational experiences can be provided to attain these purposes? (i.e. The activities, or the subject matter, **the content**).
- iii. How can these educational experiences be organized and presented effectively to achieve these purposes? (Teacher–centered or child-centered learning i.e. **methodology**)
- iv. How can we determine whether or not the expected objectives have been achieved? (i.e. using tests, performance observations and other forms of **evaluations**).

Six Essential Features of Senior Secondary School Biology Curriculum

- a. **Topic:** This state the area of subject to be taught or leaned. It captures what students must learn from the theme at every level. Examples are classification of living things cell structure and its function, cell properties Basic ecological concept (SS I), Ecological management and conservation of natural resources, Classification of plants (SS II), and Regulation of internal environment, Ecology of population, Balance in nature, Reproductive system in humans, Genetics, Variation and Evolution (SS III)
- b. **Performance Objectives:** These are the learning outcomes expected as a result of experiences and activities encountered in the lesson. It refers to what each student is expected to acquire after learning a particular topic. For example, under characteristics of living things, each student is expected to state characteristics of living things. However, it should be noted that the performance objectives presented in the curriculum are not exhaustive more are added as the need arises, especially in the higher cognitive level and psychomotor or affective domains.
- c. **Content:** this specifies aspects of the topic to be covered. Under the topic "Nutrition" for instance, the content to be covered include: food substances, types of food, balanced diet heterotrophic nutrition (comprising holozoic, saprophytic and parasitic modes), mammalian teeth (types, structure and formula) and enzymes.
- d. **Teacher's and students' activity:** This refers to effort or actions to be taken by both teachers and students in the course of the lesson for successful deliberation and achievement of the stated

objectives. Example is explanation of concept by the teacher, contributing and responding to the teacher's question by the students.

- e. **Teaching and learning resources:** These are instructional materials or tools required for effective presentation of biology lesson. They include teaching aids, apparatus, specimens, poster, charts and all other laboratory equipment such as chemicals or reagents that are consumed in biology practical lessons.
- f. **Evaluation guide:** In evaluation, the teacher would identify the level of what students learn. Questions to be asked in evaluation are normally based on stated objectives and stated in teacher's lesson plan. E.g. the teacher will ask students to state the distinguishing features between plant and animal cells.

From these features of the curriculum, the teacher is expected to draw his/her **scheme of work** where these features are to be split into weeks and lessons. A topic may be taught in one or more lessons while others may run over weeks. The daily **lesson plans** are then prepared from the scheme of work,

Organization of Biology Curriculum Content into Four Major Themes

The biology curriculum content is organized into four major themes, which serve as overarching frameworks for teaching and learning. These themes are designed to provide a structured approach to covering the diverse aspects of biology while facilitating meaningful connections between different topics. The four major themes include:

1. **Organization of life:** This theme focuses on introducing students to the fundamental concepts of life, including the characteristics of living things, classification of organisms, and the structure and function of cells.
2. **The organism at work:** In this theme, students delve deeper into the functioning of living organisms, exploring topics such as nutrition, transport systems, respiratory mechanisms, and excretory processes.

3. **The organism and its environment:** This theme emphasizes the interrelationship between organisms and their environment, covering ecological concepts, energy transformation, biodiversity, and the impact of human activities on ecosystems.
4. **Continuity of life:** The final theme centers on the processes of reproduction and inheritance, including the reproductive systems of vertebrates and plants, pollination mechanisms, genetics, and evolutionary principles.

Spiral Approach as it Relates to the Implementation of Biology Curriculum

The spiral approach in the Nigerian Biology curriculum refers to the progressive and repeated exposure of students to key concepts and topics throughout their school years. The curriculum is designed to revisit topics or themes at increasing levels of complexity as students' advance through their education. For example, the classification of living things may be introduced in SS I with a focus on botanical classification, while agricultural classification is taught in SS II. This approach allows students to deepen their understanding, build on prior knowledge, and make connections between related concepts over time. It reinforces and expands upon previous learning, contributing to a more comprehensive grasp of biology. Therefore, The Spiral Approach in implementation biology curriculum emphasizes revisiting and building upon previously learned concepts in a systematic and iterative manner. In the context of implementing the biology curriculum, the Spiral Approach entails organizing the curriculum content in a spiraling sequence, where topics are introduced at a basic level and revisited multiple times with increasing complexity and depth. This approach allows students to reinforce their understanding of core concepts while gradually expanding their knowledge and skills over time. Rather than covering each topic in isolation, the Spiral Approach encourages integration and synthesis of knowledge across different areas of biology. It promotes active engagement and critical thinking as students encounter familiar concepts in new contexts, facilitating deeper learning and retention. Overall, the Spiral Approach supports the holistic development of students' scientific literacy and prepares them to apply their knowledge effectively in real-world situations.

Personnel and Facilities Requirements for Successful Implementation of Biology Curriculum

a) Personnel Requirements:

1. **Biology Teachers:** Trained and qualified biology teachers are essential for effective curriculum implementation. They should have a strong understanding of the subject matter, pedagogical skills, and the ability to create a conducive learning environment. Continuous professional development programs should be in place to enhance their knowledge and teaching skills.
2. **Laboratory Technicians:** Biology curriculum implementation often involves practical laboratory work. Trained laboratory technicians are necessary to set up and maintain the laboratory equipment, prepare materials for experiments, and ensure safety measures are followed.
3. **School Administrators:** Supportive school administrators play a crucial role in creating a conducive environment for curriculum implementation. They need to allocate resources, provide support to teachers, and monitor the implementation process.
4. **Teacher Educators:** Teacher educators at higher education institutions or teacher training centers have the responsibility of preparing and equipping prospective biology teachers with the necessary knowledge and skills to implement the curriculum effectively.

b) Facilities Requirements:

1. **Biology Laboratories:** Well-equipped biology laboratories are essential for conducting practical experiments and investigations. They should have necessary equipment, chemicals, specimens, and safety measures to facilitate hands-on learning experiences.
2. **Classroom Infrastructure:** Classrooms should be spacious, well-lit, and equipped with appropriate instructional materials such as charts, models, and audiovisual aids. These resources enhance teaching and learning processes.

3. **Library Resources:** School libraries should have a collection of biology textbooks, reference books, scientific journals, and other relevant resources. Access to these resources enables students to explore topics in-depth and further develop their understanding of biology.
4. **Internet and Technology Access:** Access to the internet and technology resources allows students and teachers to access up-to-date information, multimedia resources, and educational software relevant to biology. This enables enhanced learning experiences and research opportunities.

Challenges Hindering the Effective Implementation of the Biology Curriculum in Nigeria

- 1) **Limited Resources:** Inadequate funding and limited resources can pose challenges in implementing the biology curriculum. Schools may struggle to provide well-equipped laboratories, updated textbooks, and access to technology, hindering effective teaching and learning experiences.
- 2) **Teacher Competence:** The lack of qualified biology teachers or teachers with insufficient subject knowledge can affect the implementation of the curriculum. Inadequate teacher training and professional development programs may hinder the ability to deliver the content effectively.
- 3) **Time Constraints:** The biology curriculum often covers a vast amount of content, and teachers may face challenges in covering all the topics within the limited time available. This can lead to rushed teaching, superficial understanding, and insufficient time for practical activities.
- 4) **Large Class Sizes:** Overcrowded classrooms can limit individual attention and interaction between teachers and students. It becomes challenging for teachers to cater to the diverse learning needs of students, provide personalized instruction, and facilitate hands-on activities.
- 5) **Limited Infrastructure:** Schools with inadequate infrastructure, such as poorly equipped laboratories, limited access to library resources, and insufficient classroom space, can hinder effective curriculum implementation.

6) Assessment Methods: Designing appropriate assessment methods that align with the curriculum objectives can be challenging. Assessments should evaluate students' understanding, critical thinking, and practical skills, but developing and implementing such assessments requires careful planning and expertise.

7) Sociocultural Factors: Sociocultural factors, such as societal beliefs, attitudes, and cultural norms, may influence the implementation of the biology curriculum. Controversial topics, such as evolution or reproductive health.

Brief Historical Account on Development of Biology Curriculum in Nigeria

- The evolution of the biology curriculum in Nigeria is intertwined with the broader history of science education in the country. Initially, when western education was introduced in 1843, science wasn't part of the curriculum. The foundations for modern science education were laid between 1861 and 1897 when rudiments of science started evolving into full science courses (Aliyu, 1984).
- By 1926, Nature Study became popular in some Primary Schools and Teacher Training Colleges, with Elementary Science taught at the first Government Teachers' College in the North. However, scarcity of teachers and resources limited the depth and coverage of the subject.
- Most Nigerian secondary schools began offering General Science, but its popularity waned when students couldn't progress to study specialized sciences like Chemistry, Physics, or Biology. By the mid-1950s, a two-tier approach emerged, where students studied General Science for two years before specializing in subjects of their choice.
- In 1950, the West African Examination Council (WAEC) took over the School Certificate Examination, leading to changes to indigenize education content. In 1957, the Science Teachers' Association of Nigeria (STAN) was inaugurated to promote science education, and the Federal School of Science was established in Lagos in 1958.

- STAN, collaborating with WAEC, spearheaded reforms in school science, leading to the development of curricula in Biology, Chemistry, and Physics. These separate science curricula were later taken over by the Comparative Education Study and Adaptation Centre (CESAC), emphasizing active learner participation and inquiry-based learning.
- With financial aid from the Ford Foundation, CESAC developed instructional materials under the Nigerian Secondary School Science Project (NSSP) in Biology, Chemistry, and Physics. These efforts culminated in the formulation of alternative syllabi and the National Senior Secondary School Syllabi in science subjects between 1984 and 1985.
- The Nigerian Educational Research and Development Council (NERDC) was established in 1988 to consolidate curriculum development efforts. Under the Curriculum Development Centre (CDC), NERDC develops curriculum content, instructional materials, and organizes teacher education programs. Biology remains a core subject in the curriculum, but changes introduced in 2009 made it optional for non-science students and compulsory for science students.

Factors that Influenced the Development of Biology Curriculum in Nigeria

- **Indigenization of education:** As Western education was introduced, efforts were made to indigenize the curriculum to reflect the needs and context of Nigerian students.
- **The need for science education:** The recognition of the importance of science education led to the development of science subjects in the curriculum.
- **Teacher scarcity and resource constraints:** In the early stages, scarcity of teachers and limited resources affected the depth and coverage of science education.
- **International reforms and global trends:** Nigeria was influenced by worldwide science reforms and changing needs in science education, leading to the adoption of inquiry-based learning and active learner participation approaches.
- **Collaboration between educational bodies:** Collaborative efforts between organizations like STAN, WAEC, CESAC, and NERDC played a crucial role in the development of the curriculum.

These organizations worked together to develop syllabi, instructional materials, and conduct research to improve science education.

- **Government initiatives:** The government's involvement and support in establishing institutions like the Federal School of Science and the Nigerian Educational Research and Development Council played a significant role in shaping the curriculum.
- **Technological advancements:** The advancement of science and technology globally influenced the inclusion of subjects like Computer Science in the curriculum to ensure students are prepared for the modern age.
- **Educational policies and reforms:** Changes in educational policies, such as the inclusion of Biology in the core curriculum and the revision of secondary school curricula, were driven by the government's vision for education and the evolving needs of the society.
- **Feedback from teachers and stakeholders:** Input and feedback from science teachers, educational associations like STAN, and other stakeholders helped shape the curriculum to align with the needs and aspirations of the students and the nation.

Lecture Method and Activity-Based Learning as Teaching Strategies in Secondary School Biology

The Lecture Method and Activity-Based Learning represent contrasting approaches to teaching biology. The Lecture Method, characterized by teacher-centered instruction, involves the dissemination of information through verbal presentation. In this method, students typically assume a passive role, listening attentively while the teacher delivers content. While efficient for conveying large amounts of information to a broad audience, the Lecture Method often lacks opportunities for active engagement and student interaction. Conversely, Activity-Based Learning fosters a student-centered environment where hands-on activities, experiments, and collaborative tasks take precedence. This approach encourages active participation, critical thinking, and problem-solving skills development. By engaging students in experiential learning, Activity-Based Learning promotes deeper understanding and retention of biological concepts. Despite their differences, both methods play central roles in biology instruction.

at secondary school, offering teachers diverse options to cater to varying learning needs, situations and preferences.

Advantages of Lecture Method

- Efficient for delivering large amounts of information in a short period.
- Provides a structured format for presenting content.
- Suitable for conveying complex or abstract concepts.
- Allows for a consistent delivery of information across different classes or groups.

Disadvantages of Lecture Method

- Limited student engagement and participation.
- May lead to passive learning and lack of critical thinking.
- Students may have difficulty retaining information without active involvement.
- Not suitable for all types of learners, as it relies heavily on auditory learning.

Advantages of Activity-Based Learning (ABL)

- Promotes active learning and student engagement.
- Enhances critical thinking, problem-solving, and decision-making skills.
- Encourages collaboration and communication among students.
- Provides opportunities for students to apply knowledge in real-life situations.

Disadvantages of Activity-Based Learning (ABL)

- Requires careful planning and preparation of activities.
- Time-consuming in terms of designing and implementing activities.
- May be challenging to manage and assess student learning in large class sizes.

Short thesis on the role of performance objectives in guiding biology teachers in ensuring meaningful learning outcomes for students

Performance objectives guide teachers in selecting content that is meaningful, engaging, and aligned with the desired learning outcomes, ensuring that students are provided with a comprehensive and relevant biology education. Performance objectives guide teachers in selecting appropriate content by providing a clear understanding of what students should be able to do or demonstrate at the end of a lesson or unit. These objectives serve as a roadmap for teachers, helping them align their instructional strategies and content choices with the desired learning outcomes. Furthermore, these objectives are stated in active verbs within the lesson plan, such as "list," "describe," "analyze," or "demonstrate," thereby communicating clear expectations of active student engagement. This approach fosters a participatory learning environment, where students are encouraged to take possession of their learning journey and actively demonstrate their understanding of key concepts.