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WAYS OF ENHANCING STUDENTS' CRITICAL THINKING SKILLS IN BIOLOGY AS PERCEIVED BY TEACHERS IN IGBO-ETITI LOCAL GOVERNMENT AREA

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Abstract
The study focused ways of enhancing students' critical thinking skills in Biology as perceived by teachers in Igbo-Etiti Local Government Area of Enugu State. The study was guided by five research questions. The study adopted a descriptive survey research design with the population of all the 19 biology teachers in Igbo-Etiti Local Government Area. Since the population was small and manageable; the entire population was used for the study. A structured rating scale developed by the researchers titled Teachers' Perceived Ways of Enhancing Students' Critical Thinking Skills in Biology Scale (TPWESCTSBS) was used to collect data for this study. The instrument was validated by three experts. Internal consistency reliability estimates were 0.61, 0.73, 0.77, 0.73, and 0.72 for clusters A, B, C, D, and E, respectively, and an overall reliability value of 0.75 determined using Cronbach Alpha. Data collected from the respondents were analyzed using the Statistical Package for Social Sciences (SPSS) to generate the mean and standard deviation used in answering the research questions. The findings revealed the strategies/ways of enhancing students' observation, analysis, inference, communication, and problem-solving as critical thinking skills in Biology as perceived by teachers. Based on the findings, it was recommended that the ministry of education and professional associations such as Science Teachers Association of Nigeria (STAN) should organize professional development workshops and training sessions for teachers on ways to enhance students' critical thinking skills in biology for transformative education as well as for preparing students to thrive in a digitally changing world.

Keywords: observation, analysis, communication, problem-solving, critical thinking

Introduction

Biology is the branch of science that studies life and living organisms. It explores the structure, function, growth, evolution, as well as behaviour of organisms that exist in microscopic or more complex macroscopic form (Agboghoroma & Oyovwi, 2015). Biology encompasses diverse subfields among which are genetics, ecology, physiology, and molecular biology, all of which seek to explain the processes and principles that govern life. Biology plays a fundamental role in individual development by deepening the understanding of the human body, mind, and environment (Ihekwoba et al., 2020). With the knowledge of biology, individuals make informed decisions about their health, lifestyle, and nutrition. It also enables students to understand how the body functions, how the immune system works, and how diseases spread; thus, allowing individuals to take adequate care for their physical and mental health. Additionally, Biology encourages logical and analytical thinking. The nature of Biology

requires learners to possess the ability to observe, hypothesize, experiment, and analyze results among others which are useful skills that are transferable to different areas of life. The knowledge Biology fosters responsible behaviour towards nature, promoting sustainability and efforts towards conservation. Biology as a fundamental science subject at the senior secondary school level in Nigeria, plays a pivotal role in preparing students for careers in public health, healthcare services, biotechnology, agriculture, and many other biology-related disciplines. Its effective learning requires not only mastery of contents but also development of students' employable skills such as the critical thinking skills.

Critical thinking (CT) is defined as the ability to analyze information objectively and make reasoned judgments or take logical decisions. Critical thinking is a 21st-century skill that applies across all forms of knowledge and requires learners to engage deeply in the process of knowledge construction through reflection and deep thinking. Alison (2022) stated that critical thinking is the ability to analyze information objectively and make a reasoned judgment. It involves evaluating sources such as data, facts, observable phenomena, and research findings. Critical thinking is an ability that goes beyond memorization (Paul & Elder, 2019). When students think critically, they are encouraged to think for themselves, question hypotheses, analyze and synthesize events, and develop new hypotheses to test against facts (Facione, 2015). Curiosity is the foundation of critical thinking, which in-turn is the source of knowledge and should be taught as a framework for all learning (Lipman, 2018). This is hinged to Jean Piaget's theory of cognitive constructivism that focuses on the active role of learners in constructing their own understanding and meaning from their experiences (Piaget, 1973). Learning is an active process in which learners actively engage with their environment, interact with information and make sense of it through their mental processes. However, students are frequently conditioned in their approach to learning because of their experiences in teacher-centered and textbook-driven classrooms (Sharma & Elbow, 2017). The development of critical thinking is crucial for various significant reasons.

Critical thinking can boost creativity and enhance the way one uses and manages time. Paul and Elder (2019) pointed out that critical thinking not only involves the ability to think according to the rules of logic and probability but also the ability to apply these skills to real-life problems which are not content-independent. It provides students with a more insightful understanding of themselves and promotes objectivity, emotional control, and open-mindedness in appreciating other individuals' opinions. By thinking ahead, students gain the confidence to present fresh perspectives and new insights into various concerns (Ennis, 2016). Critical thinking can be classified into two main components: critical thinking disposition and critical thinking skills.

Critical thinking disposition is a habit of mind that is integrated into one's actions to effectively solve problems and make decisions as a product of thinking. The components of critical thinking dispositions are willingness, sensitivity, and ability (Perkins et al., 2015). Learners should build their own knowledge through inquiry processes, both independently and mentally, which requires the willingness, sensitivity, and ability to solve the problems encountered (Ennis, 2016). Thus, thinking critically helps in lifelong learning. Additionally, critical thinking disposition has seven characteristics: curiosity, open-mindedness, systematicity, analyticity, truth-seeking, confidence, and maturity (Facione, 2015). Critical

thinking skills are another group of critical thinking. There are lots of critical thinking skills, however, this study specifically focused on five critical thinking skills which Herrity (2021) identified as essential in biology education. They are observation, analysis, inference, communication, and problem-solving.

Navigating through biological inquiry begins with observation. As the foundational entry point, observation involves more than mere looking. It is the active process of noticing patterns and predicting potential problems or opportunities. When students make observations in science, they gather data. However, these observations remain dormant until they are subjected to analysis. Analysis serves as the processor, where students organize, interpret, and give meaning to their observations, transforming a field note into a data set through which useful inferences are made.

Once data is analyzed, the skill of inference allows students to bridge the gap between known information and new conclusions. This is where logical reasonings occur; for example, after analyzing the data within a food chain, a student could infer how the removal of a single organism from the chain might destabilize the entire feeding order. This logical process will manifest through communication. In biology, communication is the authentication phase. When findings are shared through visual aids such as graphs or verbal presentations among others, students by this way subject their inferences to peer review and collaborative refinement (Jamie, 2020). This ensures that knowledge is not just discovered, but understood and disseminated thereby leading to problem-solving. Problem-solving serves as the amalgamation of the aforementioned four skills. The skills of observation, analysis, inference and communication jointly gear towards problem-solving. In other words, it is under problem-solving that observation, analysis, inference, and communication become mobilized to address a specific challenge. Therefore, inability of students to think critically could affect their careers and relevance in their fields of endeavour.

Lack of critical thinking skills is likely to bring about issues. The absence of critical thinking skills in science teaching tends to promote rote learning, leading students to become passive recipients of knowledge (Johnson & Smith, 2018). Passive learning approach becomes an impediment to students' development of critical thinking skills. Evaluating on the ways of improving students' critical thinking in biology, Khodadad (2023) identified safe-learning environments, active participation, connections with previous knowledge, mistakes and learning from them, as well as instructional strategies. Also, Pearson India Education Services (2021) identified five strategies for improving students' critical thinking which include by asking questions, participating in discussions, practising active learning, studying with the help of examples, and going beyond academic learning. However, these studies did not consider ways of enhancing critical thinking skills in biology as perceived by teachers who are facilitators of learning and implementers of curriculum thereby creating a lacuna. Thus, by understanding such strategies which teachers perceive as most beneficial in fostering students' observation, analysis, inference, communication and problem-solving as CT skills in biology, the study will inform future curriculum development and teaching practices that better support the cultivation of critical thinking in biology learning. This study therefore investigated ways of enhancing students' critical thinking skills in biology as perceived by teachers in Igbo-Etiti Local Government Area.

Specifically, the study determined:

1. ways of enhancing students' observation as a critical thinking skill in biology as perceived by teachers.
2. ways of enhancing students' analysis as a critical thinking skill in biology as perceived by teachers.
3. ways of enhancing students' inference as a critical thinking skill in biology as perceived by teachers.
4. ways of enhancing students' communication as a critical thinking skill in biology as perceived by teachers.
5. ways of enhancing students' problem-solving as a critical thinking skill in biology as perceived by teachers.

Research Questions

The study was guided by the following research questions:

1. What are the mean ratings of teachers on ways of enhancing students' observation as a critical thinking skill in Biology?
2. What are the mean ratings of teachers on ways of enhancing students' analysis as a critical thinking skill in Biology?
3. What are the mean ratings of teachers on ways of enhancing students' inference as a critical thinking skill in Biology?
4. What are the mean ratings of teachers on ways of enhancing students' communication as a critical thinking skill in Biology?
5. What are the mean ratings of teachers on ways of enhancing students' problem-solving as a critical thinking skill in Biology?

Design of the Study

The research design adopted for this study was descriptive survey research design. Descriptive survey aims at collecting data on, and describing in a systematic manner the characteristics, features or facts about a given population (Nworgu, 2015). It is appropriate for this research because it is set to find out ways of enhancing students' critical thinking skills in Biology as perceived by teachers in Igbo-Etiti Local Government Area of Enugu State, Nigeria. The population of the study comprised all the nineteen (19) Biology teachers in Igbo Etiti Local Government Area. They served as participants for the study because the population was manageable. Creswell and Creswell (2018) upheld that when the population is very small (under ~30), researchers often use a consensus, meaning in this case that all the 19 teachers were included in the study.

A structured rating scale titled, Teachers' Perceived Ways of Enhancing Students' Critical Thinking Skills in Biology Scale (TPWESCTSBS) developed by the researchers was used to collect data for the study. The 4-point Likert type scale was divided into five clusters A-E. Cluster A with 6-items elicited information on ways of enhancing students' observation as a critical thinking skill in Biology as perceived by teachers. Cluster B with 8-items elicited information on ways of enhancing students' analysis as a critical thinking skill in Biology as perceived by teachers. Cluster C with 4-items elicited information on ways of enhancing students' inference as a critical thinking skill in Biology as perceived by teachers. Cluster D

with 5-items elicited information on ways of enhancing students' communication as a critical thinking skill in Biology as perceived by teachers. Cluster E with 5-items elicited information on ways of enhancing students' problem-solving as a critical thinking skill in Biology as perceived by teachers. The response options in the scale were Strongly Agreed (SA) = 4, Agreed (A) = 3, Disagreed (D) = 2, and Strongly Disagreed (SD) = 1. The instrument was face-validated by three experts in Biology; and Measurement and Evaluation from the Department of Science Education, University of Nigeria, Nsukka.

To ascertain the reliability of the instrument, a trial test was carried out by administering 20 copies of the instrument to twenty Biology teachers in public secondary schools in Nsukka LGA, which is different from the study area but shares the same characteristics in terms of academic calendar and subject curriculum. Cronbach's Alpha statistical tool was used to get the reliability estimate. The internal consistency reliability estimates gave reliability values of 0.61, 0.73, 0.77, 0.73, and 0.72 for clusters A – E respectively with an overall reliability estimate of 0.75 which according to Nworgu (2015), is high for the study. The researchers administered the instrument to the respondents at their various schools through an on-the-spot delivery technique with the help of three research assistants that ensured high return rate. The respondents completed and returned the instrument to the assistants.

Data collected from the study were analyzed using Statistical Package for the Social Sciences (SPSS) to determine the mean and standard deviation. The decision rule was based on the criterion mean of 2.50. Therefore, items with mean scores of 2.50 or above would be accepted, while those below 2.50 were rejected.

Results

Table 1: Mean and standard deviation scores of ways of enhancing students' observation as a critical thinking skill in Biology as perceived by teachers

S/N	Item statement N=19	Mean	Std. Dev.	Remarks
1.	Engaging students in hands-on laboratory activities that require careful observation or recording of biological phenomena.	3.53	0.51	Strongly Agree
2.	Incorporating visual and technological/digital tools.	3.37	0.68	Agree
3.	Engaging students in field trips or outdoor activities.	3.80	0.50	Strongly Agree
4.	Using structured observation guide in Biology lessons when teaching with real life specimens and other instructional materials.	3.74	0.73	Strongly Agree
5.	Giving students exercises in biology that require detailed scientific descriptions.	3.68	0.75	Strongly Agree
	Mean of Cluster A	**3.36**	**0.31**	

Table 1 above shows the mean ratings of teachers on ways of enhancing students' observation as a critical thinking skill in Biology. The table reveals that items 1-5 have mean values that range from 3.37 to 3.80. These mean values are above the cut off mean value of 2.50. It implies that teachers perceived items 1-5 as the ways of enhancing students' observation as a critical thinking skill in Biology. The agreement by the teachers is further substantiated by the cluster mean of 3.36 and a small standard deviation score of 0.31 which indicates that the responses from the participants were not wide spread.

Table 2: Mean and standard deviation scores of teachers on ways of enhancing students' analysis as a critical thinking skill in Biology

S/N	Item statement N=19	Mean	Std. Dev.	Remarks
6.	Engaging students in scaffolded inquiry-based activities that require analysis of biological phenomena.	3.42	0.61	Agree
7.	Use of concept mapping in biology teaching/learning.	3.26	0.99	Agree
8.	Providing opportunities for students to practice data analysis skills.	3.68	0.48	Strongly Agree
9.	Asking probing questions during biology lessons.	3.53	0.69	Strongly Agree
10.	Encouraging evidence-based scientific arguments in Biology	3.05	0.97	Agree
11.	Integrating sufficient laboratory activities in Biology teaching.	3.58	0.61	Strongly Agree
12.	Having students compare things by stating the differences or similarities between biological phenomena	3.63	0.59	Strongly Agree
	Mean of Cluster B	**3.45**	**0.39**	

Table 2 with respect to ways of enhancing students' analysis as a critical thinking skill in Biology, shows that the mean ratings of teachers in items 6 to 12 range from 3.05 to 3.68. The mean scores are above the bench mark mean of 2.50. This is an indication that teachers perceive items 6 to 12 as ways of enhancing students' analysis as a critical thinking skill in Biology. The cluster mean of 3.45 with a standard deviation of 0.39 further reveal teachers' agreement that items 6 to 12 are the ways of enhancing students' analysis as a critical thinking skill in Biology.

Table 3: Mean and standard deviation scores of teachers on ways of enhancing students' inference as a critical thinking skill in Biology

S/N	Item statement N=19	Mean	Std. Dv	Remarks
13.	Promoting classroom discussions or argumentation activities where students engage in reasoning or debate.	3.53	0.84	Strongly Agree

14.	Presenting students with case studies that require them to make inferences based on biological information.	3.52	0.61	Strongly Agree
15.	Incorporating scientific experiments into biology lessons that provide opportunity for inference.	3.42	0.69	Agree
16.	Assigning students scientific articles related to biology for them to analyze and make inferences.	3.32	0.95	Agree
	Mean of Cluster C	**3.45**	**0.41**	

Table 3 reveals the mean ratings of teachers on ways of enhancing students' inference as a critical thinking skill in Biology. It shows that items 13 to 16 have mean values that range between 3.32 and 3.53. The said mean values are above 2.50 criterion mean. This implies that items 13 to 16 are among the ways perceived by teachers to enhance students' inference as a critical thinking skill in Biology. This is additionally revealed by the cluster mean of 3.45 with its standard deviation of 0.41.

Table 4: Mean and standard deviation scores of teachers on ways of enhancing students' communication as a critical thinking skill in Biology

S/N	Item/statement N=19	Mean	Std. Dev.	Remarks
17.	Giving students assignments or tasks in biology that requires group work.	3.42	0.61	Agree
18.	Incorporating oral presentation activities during biology lesson.	3.68	0.48	Strongly Agree
19.	Promoting laboratory report writing by students.	3.16	0.68	Agree
20.	Encouraging students in role-playing activities, class discussions as well as debates.	3.32	1.05	Agree
21.	Encouraging students to provide constructive feedback individually on peers' projects in biology.	3.53	0.84	Strongly Agree
	Mean of Cluster D	**3.42**	**0.39**	

Table 4 reveals the mean ratings of teachers with respect to ways of enhancing students' communication as a critical thinking skill in Biology. It shows that items 17 to 21 have mean values that range from 3.16 to 3.68. The mean scores of items 17 to 21 are above the mean of acceptance of 2.50. This indicates that items 17 to 21 are the ways perceived by teachers to enhance students' communication as a critical thinking skill in Biology. The agreement of teachers to those items is further revealed by the cluster mean of 3.42 and its associated standard deviation of 0.39 which shows that the responses of the respondents are not wide spread.

Table 5: Mean and standard deviation scores of teachers on ways of enhancing students' problem-solving as a critical thinking skill in Biology

S/N	Item/statement N=19	Mean	Std. Dev.	Remarks

22. Using real-life case studies as examples when teaching students biology.	3.84	0.37	Strongly Agree
23. Presenting real-world biological problems during Biology teaching and learning.	3.63	0.59	Strongly Agree
24. Engaging students in inquiry-based investigations.	3.53	0.84	Strongly Agree
25. Asking students higher-order thinking questions	3.58	0.76	Strongly Agree
26. Promoting data analysis and interpretation tasks that require students to solve real-life problems in biology.	3.52	051	Strongly Agree
Mean of Cluster E	**3.62**	**0.39**	

Table 5 shows the mean rating of teachers on ways of enhancing students' problem-solving as a critical thinking skill in Biology. It reveals that items 22 to 26 have mean scores that range between 3.52 and 3.84. The said mean scores are above the cut off mean of 2.50. This indicates that teachers strongly agree that items 22 to 26 are among the perceived ways of enhancing students' problem-solving as a critical thinking skill in Biology. This is further revealed by the cluster mean of 3.62 and a small standard deviation score of 0.39. The small standard deviation score authenticates that the responses of the participants do not spread widely.

Discussion

The Table 1 showed that teachers identified multiple approaches to developing observation as a critical thinking skill in Biology. Key strategies included engaging students in hands-on laboratory activities that require careful observation or recording of biological phenomena; incorporating visual and technological tools; engaging students in field trips or outdoor activities; using structured observation guide in biology lessons when teaching with real life specimens and other instructional materials as well as giving students exercises in biology that require detailed scientific descriptions. The finding is in agreement with Herron et al. (2021) that engaging students in hands-on laboratory activities that require careful observation and recording of biological phenomena will encourage students to use their senses to make detailed observations, take accurate measurements, and document their findings. This ability aids in formulating hypotheses and drawing meaningful conclusions from the data. Additionally, D'Angelo and Rutledge (2015) noted that incorporating digital resources, such as virtual labs or interactive simulations, provides students with opportunities for close observation, offering high-quality visuals and allowing them to manipulate objects or organisms, thereby promoting detailed observation and analysis. Promoting observation as a critical thinking skill among Biology students helps them to make use of their senses adequately in making observations of biological specimens which can in-turn be applied in real-life situations and work-places geared towards solving problems. Observation as a CT skill improves students' awareness, minimizes mistakes, enhanced communication, develops one's emotional intelligence, promotes learning, and reinforces decision-making as this starts with authentic information obtained through observation.

Table 2 revealed that teachers identified ways for enhancing students' analysis as a critical thinking skill in Biology. These include: engaging students in scaffolded inquiry-based activities that require analysis of biological phenomena, use of concept mapping in biology teaching/learning, providing opportunities for students to practice data analysis skills, asking probing questions during biology lessons, encouraging evidence-based scientific arguments in biology, integrating sufficient laboratory activities in biology teaching and having students compare things by stating the differences or similarities between biological phenomena. These have become necessary as analytical skills are germane for effective problem-solving, risk assessment, data interpretation and better decision making. Thus, while observation collects information, analysis interprets and evaluates such information. This aligns with Krajcik et al. (2013), who found that scaffolded inquiry-based activities with structured guidance improve students' analytical thinking and problem-solving strategies. Herreid and Schiller (2013) noted that authentic problems and real-world case studies encourage students to apply knowledge, analyze information, and propose evidence-based solutions. Similarly, Hansen et al. (2014) emphasized that data-driven investigations enable students to practice data analysis skills, make evidence-based claims, and draw conclusions.

Table 3 revealed that teachers identified several strategies for enhancing students' inference as a critical thinking skill in Biology. These include promoting classroom discussions or argumentation activities where students engage in reasoning or debate, presenting students with case studies that require them to make inferences based on biological information, incorporating scientific experiments into biology lessons that provide opportunity for inference and assigning students scientific articles related to biology for them to analyze and make inferences. Possession of inference skill as CT skill has become apt as it fosters students' reading between the lines, in-depth understanding, predict outcomes and improved decision making. As observation help to gather information or facts, inference tend to connect them. Smith and Brown (2018) support this finding by emphasizing that classroom discussions and argumentation enable students to engage in reasoning and debate. Such activities allow students to present evidence, challenge each other's reasoning, and refine their inferences through critical analysis. Herreid and Schiller (2013) found that case studies encourage students to analyze data and draw logical conclusions based on biological information. Garcia and Lee (2017) demonstrated that scientific modeling activities significantly enhance students' ability to infer mechanisms and relationships from available evidence. Additionally, Marbach-Ad et al. (2019) noted that analyzing scientific articles encourages students to make inferences based on reported data while considering research strengths and limitations.

Table 4 findings revealed that teachers identified strategies for enhancing students' communication as a critical thinking skill in Biology. These include giving students assignments or tasks in biology that requires group work, incorporating oral presentation activities during biology lesson, promoting laboratory report writing by students, encouraging students in role-playing activities, class discussions as well as debates and encouraging students to provide constructive feedback individually on peers' projects in biology. Communication as CT skill enables biology students to build strong relationships, clearly express ideas, fosters success professionally, improves one's leadership abilities and helps in conflict resolution through open communication. This skill is necessary in biology and other sciences as best ideas

are useless if they cannot be effectively communicated. These findings align with Russell and Weaver (2018) who emphasized that science communication activities provide opportunities for students to articulate complex biological concepts clearly and concisely. LoSchiavo et al. (2017) found that peer review exercises encourage students to provide constructive feedback focusing on clarity, organization, and communication effectiveness. Binta et al. (2012) demonstrated that reflective writing and journaling activities promote metacognition while helping students develop their ability to express biological concepts in writing. Additionally, Saha and Moyer (2019) noted that role-playing activities and debates enable students to think critically, construct arguments, and communicate their ideas effectively.

Table 5 findings revealed that teachers identified strategies for enhancing students' problem-solving as a critical thinking skill in Biology. These include using real-life case studies as examples when teaching students biology, presenting real-world biological problems during Biology teaching and learning, engaging students in inquiry-based investigations, asking students higher-order thinking questions as well as promoting data analysis and interpretation tasks that require students to solve real-life problems in biology. Problem-solving skill as a CT skill is important in biology learning as it helps students to overcome challenges, increases their confidence and productivity, fosters creativity and decision-making. Problem-solving skill is the zenith of learning and the reason for scientific literacy. Thus, problem-solving amalgamates observation, analysis, inference, and communication. These findings align with Herreid and Schiller (2013) who found that case studies presenting authentic, complex biological scenarios promote critical thinking through analysis and problem-solving. Smith and Brown (2018) demonstrated that inquiry-based investigations allow students to explore biological phenomena, generate questions, design experiments, and analyze data, thereby enhancing problem-solving skills through evidence-based decision-making. Garcia and Lee (2019) noted that collaboration and peer discussion provide opportunities for students to engage in critical discourse, share ideas, and learn from different perspectives. Moreover, Johnson and Smith (2017) found that formative assessment and feedback help students identify areas for improvement and refine their critical thinking skills.

These findings have significant implications for transformative learning and global competitiveness in the digital era. In transformative learning deep understanding, reflective thinking, and the ability to question assumptions are stressed. Thus, teachers' perceptions that strategies such as inquiry-based learning, problem-solving activities, laboratory investigations, collaborative learning, and the integration of digital tools enhance critical thinking indicate a paradigm shift in Biology instruction by moving it beyond rote memorization to active knowledge construction through the strategies revealed in this study. Also, in the digital era, global competitiveness is dependent on innovation, technological proficiency, scientific literacy, and problem-solving skills among others. Enhancing critical thinking in Biology equips students with competencies needed in biotechnology, healthcare, environmental management, science teaching and other science-driven industries via which they become globally relevant.

Conclusion

In conclusion, ways of enhancing students' observation, analysis, inference, communication, and problem-solving as critical thinking skills in Biology as perceived by teachers can be said to be foundational to transformative education and essential for preparing students to succeed in a digitally driven world as well as become globally relevant.

Recommendations

It is recommended as follows:

- The ministry of education and professional science associations such as Science Teachers Association of Nigeria (STAN) should organize professional development workshops and training sessions for teachers on ways to enhance students' critical thinking skills in biology for transformative education as well as for preparing students to thrive in a digitally changing world.
- The strategies of enhancing students' CT skills in biology identified in this study should be strengthened through policy support, and technological integration to bridge the gap between local educational practices and global standards.
- The government should provide biology teachers with requisite and supportive resources such as teaching aids, multimedia materials and assessment tools designed to enhance students' critical thinking skills.
- Biology teachers should encourage the implementation of student-centred and inquiry-based learning activities. They should also foster hands-on activities, experiments and collaborative projects among others that require students to apply critical thinking in real-world contexts.

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