



Teachers' Awareness and Utilisation of Flipped Classroom Instructional Approach in Secondary School Biology Teaching and Learning

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Abstract

The study examined challenges militating use of flipped classroom instructional approach in Biology teaching and learning using a descriptive survey research design. Population of the study comprised all Biology teachers in Nsukka Local Government Area, purposively sampled. A validated structured questionnaire was used to collect data. A reliability index of 0.85 of the instrument was established using Cronbach Alpha. Data were analyzed using frequency tables, percentages, means and hypotheses tested using ANCOVA at 0.05 level of significance. Findings revealed that mostly male Biology teachers are ignorant of the instructional approach. Major problems militating use of this approach are ignorance of the teachers, cost, time and epileptic power supply among others. Suggested solutions included organizing conferences and workshops for serving teachers, encouraging parents and teachers to provide online facilities for students among others. Recommendations were made for teachers to adopt the use of flipped classroom instructional approach for effective Biology teaching/learning.

Keywords: Flipped Classroom, Challenges, Solution and Biology teaching and learning.

Introduction

The global advancement in technology has helped in the production of educational technological tools such as interactive videos and other different forms of e-learning facilities. These educational technological tools have helped to increase the interest of educators and researchers in search of more effective electronic facilitated approaches to teaching and learning. One of such approaches is the Flipped Classroom instructional approach.

A flipped classroom 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. The flipped classroom approach "flips" the typical presentation of contents, where class time is used for lectures and homework consists of problem sets or group projects outside the classroom (Roehling & Bredow, 2021). Thus, Uzunboylu and Karagozlu (2015) maintained that in flipped teaching pedagogical approach, that classroom activities and homework are interchanged. Roehling and Bredow (2021) defined flipped classroom as pedagogy in education in which students view digitalized or online lectures as pre-class homework, then spend in-class time engaged in active learning experiments such as discussions, peer teaching, presentation, problem-solving and group activities among others. Flipped classroom can therefore be perceived as an innovative

pedagogy that encourages students to learn contents outside the classroom through digital resources such as videos and later discuss the pre-viewed content through active classroom interaction under the guidance of an instructor. The essential principle of flipped classroom instructional approach is to ensure better comprehension and consolidation of the content which is learned by the students outside the classroom, under the guidance of the instructor(s) inside the classroom (Cabi, 2018).

Flipped classroom instructional approach is presented in different terms by different authors. Hence, Hung as cited by Uzunboylu and Karagozlu (2015) noted that there are synonymous terms with flipped teaching which have been used in different studies. These terms include 'inverted classroom' (Large & Platt, 2000) 'inverted learning' (Barker, Quennerstedt & Annerstedt, 2013) 'flipped model' (Cabi, 2018), 'just-in-time teaching' (Novak, 2011), while Lo and Hew (2017) used the term flipped classroom instructional approach which is applied in this study. Nevertheless, these terms can be interchangeably used when discussing about flipped classroom.

Many studies outlined the academic benefits of flipped classroom. Hamdem, 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. In the same vein, Roehling and Bredow (2021) remarked that it was one of the teaching



methods that were particularly amenable to teaching during the COVID-19 pandemic. Roehling and Bredow (2021) further outlined the academic benefits of flipped classroom over-lecture based teaching to include promoting in students higher order thinking and applied skills, intra/inter-personal aptitudes, active learning engagement, meta-cognitive and interpersonal skills and academic gain and satisfaction among others. Similarly, the study by Kim, Kim, Khera and Getmun (2014) indicated that flipped classroom allows students to incorporate foundational information into long-term memory prior to class and enable students to build a learning community. However, most Biology teachers are not aware of the use of flipped classroom instructional approach (Fatokun, Jimoh & Enefure, 2019).

Theoretically, Flipped Classroom instructional 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) opined that the effective use of flipped classroom in Biology (science) teaching and learning could promote science education.

Regardless of the aforementioned academic benefits of flipped classroom instructional approach. However, the researchers’ experiences in teaching and teaching practice supervisions, revealed ineffective use or non-adoption of this pedagogy in Biology teaching and learning and report by Egbujuo (2011). Based on this, the researchers investigated the challenges militating against the use of flipped Classroom instructional approach in secondary school Biology teaching and learning in Nsukka Education Zone.

Statement of Problem

The high rate of insecurity and the occasional outbreak of pandemic diseases that usually hinder the normal face-to-face classroom interaction, calls for innovative teaching approaches that are digitalized to ensure academic continuity regardless of barriers. Thus, the global advancement in educational technological tools such as interactive videos, video conference system paved way for digitalized learning approaches. One of these approaches is the Flipped Classroom. It is a pedagogical approach in which instructor(s) share predetermined digital resources with students through a platform outside the classroom, while active, collaborative and interactive problem-solving activities and consolidated practices are carried out inside the classroom. Regardless of the

numerous academic benefits of this approach, its usage in Biology teaching and learning hasn’t been extensive. Since adopting new pedagogies by instructors can be daunting, this study examined the challenges militating against its usage by Biology teachers in Nsukka Local Government Area and possible solutions.

Purpose of Study

1. determine the level of Biology teachers’ awareness of flipped classroom instructional approach,
2. determine the extent of teacher’s usage of flipped classroom in Biology teaching and learning,
3. find out the challenges militating the use of flipped classroom in Biology teaching and learning and
4. find out possible solutions to challenges militating the use of flipped classroom in Biology teaching and learning.

Research Questions:

1. What is the level of Biology teachers’ awareness of Flipped Classroom instructional approach?
2. What is the extent of Biology teachers’ usage of Flipped Classroom instructional approach?
3. What are the challenges militating the use of Flipped Classroom approach in Biology teaching and learning?
4. What are the solutions to problems militating teachers’ use of Flipped Classroom in Biology teaching and learning?

Hypotheses

1. There is no significant difference between the ratings of male and female Biology teachers on their level of awareness of Flipped Classroom instructional approach.
2. There is no significant difference between the ratings of male and female Biology teachers on their usage of Flipped Classroom instructional approach.
3. There is no significant difference between the ratings of male and female biology teachers on the challenges militating the use of Flipped Classroom approach in Biology teaching and learning.
4. There is no significant difference between the ratings of male and female biology teachers on

the solutions to problems militating the teachers’ use of Flipped Classroom in Biology teaching and learning.

Method

This study adopted a descriptive survey research design. A descriptive survey deals with describing the characteristics or attribute of an element or group of elements ((Fatokun, Jimoh & Enefure, 2019). The element could be individual, event or object. The study was carried out in all the public secondary schools in Nsukka Local Government Area of Enugu state. The population of the study comprised all the 60 Biology teachers in Nsukka Local Government Area of Enugu State. This was to get a result which can be generalized in the entire Local Government Area of the State. All the Biology teachers in Nsukka Local Government Area of Enugu State were purposively selected hence, there was no sampling. A structured questionnaire titled “Questionnaire on Challenges Militating Use of Flipped Classroom Instructional Approach in Biology Teaching and Learning (QCMAUFCIABTL) developed by the researchers

was used to solicit information from our respondents (Biology teachers). The questionnaire has two sections. Section “A” solicits Socio-demographic information of the respondents while section “B” has twenty-nine items grouped into four clusters with different items to address the four research questions respectively. The questionnaire was administered to the respondents and collected on the spot.

The instrument was validated by three experts from Science Education Department. Two experts from Biology unit and one from measurement and evaluation unit, all from University of Nigeria, Nsukka validated the instrument. Reliability coefficient index of 0.85 for the instrument was obtained using Cronbach Alpha, making the instrument suitable and reliable for the study. Data for the study were analyzed using frequency tables, percentages, means and hypotheses tested using ANCOVA at 0.05 level of significance.

Results

Table 1: Mean analysis of the ratings of male and female Biology teachers on their level of awareness of Flipped Classroom instructional approach

S/N	Item Statement	Gender	N	Mean	SD.	Remark
1	I always attend conferences, workshops and seminars to update my knowledge on innovative teaching/learning approaches.	Male	20	2.80	1.00	Agree
		Female	40	2.90	.70	Agree
2	I have not heard about flipped classroom instructional approach before.	Male	20	1.80	1.19	Disagree
		Female	40	2.10	1.15	Disagree
3	Flipped classroom instructional approach is one of the best current innovative approaches in science teaching and learning.	Male	20	2.20	1.00	Disagree
		Female	40	2.80	.75	Agree
4	I normally buy some journals to sieve out useful hints on innovative instructional approaches.	Male	20	2.00	.64	Disagree
		Female	40	2.70	.91	Agree
5	Current innovative instructional strategies by undergraduates and postgraduates are easily accessible to science teachers.	Male	20	2.60	1.04	Agree
		Female	40	2.10	1.05	Disagree
6	I heard about flipped classroom in PG lectures.	Male	20	1.40	.82	Disagree
		Female	40	2.40	.92	Disagree
7	I have heard about flipped classroom but I find it very difficult to adopt.	Male	20	1.20	.41	Disagree
		Female	40	2.10	1.23	Disagree
	Overall Mean	Male	20	2.00	.44	Disagree
		Female	40	2.44	.32	Disagree

Table 1 shows that the mean ratings of male and female biology teachers on item 1 are more than 2.50 benchmark mean while their mean ratings on items 2, 6 and 7 are less than the 2.50 benchmark mean. This

implies that both male and female teachers are aware of Flipped Classroom instructional approach of item 1 but are not aware of the Flipped Classroom instructional approach of items 2, 6, and 7. However,

while male teachers are not aware of Flipped Classroom instructional approach of item 3, the female teachers are aware of it. On the other hand, while male teachers are aware of the Flipped Classroom instructional approach of item 5, the female teachers are not aware of it. The overall mean ratings of ($M = 2.00, SD = .44$) and ($M = 2.44, SD = .32$) for male and female biology teachers respectively imply that female teachers had higher mean awareness level of Flipped Classroom instructional approach than the male teachers.

Table 2: t-test analysis of the ratings of male and

female Biology teachers on their level of awareness of Flipped Classroom instructional approach

Gender	N	Mean	SD	df	t	P
Male	20	2.00	.44	58	-4.379	.000
Female	40	2.44	.32			

Table 2 shows that there is a significant difference in the mean ratings of male ($M = 2.00, SD = .44$) and female ($M = 2.44, SD = .32$) biology teachers on the level of Biology teachers' awareness of Flipped Classroom instructional approach, $t(58) = -4.379, p = .000$. Thus, the null hypothesis is rejected ($p < .05$).

Table 3: Mean analysis of the ratings of male and female Biology teachers on their usage of Flipped Classroom instructional approach

S/N	Item Statement	Gender	N	Mean	SD	Remark
8	I use flipped classroom instructional approach in my Biology lessons.	Male	20	1.40	.50	VLE
		Female	40	2.00	.78	LE
9	I occasionally use flipped classroom instructional approach to teach some Biology concepts.	Male	20	1.80	1.00	LE
		Female	40	2.00	.78	LE
10	I often combine the use of flipped classroom instructional approach with other innovative teaching approaches.	Male	20	2.20	1.19	LE
		Female	40	2.10	.70	LE
11	I give my students assignment involving the use of flipped classroom instructional approach.	Male	20	1.60	.82	LE
		Female	40	1.90	.54	LE
Overall Mean		Male	20	1.75	.84	LE
		Female	40	2.00	.55	LE

Table 3 shows that male biology teachers' mean rating on item 8 is within the mean range of 1.0 to 1.49 while that of the female teachers is within the mean range of 1.50 to 2.49, implying that the male teachers to a very low extent utilise Flipped Classroom instructional approach while the female teachers to a low extent utilise Flipped Classroom instructional approach. However, the mean ratings of both male and female biology teachers on items 9 to 11 are within the mean range of 1.50 to 2.49 implying that both male and female teachers to a low extent utilise Flipped Classroom instructional approach. The overall mean ratings of ($M = 1.75, SD = .84$) and ($M = 2.00, SD = .55$) for male and female biology teachers respectively imply that female teachers had higher mean rating than the male teachers.

Table 4: t-test analysis of the ratings of male and female Biology teachers on their extent of usage of Flipped Classroom instructional approach

Gender	N	Mean	SD	df	t	P
Male	20	1.75	.84	58	-1.377	.174
Female	40	2.00	.55			

Table 4 shows that there is no significant difference in the mean ratings of male ($M = 1.75, SD = .84$) and female ($M = 2.00, SD = .55$) biology teachers on the extent of Biology teachers' usage of Flipped Classroom instructional approach, $t(58) = -1.377, p = .174$. Thus, the null hypothesis was not rejected ($p > .05$).

Table 5: Mean analysis of the ratings of male and female Biology teachers on the challenges militating against the use of Flipped Classroom approach in Biology teaching and learning

S/N	Item Statement	Gender	N	Mean	SD	Remarks
12	Flipped classroom is new and not known by	Male	20	3.00	1.12	Agree

	Biology teachers.	Female	40	3.30	.91	Agree
13	Lack of adequate power supply and teaching/learning facilities to encourage current innovative instructional approaches.	Male	20	3.20	.41	Agree
		Female	40	3.00	.64	Agree
14	Problem of large class size and unappealing learning environment for flipped classroom (FC).	Male	20	3.40	.82	Agree
		Female	40	3.30	.64	Agree
15	Lack of appropriate funding of secondary school to acquire needed equipment.	Male	20	3.40	.50	Agree
		Female	40	3.30	.64	Agree
16	Bulky syllabus which must be covered within specific time does not give room for the use of flipped classroom (FC).	Male	20	2.80	1.00	Agree
		Female	40	3.30	.91	Agree
17	Lack of implementation guide on how to practically adopt flipped classroom.	Male	20	3.40	.50	Agree
		Female	40	3.30	.64	Agree
18	Lack of necessary encouragement, motivation, support and monitoring by school administrators and supervisors.	Male	20	2.80	1.00	Agree
		Female	40	2.90	.70	Agree
19	Instructional materials for flipped classroom e.g. video are very costly to procure.	Male	20	3.80	.41	Agree
		Female	40	3.80	.40	Agree
	Overall Mean	Male	20	3.22	.32	Agree
		Female	40	3.27	.41	Agree

Table 5 shows that the mean ratings of both male and female teachers on items 12 to 19 are more than 2.50 benchmark mean. This indicates that items 12 to 19 are the challenges militating against the use of Flipped Classroom approach in Biology teaching and learning. The overall mean ratings of ($M = 3.22, SD = .32$) and ($M = 3.27, SD = .41$) for male and female biology teachers respectively imply that female teachers had higher mean rating than the male teachers

Table 6: t-test analysis of the ratings of male and female biology teachers on the challenges militating

against the use of Flipped Classroom approach in Biology teaching and learning

Gender	N	Mean	SD	df	t	P
Male	20	3.22	.32	58	-.469	.641
Female	40	3.27	.41			

Table 6 shows that there is no significant difference in the mean ratings of male ($M = 3.22, SD = .32$) and female ($M = 3.27, SD = .41$) biology teachers on the challenges militating against use of Flipped Classroom approach in Biology teaching and learning, $t(58) = -1.377, p = .174$. Thus, the null hypothesis was not rejected ($p > .05$).

Table 7: Mean analysis of the ratings of male and female Biology teachers on the solutions to problems militating against teachers' use of Flipped Classroom in Biology teaching and learning

S/N	Item Statement	Gender	N	Mean	SD	Remark
20	Science teachers should be mandated to be attending conferences, seminars and workshops organized by professional bodies like Science Teachers' Association of Nigeria (STAN).	Male	20	3.60	.50	Agree
		Female	40	3.80	.40	Agree
21	Researchers should provide basic guides (easy to follow steps) on how to implement their findings to science teachers.	Male	20	3.20	.41	Agree
		Female	40	3.50	.50	Agree
22	There should be interactions between teachers during workshops and seminars.	Male	20	3.40	.50	Agree
		Female	40	3.60	.49	Agree
23	Provision of necessary equipment, ICT facilities and journals in schools to sufficiently accommodate the adoption of flipped classroom.	Male	20	3.40	.50	Agree
		Female	40	3.70	.46	Agree

24	Researches should be conducted on assisting science teachers at their implementation stage.	Male	20	3.40	.50	Agree
		Female	40	3.50	.50	Agree
25	There should be proper funding of educational research.	Male	20	4.00	.00	Agree
		Female	40	3.70	.46	Agree
26	There should be proper monitoring of science teachers by school administrators and supervisors.	Male	20	2.60	.82	Agree
		Female	40	3.10	.84	Agree
27	There should be adequate motivation by school administrators and the government.	Male	20	2.60	1.04	Agree
		Female	40	3.50	.67	Agree
28	There should be a means of collating all research reports centrally and disseminating same to all implementers uniformly in form of bulletin	Male	20	2.60	.82	Agree
		Female	40	3.10	.84	Agree
29	Science curriculum could be reviewed to specify the use of some these current innovative instructional approaches.	Male	20	3.00	.64	Agree
		Female	40	3.60	.49	Agree
30	There should be regular supervision and monitoring of teachers to ensure the adoption and utilization of new methods of teaching.	Male	20	3.00	.64	Agree
		Female	40	3.30	.46	Agree
		Male	20	3.16	.36	Agree
Overall Mean		Female	40	3.49	.25	Agree

Table 7 that the mean ratings of both male and female teachers on items 19 to 30 are more than 2.50 benchmark mean. This indicates that items 19 to 30 are the solutions to the problems militating against teachers' use of Flipped Classroom in Biology teaching and learning. The overall mean ratings of ($M = 3.16, SD = .36$) and ($M = 3.49, SD = .25$) for male and female biology teachers respectively imply that female teachers had higher mean rating than the male teachers

Table 8: t-test analysis of the ratings of male and female biology teachers on the solutions to problems militating against teachers' use of Flipped Classroom in Biology teaching and learning

Gender	N	Mean	SD	df	t	P
Male	20	3.16	.36	58	-4.071	.000
Female	40	3.49	.25			

Table 8 shows that there is a significant difference in the mean ratings of male ($M = 3.16, SD = .36$) and female ($M = 3.49, SD = .25$) biology teachers on the solutions to problems militating against teachers' use of Flipped Classroom in Biology teaching and learning, $t(58) = -4.071, p = .000$. Thus, the null hypothesis was rejected ($p < .05$).

Discussion

The findings of the research shows that flipped classroom instructional approach is one of the current innovative instructional approaches but many science teachers are not aware of it. Those who happen to know about it and its efficacy hardly use it, either because of limited access to information or their unwillingness to make effort in using it (Fatokun, Jimoh & Enefure, 2019). This finding is in line with Egbujoo (2011) who affirmed that most science teachers are unable to utilize findings from research reports due to lack of access to information. Though most teachers are having difficulty in transmitting from the conventional teaching approach to innovative or blended approaches, they still ascertain that the innovative strategies are efficient in enhancing learning. This view is in agreement with Ochu and Haruna (2014) who confirmed that the only way to arrest students' poor performance in Biology is through the adoption of some innovative approaches such as flipped classroom instructional approach.

Conclusion and Recommendations

The finding of this study reveals that innovation in science teaching is a welcome development but there are lots of setbacks due to insufficient access to research findings. Lack of awareness of science teachers on some innovative instructional approaches like flipped classroom was discovered and their



inability to implement the ones they were aware of properly. It is therefore recommended that there should be proper means of collating all research findings centrally and disseminating same to all implementers uniformly in form of a bulletin with step by step guide on how to effectively practice the new teaching approach. Enabling environment should be created through proper funding by the government to encourage the adoption of flipped classroom instructional approach by science teachers toward students' academic excellence.

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