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Exploring Student Learning Activities and Pedagogical Approaches in Lower Secondary School Biology Lessons in Uganda

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Abstract: This study investigates the types of student learning activities employed by biology teachers in lower secondary schools in Uganda, examines how pedagogical approaches influence these activities, and assesses their alignment with national curriculum standards. Utilizing a qualitative case study design, data were collected through interviews, classroom observations, and document analysis involving eight biology teachers. Findings reveal a predominant reliance on textbooks and teacher-centered methods, with limited integration of student-centered activities such as collaborative learning and inquiry-based approaches. The study underscores the need for professional development programs to enhance teachers' capacity to implement student-centered pedagogies that align with curriculum objectives and foster critical thinking skills (Bennett et al., 2020; Mulumba & Kirunda, 2023).

Keywords: *biology Education, Student Learning Activities, Pedagogical Approaches, Curriculum Alignment.*

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I. INTRODUCTION

The quality of science education, especially biology, is essential in developing analytical, critical thinking, and problem-solving competencies. In Uganda, the revised lower secondary curriculum emphasizes learner-centered pedagogy to nurture these skills (NCDC, 2020). However, classroom practices are often characterized by traditional teaching methods, limiting student

Engagement and conceptual understanding. Student-centered pedagogies such as inquiry-based learning, problem-solving, and cooperative learning have been shown to increase learner autonomy and deeper learning (Freeman et al., 2014). This study aims to explore the nature of student learning activities in biology classes, the pedagogical approaches that shape these activities, and how they align with curriculum expectations.

II. LITERATURE REVIEW

Effective teaching in science education requires pedagogies that engage learners in active meaning-making. Constructivist theories emphasize learning as a process of personal construction of knowledge through hands-on experience and social interaction (Vygotsky, 1978). Studies by Abungu et al. (2018) and Laverty et al. (2016) support the integration of inquiry-based and collaborative methods to improve student outcomes. Yet, in many Sub-Saharan contexts, implementation of such strategies is hampered by challenges including insufficient training, inadequate resources, and overcrowded classrooms (Saarinen et al., 2018; Nalukwago, 2022). Additionally, Williams et al. (2017) emphasized the importance of formative assessments and continuous feedback in fostering meaningful learning. In Uganda, teachers often lack sustained support to transition from didactic Instruction to more facilitative roles (Nakabugo et al., 2020).

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III. METHODOLOGY

➢ *Research Design and Approach*

A qualitative case study design was employed to gain an in-depth understanding of the pedagogical practices of biology teachers in lower secondary schools. This approach is suitable for exploring complex phenomena within their real-life contexts (Creswell & Poth, 2018).

➢ *Sampling Strategy and Population*

Purposive sampling was used to select eight biology teachers from different lower secondary schools in Uganda. Participants were chosen based on their experience and willingness to provide detailed insights into their teaching practices.

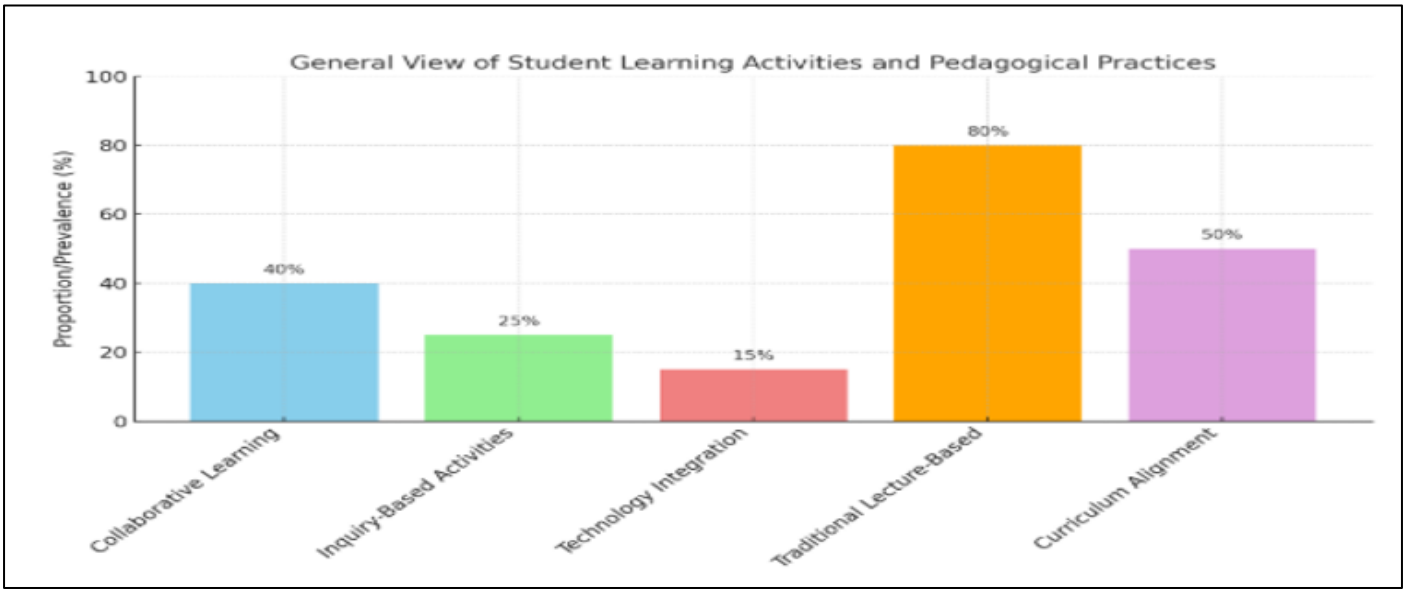
➢ *Data Collection Methods*

Data were collected through semi-structured interviews, classroom observations, and analysis of lesson plans and teaching materials. Interviews focused on teachers' pedagogical approaches and the types of learning activities they employed. Observations provided contextual information on classroom interactions and teaching methods.

➢ *Data Analysis*

Thematic analysis was conducted to identify patterns and themes related to teaching practices and curriculum alignment. Data from interviews and observations were transcribed, coded, and analyzed using qualitative data analysis software.

IV. RESULTS



Graph 1 Types of Student Learning Activities

The bar graph shows that teacher-centered instruction, especially lecture-based methods (80%), remains dominant in classrooms. This aligns with studies by Nyangau (2021) and Ochieng & Namukasa (2020), who found that despite curriculum reforms, many teachers still rely on traditional methods due to systemic constraints like large class sizes and limited resources.

Student-centered approaches, such as collaborative learning (40%) and inquiry-based activities (25%), are used occasionally, reflecting a slow shift toward active learning. This is supported by Chikuta et al. (2019) and Vandeyar (2022), who emphasize the need for teacher support and training to implement these methods effectively.

Technology use is minimal (15%), consistent with Kassah & Ananga (2021), who cite infrastructure and digital literacy as major barriers.

Only 50% of classroom activities align with national curriculum goals, indicating a gap between policy and practice. Ssempala (2019) notes that reliance on rote learning hinders the development of critical thinking skills emphasized in Uganda's curriculum.

Finally, teachers' beliefs significantly influence pedagogy, as Fullan (2018) and Mwesigwa & Namubiru (2023) observe—those who value student engagement are more likely to use innovative methods.

➢ *Influence of Pedagogical Approaches*

The study shows that teachers' beliefs strongly influence their teaching methods. Those who value student autonomy tend to use collaborative and inquiry-based learning, while others stick to lecture-based teaching. This aligns with literature by Fullan (2018) and Vandeyar (2022), which emphasizes that pedagogical beliefs shape classroom practices. Mwesigwa and Namubiru (2023) note that many Ugandan teachers replicate the traditional methods they experienced during their own training. Studies like Chikuta et al. (2019) also highlight that positive beliefs about learner capability lead to more participatory teaching. Overall, transforming teaching practices requires changing not only methods but also the underlying teacher beliefs.

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➢ *Alignment with National Curriculum Standards*

The findings indicate only partial alignment between classroom practices and national curriculum goals. While some teachers used activities to promote critical thinking, many relied heavily on rote learning and textbook use. This is consistent with Ssempala (2019) and Ochieng & Namukasa (2020), who found that Uganda's curriculum reforms often fail at the classroom level due to limited teacher capacity and inadequate resources. Vandeyar (2022) also notes that despite progressive curriculum frameworks, actual practice often remains traditional. Achieving full alignment requires ongoing teacher training, support, and a shift toward more competency-based, learner-centered instruction.

V. DISCUSSION

The study underscores the need for a shift toward more student-centered pedagogies in biology education. Current reliance on rote learning limits critical thinking and deep understanding, despite curriculum reforms advocating active learning. Research by Nyangau (2021) and Vandeyar (2022) supports the idea that collaborative and inquiry-based methods improve student engagement and learning outcomes. However, as Mwesigwa and Namubiru (2023) emphasize, many teachers lack the training to implement these methods effectively. Thus, targeted professional development is crucial to equip teachers with practical strategies that promote learner participation and align classroom practices with curriculum goals. Without such support, curriculum intentions will continue to fall short at the implementation level.

VI. CONCLUSION

This study highlights the critical need for a shift from traditional, teacher-centered instruction to more student-centered approaches in lower secondary school biology education. Such methods—particularly collaborative and inquiry-based learning—are essential for developing learners' critical thinking skills and achieving the competencies outlined in the national curriculum. To realize this shift, it is imperative to invest in continuous teacher professional development, ensure adequate teaching and learning resources, and strengthen curriculum support systems. A coordinated effort among policymakers, educators, and school leaders is necessary to create an enabling environment that supports effective, learner-focused teaching practices.

RECOMMENDATIONS

➢ *Teacher Training*

Develop and implement continuous professional development programs for biology teachers that prioritize student-centered teaching approaches. These programs should focus on active learning strategies, inquiry-based instruction, and ways to foster critical thinking and problem-solving skills among students.

➢ *Curriculum Review*

Undertake a comprehensive review of the current biology curriculum with the goal of integrating more opportunities for students to engage in critical thinking, analytical reasoning, and real-world problem solving. Emphasize hands-on experiments, case studies, and application-based learning to make the subject more relevant and stimulating.

➢ *Resource Provision*

Allocate adequate funding and logistics to equip biology classrooms with up-to-date teaching aids, laboratory equipment, and ICT tools such as computers, projectors, and relevant software. This will enhance interactive learning and enable teachers to utilize diverse instructional methods effectively.

➢ *Further Research*

Initiate longitudinal studies that track student performance and engagement over time to evaluate the long-term effects of adopting student-centered pedagogies and curriculum reforms in biology. Such research should also explore contextual factors influencing implementation success and identify best practices for scaling up effective interventions.

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