

*Full Length Research Paper*

# **Use of online collaborative learning strategy in enhancing postgraduates' learning outcomes in science education**

**Peter Oladeji Ajayi\* and Lois Folasayo Ajayi**

Department of Science Education, Faculty of Education, Ekiti State University, Ekiti State, Nigeria.

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**Most postgraduates in Nigeria Universities are family and working-class students. They rarely have time to stay and study in the classroom due to pressures at home and work-place. To enhance their outcomes in the program despite their tight schedule, the use of online collaborative learning strategy was employed. Pretest-posttest, control quasi-experimental research design was used on 38 postgraduates in Science Education. The sample was selected from two Universities in south west Nigeria. Two instruments: Questionnaire on Postgraduates' Studying Challenges (QPSC) and Science Education Performance Test (SEPT) were administered on the sample. Data generated were analyzed using descriptive and inferential statistics. The result revealed that the use of Online Collaborative Learning Strategy enhances undergraduates' learning outcomes and retention in Science Education.**

**Key words:** Postgraduates, online collaborative learning strategy, science education, learning outcomes, universities, students.

## **INTRODUCTION**

Postgraduate programs at Masters level in Nigeria Universities are combination of course works and research activities. These require students' presence both in the classroom and on the field most of the time. They are expected to spend more time on research field than in the classroom. At the same time, they must visit their research supervisors to showcase their progress reports and take some instructions from them. Most of the class works and research activities cannot be done in isolation. There is need for collaboration and consultation. Coupled with the family life and workplace demands, most postgraduates are faced with a number

of challenges in their studies (Chigona and Chetty, 2017). The three facets of their pursuits compete with the limited time available to undergraduates (Ataca and Berry, 2010). As a result of the numerous challenges faced by married students, there is need for an avenue where such students could interact with their colleagues and instructors without jeopardizing the family and work-place demands. One of the current ways of getting these activities done is through online collaboration.

Online Collaborative Learning Strategy (OCLS) in the context of this work entails grouping the students together in a sizable number suitable for group work.

\*Corresponding author. E-mail: [Oladeji.ajayi@eksu.edu.ng](mailto:Oladeji.ajayi@eksu.edu.ng).

Unlike the conventional Collaborative Learning Strategy (CLS), in OCLS, there might be no need for physical convergence of the group members at all times. It is a distance learning carried out collaboratively.

Online activities include the use of social media platforms. Students across the world are embracing learning through social media. From the study of Ansari and Khan (2020) revealed that 67% of India students accepted that mobile devices and social media play a vital role in their academic performance and career enhancement. This was in support of Gikas and Grant (2013) who earlier opined that mobile devices and social media provide excellent educational e-learning opportunities to the students for academic collaboration, accessing course contents and tutors despite the physical boundary. Ansari and Khan further stressed that some of the benefits of collaborative learning through social media networks include accessing course contents, video clip, transfer of instructional notes. In an interview study carried out among students of three Universities in the United States showed that social media created resourceful collaborative learning opportunities to students (Gikas and Grant, 2013). This was buttressed by a study carried out by Dahlstrom (2011) cited in Elkaseh et al. (2016) on 3000 college students in United States which revealed that 90% of the students uses Facebook, while 37% uses Twitter to share information. Studies in western countries have stressed that online social media used for collaborative learning has a significant contribution to students' academic performance and satisfaction (Ansari and Khan, 2020). Study of Eid and Al-Jabri (2016) carried out on 308 graduates and postgraduates in Saudi Arabia University revealed that students embarked on collaborative learning, sharing files and knowledge through the use of social media. In Nigeria, over 60% of students use social media as their primary source of information (Kamau, 2017). These studies carried out across the world justified the inclusion of online media in the Collaborative Learning Strategy as adopted in this work. The choice of social media for the study was based on the findings of previous researches that claimed popularity of Facebook and other social media among students in various levels of educational institutions. Derived from literature, it implies that all collaborative activities might be perfectly done online. This would spare the students time to attend to family and work-place issues. Distance coverage in journeys to attend lectures and deliberations on field work and the risks involved in such journeys could be avoided, yet the postgraduates' activities could still be carried out appropriately.

OCLS is part of Group Learning Strategies where students work together as a team (Chandra, 2015; Ha et al., 2018). In OCLS, students are grouped into five memberships at most. Each group is given a task to perform and in performing the task, each member studies, thinks and shares ideas among colleagues. In

online collaborative learning, everyone is an active member of the group (Yamarik, 2007). Online collaborative learning enhances active interaction with other members of the group, each member is accountable and responsible to the group, and there is positive interdependency. In small groups students are more active and perform better (Yamarik, 2007). Collaborative learning has been proved to have the potentials of enhancing students' learning (ai, 2011, 2013).

The slight difference between the CLS and the OCLS is in the introduction of virtual classroom. In CLS, sharing of information, class or group interaction is not possible unless there is physical class or group gathering. Each member of the class would have to travel from their various locations for the purpose of sharing or receiving information or materials. Much time is spent by the students in order to receive instructions or deliberate on the study tasks. But in OCLS, all activities are online based. Students might not need to leave their duty posts for study centers. Yet all learning activities are done through online platforms. OCLS allows constant and consistent discussions among the learning group members, it doesn't require physical gathering of the learners before performing any necessary learning activity. It makes sharing of information and materials easier. It also allows prompt and instant reports from the fieldwork. The idea of waiting till the meeting days before reporting is defeated under OCLS. The stages involved the use of OCLS includes the following.

### **Permutation of the learning groups**

The teacher at the beginning of the class will, through the use of an unbiased technique, group the students into sizable numbers ranging between 3 and 5. The group head/coordinator will thereafter be appointed for each group. The group head is saddled with the responsibility of coordinating the activities in the group and keep records of what is done.

### **Preparation and presentation of the day's activities**

The teacher who stands as the facilitator under this strategy prepares the students for the day's work and gives them the study contents and the learning objectives. All necessary learning materials are also provided and presented to the groups. The group members thereafter determine the procedures for the tasks before them.

### **Participation and online collaboration**

Members of the groups are made to register online with

one of the two social media platforms dedicated for this study. Facebook Group Class (FGC) and WhatsApp Group Class (WGC) were chosen to be the group learning platforms because of their popularity among Nigeria students. The two social media platforms are mostly used by many Nigerian students. They are already used to the operations of the platforms. Network providers in Nigeria also make their services on the two platforms affordable to students. By implication, every student in Nigeria is a perpetual user of Facebook and WhatsApp (Mageto, 2017; Kamau, 2017; Ngonso, 2019). For the purpose of this study, whichever platform chosen by a group becomes the virtual classroom for the group members to interact. ZOOM was dedicated for general classroom interaction. ZOOM was preferred as the overall virtual classroom because of its features and provision for large participants. The collaborative activities are done online. Group members chat and present ideas through the platform. The duty of the course lecturer is to monitor the online collaboration but not to intervene in their learning processes. At the end of a section, the lecturer converge all the groups through ZOOM which was created for the purpose of online general class teaching in this study. The use of online platform for collaboration was to allow the postgraduates have time for home and office commitments and at the same time, progressing in their studies. They begin the activities by discussing, observing, deliberating and manipulating the materials online one after the other. At this stage every member of the group must present his ideas and findings to the group. Every individual's findings are considered by the entire group members and discussions are allowed on such findings. This will be done in turns among the group members until everyone in the group have participated. To conclude the group activities for the section, a consensus would be reached and documented for presentation to the whole class.

### **Progress report and posting**

At the end of the activities, every group would be made to present their findings through the ZOOM platform and the entire class members will consider and conclude on the best findings out of all that were presented by the groups. The learning for the section then ends.

### **Statement of the problem**

Most postgraduates in Science Education are family and work-class people. They rarely have time to spend in the classroom yet interested in the postgraduate program. A good number of them are faced with the challenges of managing work and family alongside their studies. There are little or no time left out of their tight schedules for the rigorous and "in-the-class" study in higher education. As a result of physical convergence barrier among them,

sharing of study materials, knowledge and ideas are almost impossible. There was no opportunity of team work which postgraduate studies required most of the time. To encourage such married students and encourage team work as well as sharing of information and ideas, there is need to provide a learning platform that would allow them study as teams, share information and at the same time manage their homes and work schedules. Since the lecturer-in-charge cannot give all his time to students' consultations only, and the students are faced with the challenges of converging in the classroom for lectures, there is need for online collaboration. Therefore, this study introduced Online Collaborative Learning Strategy (OCLS) to determine its effects on postgraduates' learning outcomes in Science Education.

### **Research questions**

The following research questions were raised to guide the study:

1. What is the distribution of the postgraduates in Science Education across marital and employment statuses?
2. What are the challenges faced by the postgraduates in their studies?

### **Research hypotheses**

The following research hypotheses were formulated and analyzed:

- 1). There is no significant difference between the pretest mean scores of experimental and control groups
- 2). There is no significant difference between the posttest mean scores of experimental and control groups.
- 3). There is no significant difference between the retention mean scores of experimental and control groups.

### **METHODOLOGY**

The design used for the study was a pretest-posttest- control quasi-experimental research. The sample used was 38 postgraduates studying Science Education at Masters level selected from two Universities in South-West, Nigeria. Simple random sampling technique was used in selecting two states out of the six states in South-West, Nigeria as well as in the selection of the two Universities used in this study. Simple random sampling technique was also used to select the University designated as 'Experimental Group' while the other University became the 'Control Group'. Purposive sampling technique was used in the selection of the 20 Science Education students for experimental group as well as the 18 Science Education students for the control group. All second-year postgraduates studying Science Education at Masters level from the two Universities selected were used for the study. Two instruments were used for the study. The first instrument was a self-constructed 10-item questionnaire titled 'Questionnaire on Postgraduate Studying Challenges' (QPSC) and a 10-item short

**Table 1.** Percentage analysis of the marital and employment statuses of the postgraduates in Science Education.

Postgraduate status	N	Percentage
Married and employed	30	78.95
Not married but employed	3	7.89
Married but not employment yet	4	10.53
Not married and not employment yet	1	2.63
<b>Total</b>	<b>38</b>	<b>100</b>

answer easy type 'Science Education Performance Test' (SEPT). Each item in QPSC was rated 1 mark while each item in SEPT was scored 2 marks. Face and content validity of the two instruments were ensured and reliability was also carried out on the two instruments by administering them to 5 postgraduates in Science Education outside the sampled Universities for this study. The data collected from the 5 students were analyzed using Kuder-Rechardson formula 21 ( $Kr_{21}$ ) for QPSC and Kuder-Rechardson formula 20 ( $Kr_{20}$ ) for SEPT. The reliability coefficients obtained were 0.86 and 0.89 for QPSC and SEPT respectively at 0.5 level of significance. The two instruments were administered on the experimental and control groups prior the treatment to obtain their pretest scores. Experimental group was thereafter grouped into four learning groups. Each group had five memberships. The four groups were made to register on any of the two Social Media Platforms dedicated for the group online collaboration. The two Social Media Platforms for group online interactions were Facebook Group Class (FGC) and WhatsApp Group Class (WGC). 'ZOOM' was chosen to be the general online classroom platform for experimental group only. This was where general class interactions and findings of all groups were collated and judged. All activities done throughout the study were online and virtual classroom based.

#### Activities within experimental group

The treatment was given to the experimental groups for a period of ten weeks out of the thirteen weeks designated for the study. At the end of the formation and online registration of the collaborative learning groups, study contents and learning objectives were presented to both experimental and control groups. The researcher played the role of an online facilitator to the experimental group. The frequency of the online meetings was determined by the OCLS learning groups. None of the groups met less than five times of appreciable hours per week. They took advantage of online platforms that allow studying while at work or home

#### Activities within the control group

The regular course lecturer for the control group was made to engage his students using his conventional teaching strategies for the period of the study. By implication, the learning process existing at the control group class before the commencement of this study was upheld throughout the study period. There was no interference or adjustment to the learning conditions of the control group. The control group had meetings twice a week for a period of 2 h per day as stipulated in the University lecture time table. It was ensured that there was no interference between the two groups throughout the ten weeks of study. The same Science Education curriculum was given to the two groups for the period. Contents of the curriculum covered were as prescribed in the University course-work schedule for the semester that coincides with this study time. These include: Instructional Materials and Techniques in Science Teaching, and

#### Evaluation in Science Education

At the end of the tenth week, SEPT was administered on the two groups to determine their posttest mean scores. Three weeks break was given to the students thereafter and SEPT was re-administered on the two groups to obtain the retention mean scores. The study lasted 13 weeks. The data collected were subjected to statistical analysis to determine the students' performance and retention in Science Education.

## RESULTS

### Descriptive analysis

Question 1: What is the distribution of the postgraduates in Science Education across marital and employment statuses?

Table 1 shows that 78.95% were married and employed, 7.89% were not married but employed, while 10.53% were married but not employed yet and 2.63% were not married and not employed yet. This showed that 89.5% of the students sampled were married and at the same time studying, while 86.8% were students and also working at the same time.

Question 2: What are the challenges faced by the postgraduates in their studies?

Table 2 showed that 78.9% of the postgraduates sampled were fully engaged at the work-place, 76.3% found it difficult to study at home due to huge domestic activities, 68.4% also found it difficult to attend classes and 84.2% could not embark on field work alone, while 60.5% missed lectures as a result of domestic challenges. The table revealed further that 68.4% of the postgraduates were not gaining the support of their employer to proceed on the study, 57.9% were not visiting their project supervisors as expected, 97.4% confirmed that it was difficult for the entire students to physically converge at the study center due to variations in terms of office and family schedules, 100.0% of the students claimed that lectures and field works are time demanding, while 97.4% of the students observed that postgraduate programs require collaboration among the students.

### Hypotheses testing

$H_0$ 1: There is no significant difference between the

**Table 2.** Percentage analysis of the challenges faced by the postgraduates in their studies.

Challenges	N	Percentage
My duties at work-place do take much of my time	30	78.9
Domestic activities always hinder my personal study at home	29	76.3
Coming to class possess great challenge to my life	26	68.4
It's difficult to do field work alone	32	84.2
I always miss class lectures due to domestic challenges	23	60.5
My place of work did not support my study	26	68.4
I rarely meet with my supervisor as a result of time constraints	22	57.9
It is difficult to physically converge in the class due to variations in office work schedules of working-class students among us	37	97.4
Lectures and field works demand much time	38	100
Postgraduate program requires collaboration with colleagues	37	97.4

**Table 3.** t-test analysis of the difference between the pretest mean scores of experimental and control groups.

Group	N	Mean	SD	df	t	Sig
Experimental	20	6.40	1.47	36	0.27	0.789*
Control	18	6.28	1.32			

\* $p < 0.05$ .

pretest mean scores of experimental and control groups.

Table 3 revealed that the p value (0.789) was greater than the  $\alpha$ -value (0.05). Therefore, the hypothesis was not rejected. There was no significant difference in the pretest mean scores of experimental and control groups. Both experimental control groups were at the same performance level before the treatment. It implies that the two groups were homogeneous.

H<sub>0</sub>1: There is no significant difference between the posttest mean scores of experimental and control groups. Table 4 revealed that the p value (0.000) was less than the  $\alpha$ -value (0.05). Therefore, the hypothesis was rejected. There was a significant difference in the posttest mean scores of experimental and control groups. Experimental group performed better than the control group as a result of the treatment.

H<sub>0</sub>2: There is no significant difference between the retention mean scores of experimental and control groups.

Table 5 revealed that the p-value (0.000) was less than the  $\alpha$ -value (0.05). Therefore, the hypothesis was rejected. There was a significant difference in the retention mean scores of experimental and control. Experimental group has better retention ability than the control group.

## DISCUSSION

The findings of the study showed that statuses of the

postgraduates were very busy ones. Most of them were married and employed. This indicates that they were to manage home and office tasks together as well as attending to their studies at the same time. This posed a lot of challenges to the students. There were conflicts between the three obligations. It was found out that the students were fully engaged at the work-place at the same time find it difficult to study at home due to huge domestic activities. The students also found it difficult to attend lectures. They could not embark on field work alone and could not visit their project supervisors as expected. One of the reasons was the inability to gain the support of their employer towards the study. This finding was in agreement with Chigona and Chetty (2007) as well as Ataca and Berry (2010) who both observed that most postgraduates are faced with challenges of managing their studies with office work and home activities. Since none of the trio can be sacrificed for the other, there is bound to be conflicts in time demand and allocation to each of the pursuits.

The findings from the study showed that there was no significant difference in the pretest mean scores of experimental and control groups. Both experimental control groups were at the same performance level before the treatment. It implies that the two groups were homogeneous. The findings of the study further revealed that there was a significant difference in the posttest mean scores of experimental and control groups. Experimental group performed better than the control group as a result of the treatment. Online collaboration

**Table 4.** t-test analysis of the difference between the posttest mean scores of experimental and control groups.

Group	N	Mean	SD	df	t	Sig
Experimental	20	16.05	2.87	36	7.71	0.000*
Control	18	9.94	1.83			

\*p&lt;0.05.

**Table 5.** t-test analysis of the difference between the retention mean scores of experimental and control groups.

Group	N	Mean	SD	df	t	Sig
Experimental	20	14.5	2.69	36	9.13	0.000*
control	18	8.06	1.39			

\*p&lt;0.05.

among the postgraduates allowed them to have constant and consistent interactions with their group members, the entire class and the lecturer-in-charge without necessarily jeopardizing the assignments at work-place and home. Unlike in the control group where learners were to leave their place of works and homes to meet for lectures or meetings. The OCLS learning groups were more active, meeting regularly, frequently and consistently for discussions and sharing of information. Consequently, their performances in the study and at the research activities were enhanced. This was in line with the findings of Yamarik (2007), Al-Saai et al. (2011) and Kyndt et al. (2013) carried out in different parts of the continent. They all found out the collaborative learning enhances the performance of higher education students. Eid and Al-Jabri, (2016) as well as Ansari and Khan (2020) in the recent year also buttressed the fact that online collaboration enhances performance and satisfaction among University students.

The findings of the study also revealed that there was a significant difference in the retention means scores of experimental and control. Experimental group has better retention ability than the control group. This was as a result of the treatment given to the experimental groups. Students exposed to Online Collaboration Learning Strategy could retain what they learnt for a period of time. This was in line with the findings of Hasan and Fook (2012), Puzio and Colby (2013) as well as Ha et al. (2018). They all agreed that students exposed to Online Collaborative Learning Strategy could perform better and retain what they have learnt for a period of time than their counterparts who were not exposed to Online Collaborative Learning Strategy. This could be so because of the fact that the online classroom afforded them the opportunity of interacting regularly with their counterparts without conflicts of time and schedules.

Therefore, they can retain what they have learnt for a

period of time.

## CONCLUSION AND RECOMMENDATION

The study was able to present Online Collaborative Learning Strategy as one of the most effective learning strategies for postgraduates in Science Education. It was concluded from the study that the use of OCLS has the potentials to enhance students' sharing of information, resource materials, ideas and performance. It also improved their retention abilities. The use of OCLS gave the students an opportunity of coordinating their study activities alongside the office work and home obligations. It provided the avenue for consistent collaboration with other students and the lecturer-in-charge overcoming the barrier of physical distances. Based on the findings, it was recommended that Online Collaborative Learning Strategy should be used for postgraduates in Science Education to enable them cope with the trio commitments of study, work-place and home and at the same time, to enhance sharing of information and ideas among them which in turn would also enhance their performance and retention in the course.

## Implication

The study revealed that postgraduate studies could be done successfully through virtual classroom. All students could interact, learn and collaborate online. If this strategy could be embraced globally, several qualified people would enroll for advanced studies in a University of their choice in any part of the World. This would enhance international relationships and value sharing. It would be of great opportunity for people from low and medium economic nations who are interested in obtaining

higher educational certificates but might not have the wherewithal to travel across countries for such studies. As the opportunities of studying and working alongside increase globally, it would encourage entrepreneurship and national economic growth because people may not need to leave their jobs or businesses in the name of going abroad to study.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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