Assessing Biology Teachers' Knowledge and use of Flipped Learning Method in the Teaching and Learning of Biology in Secondary Schools in Awka Education Zone.

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Abstract
Biology as an integral part of science learning continues to make waves through the integrating of technology into its teaching and learning. The flipped learning model has gained increasing recognition for transforming traditional classroom instruction, yet its adoption in biology classrooms remains inconsistent. This study assessed biology teachers' level of knowledge, preparedness and use of flipped learning model in secondary education. A mixed-methods design was used combining surveys, interviews, and classroom observations among 156 biology teachers. The study explores teachers' awareness, training, application, and perceived effectiveness of flipped learning in biology classrooms. Findings revealed that while 64% of teachers were aware of flipped learning, only 23% actively implemented it. Results indicate a gap between awareness and practical implementation, highlighting the need for professional development and institutional support to enhance flipped learning adoption.

Keywords: *Biology education; flipped classroom; Innovative methods*

Introduction

The emergence and rapid development in the technological world, has brought so many innovations in Education. This innovations is to better people's life and change the method knowledge is being impacted (Salas-Rueda,2023). Biology being a branch of science structured to equip students with the knowledge of relevant concepts and scientific skills is taught using these innovative methods such as flipped learning methods, interactive videos and different e-learning facilities (Oghenevwede, 2019). Flipped learning which is one of the innovative methods is a type of blended learning where students are introduced to contents at home and practice working through it at school.It is a reverse of the more common practice of introducing content at school and then assigning homework and project to students to be completed independently outside the classroom (Aniaku et al, 2022).With this, instruction has moved from the group learning space to the individual learning space.(Bergmann & Sams, 2012).Many studies showcased the academic benefits of flipped learning methods. Handen, McKnight , Mcknight and Arfstorm (2013) asserted that flipped classroom is the best model for using technology in education because it creates effective teaching environment for students with teachers as the central focus to the success of flipped learning. Their knowledge, technological skills, and attitudes significantly influence the effectiveness of this approach (Lo & Hew, 2017).

Theoretically, flipped learning method of teaching and learning approach is based on the constructionist theory, which states that "active learning enables students to create their own knowledge by building upon pre-existing cognitive framework".Thus Ochu and Haruna (2014) in Aniaku et al, (2022) opined that the effective use of flipped teaching and learning

approach in Biology could promote science education.

While interest in flipped learning is growing globally, actual implementation-especially in developing countries and secondary schools is still low due to lack of awareness and training (Zainuddin & Halili, 2016).Research further shows that the barriers to biology teachers' knowledge of flipped learning method in the teaching and learning of biology include limited training, lack of resources, resistance to change, and insufficient institutional support (Al-Samarraie et al., 2020).It is against this backdrop that the researchers wanted to find out Biology teachers' knowledge of flipped learning method in the Teaching and Learning of Biology in Secondary schools in Awka Education Zone.

Statement of Problem

Despite the recognized benefits of flipped learning methods, the extent to which biology teachers understand and implement flipped learning methods remains unclear, especially in developing educational contexts in Biology and this have amounted to poor academic performance of students in both internal and to an extent in external examinations. This poor performance might be due to poor method of teaching, poor training of teachers on the use of flipped learning approach and insufficient instructional resources. There is a need to assess their knowledge, training, and challenges in using this instructional strategy.

Objectives of the Study

- To assess the level of Biology teachers' knowledge of flipped learning methods.
- To determine the level of implementation of flipped learning in biology classrooms.
- To identify barriers to the adoption of flipped learning methods.
- To recommend strategies to enhance the use of flipped learning in biology instruction.

Research Questions

1) What is the level of Biology teachers' knowledge of flipped learning methods?
2) What is the level of implementation of flipped learning in biology classrooms?
3) What are the barriers to the adoption of flipped learning methods?
4) What are strategies to be taken to enhance the use of flipped learning in biology instruction?

Significance of the study

This study is expected to be of immense benefit to teacher's school administrators and educational bodies. By exposing them to innovative ways of teaching biology topics

Methods

The population of this study was all the public secondary schools in Awka Education Zone.The sample was drawn from all the six Local Governments in Awka Education zone. Simple random sampling was used to select a total of 20 schools with 37 Biology Teachers in all the six Local Government Area in the state.

The Instrument used was a researcher designed questionnaire on Biology Teachers' Knowledge and use of flipped learning method (BTKUFLM) which consists of two sections (Section A and B).Section A of the questionnaire requested for personal information of the biology teachers such as school's name, subject, teachers' academic qualification. Section B: The questionnaire contains 20 statements representing assessment of Biology Teachers' on the knowledge and use of flipped learning.The responses to the questionnaire items was based on frequency and percentage.The content validity of the research instrument which is the research designed questionnaire (BTKUFLM) were given to three lecturers in Biology department for their scrutiny. Furthermore , the instrument was also given to two secondary school biology teachers for their own opinion. In other to ascertain the reliability of

the instrument, , the instrument was administered to twenty biology teachers who will not be selected for the study. Cronbach coefficient alpha was used to determine the reliability index of the instrument and it was found to be 0.78.

. Quantitative data were analyzed using descriptive statistics and chi-square tests. Qualitative data were coded thematically

Results

The Results and interpretation of findings of the study are presented. Out of 200 copies of the senior secondary biology teachers questionnaire that were administered across the sampled schools, only 174 was properly filled and retrieved.

Research Question 1: What is the level of Biology teachers' knowledge of flipped learning methods?

Table 1: The level of Biology teachers' knowledge of flipped learning methods.

Item Statement	Freq	Agree (%)	Freq	Disagree (%)
The teachers' are aware of flipped learning.	25	71.3%	12	32.5%
The teachers can identify key features of flipped class	24	52.4%	13	48.2%
The teachers have used videos/pre-recorded lectures	18	38.2%	19	62,7%
The teachers understands learner-centered approach	21	57.4%	16	41.3%

Result from Table 1 shows that with the high percentage of respondents teachers' are aware of flipped learning.

Research Question 2: What is the level of implementation of flipped learning in biology classrooms?

Table 2: The level of implementation of flipped learning in biology classrooms?

Item Statement	Freq	Agree (%)	Freq	Disagree (%)
The teachers provides video lessons before class	17	32.5	20	46.7
The teachers assigns students pre-reading/pre-class tasks	19	41.6	18	57.7
The teachers' uses class time for discussion, projects, or activities	14	32.5	23	56.4
The teachers integrates technology (apps, online tools)	21	23.6	16	58.6
The teacher do assess students understanding before in-class lessons	15	43.6	22	25.6

percentage score is the teachers' integration of technology while other core flipped strategies such as assigning video lessons were poorly scored. This indicates a generally low level of implementation of flipped learning methods among Biology teachers.

Research Question 3: What are the barriers to the adoption of flipped learning methods?

Table 3: What are the barriers to the adoption of flipped learning methods

Items Statement	Freq	Agree (%)	Freq	Disagree (%)
Lack of access to reliable internet	21	37.2	16	22.3
Insufficient training on flipped learning	27	46.3	10	21.4
Students' lack of access to devices or technology	18	38.4	19	26.3
Time constraints in preparing video and online materials.	17	41.3	20	32.4
Lack of motivation or interest by teachers.	20	42.2	17	33.2

Results from Table 3, shows that Insufficient training on flipped learning has the highest ranking compare to others.

Research Question 4: What are strategies to be taken to enhance the use of flipped learning in

biology instruction?

Table 4: Strategies to be taken to enhance the use of flipped learning in biology instruction?

Item Statement	Freq	Agree (%)	Freq	Disagree (%)
Organizing regular training/workshops for teachers	25	62.3	12	32.6
Provision of internet and digital tools	22	51.2	15	41.6
Development of Biology-specific flipped learning content	20	45.3	17	43.3
Support from school administrators and policy makers	19	42.2	18	41.3
Encouraging students' access to mobile learning	21	46.2	16	43.4

Result from Table 4, shows that teacher training and Provision of internet and digital tools are the most strongly recommended strategies for enhancing flipped learning adoption in Biology classrooms.

Discussion

The findings from Table 1 show that 57.4% of Biology teachers are aware of flipped learning methods of teaching. This corresponds with Salas-Rueda (2023). The emergence and rapid development in the technological world, has brought so many changes in Education, this is to better people's life and change the method of impacting knowledge.

The findings from Table 2 revealed a generally low level of implementation of flipped learning methods among Biology teachers. This is in line with Zainuddin & Halili, (2016) which states that while interest in flipped learning is growing globally, actual implementation-especially in developing countries and secondary schools is still low due to lack of awareness and training.

The findings from Table 3 showed that technological and institutional barriers ranked as the most significant challenges to implementation, teachers' lack of training and students' limited access to devices were repeatedly highlighted as constraints while motivational and attitudinal barriers although present, were not seen as primary obstacles. This is in line with Al-Samarraie (2020) who also pointed out some of the barriers affecting the use of flipped learning in schools.

The findings from Table 4 showed that teacher training and infrastructural support are the most strongly recommended strategies for enhancing flipped learning adoption in Biology classrooms. This in line with Zainuddin, Z., & Halili, S.H. (2016) who pointed out the strategies.

Recommendations

1. Professional Development: Regular training workshops on flipped learning design and delivery.
2. Resource Provision: Access to technology tools and learning platforms.
3. Policy Support: Institutional policies promoting innovation in teaching.
4. Collaborative Communities: Peer networks to share strategies and resources.
5. Pilot Programs: Introduce flipped learning in small groups with mentorship.

Conclusion

Flipped learning offers promising possibilities for biology education, but effective implementation depends on teachers' understanding and institutional support. Bridging the knowledge-practice gap requires systemic changes, targeted training, and resource availability. Equipping biology teachers with the necessary skills and confidence is essential for transforming science education.

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