

INFLUENCE OF GROUP LABORATORY PRACTICAL WORK ON STUDENTS' ACADEMIC PERFORMANCE IN PHYSICS: COUNSELLING INTERVENTION IN IJUMU LOCAL GOVERNMENT AREA OF KOGI STATE

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ABSTRACT

The study investigated Influence of group laboratory practical work on students' academic performance in Physics: Counselling intervention in Ijumu Local Government Area of Kogi State. Descriptive design was adopted for the study. 300 students were randomly sampled for the study which comprises of 100 students each from the three geographical districts of Gbede, Ijumu Aarin and Ijumu Oke respectively. Self-structured questionnaire titled "Influence of Group Laboratory Work on Physics Students' Academic Performance in Physics (IGLWSAPP)" was used for the study. The questions were structured on modified four (4) liker scales of Strongly Agree (SA) Agree (A) Disagree (D) and Strongly Disagree (SD) and was validated by experts. Data collected was analysed by using descriptive statistics particularly the mean scores, tables and percentages with criterion mean a mid-point mean of 2.50 for acceptance and rejections of items. The study revealed among others as, students perform much more better in Physics group laboratory practical work than while working individually, the group laboratory practical work proved to have effects on students' academic performance in physics, Group physics laboratory practical work makes the teachers work more easier and it enhance large coverage of syllabus within the shortest time. The study recommended among others as, Physics teachers should lay more emphasizes on group laboratory work more than individual work, Physics practical work should be thoroughly supervised by the teachers, enough space must be provided in all the

laboratories to ensure free movement of students while working as group, Both the students and teachers should be counsel on the use of group laboratory method of teaching

Keywords: Academic, Counselling, influence, laboratory, performance, physics, practical

Introduction

Group laboratory work refers to experiments or scientific investigations conducted by a team of individuals working collaboratively in a laboratory setting. In this context, each member of the group contributes their skills, expertise, and efforts towards achieving common research goals or objectives.

Group laboratory work often involves tasks such as: Planning experiments: Collaboratively designing the experimental procedures, outlining objectives, and determining the resources required, dividing responsibilities among group members to perform various aspects of the experiment, such as data collection, sample preparation, measurements, and observations, working together to analyze experimental data, interpret results, and draw conclusions. This may involve statistical analysis, graphical representation, and comparison with theoretical predictions or existing literature, Engaging in discussions, sharing ideas, troubleshooting challenges, and providing support to fellow group members throughout the laboratory work process, collaboratively preparing reports, presentations, or publications to communicate the results of the group laboratory work. This typically includes summarizing the experimental approach, presenting data, discussing outcomes, and reflecting on the significance of the findings, group laboratory work offers several advantages, including the opportunity for students or researchers to learn from each other, develop teamwork and communication skills, leverage diverse perspectives and expertise, and accomplish more complex experiments than they might individually. Additionally, it mirrors real-world scientific practice, where interdisciplinary collaboration is often essential for tackling complex research problems. Therefore, with the rapid changing technological age that we are in, the importance of science and technology to nation like Nigeria cannot be overemphasised. Consequently great attention is been given to the teaching and learning of science so as to yield the desired results and achieved the national goals on science

education. The promotion of social and economic development through science and technology has been vigorously pursued by countries such as USA and Japan.

Physics is the branch of science that deals with the study of the composition and properties of matter, changes in matter, the laws and the principles that govern these changes (Ebbing, 2021). Physics is one of the core subjects that is offered in the Nigerian secondary school curriculum at the senior secondary school level. It is an important part of what is called science and an active and continually growing science that has vital importance to our world in both the realm of nature and realm of society (Anaso, 2020). According to Kauffman and Szmant (2017), physics is characterized as the most utilitarian of all the experimental sciences. For example, in Nigeria, a good secondary school education pass grade in physics is a prerequisite for joining science, medical and agricultural professional courses. Poor performance in the subject means fewer students are able to join such professions, therefore lack of enough professionals leading to low health care provision and food insecurity in the country.

Since physics is a practical science, teaching and learning of physics should involve physics practical. Physics practical are an essential part of effective science education and science educators have suggested that there are rich benefits in learning physics using laboratory activities (Millar, 2019). Anaso (2020) reports that researchers had observed that lack of physics practical by physics students results in poor communication as well as observational skills; this gives rise to students' poor performance. Also, good quality physics practical helps in developing students' understanding of scientific processes and concepts (Dillon, 2018), hence the heavy investment made in the provision and equipping of physics laboratories in secondary schools.

Abrahams and Millar, (2018) stressed that with the advent of the new curriculum which emphasizes on the process of higher cognitive skills, the laboratory has acquired a central role not just as a place for demonstration but as a place for real practical exercise in the teaching and learning of physics as a science subject. Laboratory activities are very essential and indispensable in the effective teaching and learning of physics. To facilitate the use of physics to advance the understanding of how science operates, the instructor will have to identify the behavioural indices by trying to promote and design objectives that will meet this end.

Laboratory activities in physics may include carrying out experiment, planning and executing experiment as a project, field trips and excursion for investigation and building models

Students that show positive attitude to laboratory activities learning the subject better and have an understanding of what they can do in solving problems in their environment. Group physics laboratory work is an essential feature of secondary science education (Abrahams and Millar, 2018), hence high proportion of physics lesson time in secondary schools is given to physics Group laboratory work with assumption that it leads to distinctive attainments among students. Although Abrahams and Millar report that questions have been raised by some science educators about their effectiveness as a teaching and learning strategy, this is yet to be thoroughly studied in Nigeria. Whilst such an approach is generally effective in getting students to do things with objects and materials, it is seen as relatively ineffective in developing their conceptual understanding of the associated scientific ideas and concepts.

Barton, (2019) observed that laboratory work providing opportunity for student to develop manipulation skills, empirical abilities and creativity. It is true that student do better when involves in personal observation of experience rather than reading about it in textbooks. Anderson (2020) stated that a good physics student should be able to ask questions after an experiment to gain a better understanding of the issue. By going through series of the laboratory activities, the student is able to observe communicate and predict. Therefore, laboratory work is of immense importance in seeking to facilitate better understanding of the basic concepts in the subject. However, one major problem that is seemingly obstructing the realization of government intension in science education was highlighted in the report of conference for problems of teaching practical science in Nigeria secondary schools and college. In a report, Abimbola, (2022) stated that, if any science subject is to be taught well, the student should be able to perform necessary experiments, use certain tools, have access to some equipment and record accurate observations. The laboratory method of teaching helps to promote positive attitude of students to the learning of science based courses that require the use of laboratory.

Therefore, for the inculcation of scientific attitude in students laboratory activities are indispensable and besides, this has become very important in view of the growing application of science and technology to industries and societal growth or development. The use of hand in coordination with other parts of the body particularly the brain in the acquisition stimulate

students to carry out further inquiry which eventually enable them to develop some necessary scientific concepts. Hence, physics laboratory work is seen as being immense of importance to both the teacher and the student in the teaching and learning of science. Several theoretical frameworks can be used to guide and understand group laboratory. Practical some of these frameworks include: Social Constructivism which emphasizes the importance of social interaction and collaboration in the construction of knowledge; Vygotsky's Zone of Proximal Development (ZPD) Vygotsky's theory which posits that learning takes place within the "zone of proximal development," which is the difference between what a learner can do independently and what they can achieve with the assistance of a more knowledgeable peer or instructor;

Experiential Learning Theory (Kolb) which proposes that learning is a cyclical process involving concrete experience, reflective observation, abstract conceptualization, and active experimentation.. However, this study is based on Cooperative Learning Theory: Cooperative learning theory which emphasizes the benefits of structured group activities that promote positive interdependence, individual accountability, promote interaction, and collaborative skills. In group laboratory work, cooperative learning strategies such as Jigsaw, Think-Pair-Share, and Peer Tutoring can enhance students' engagement, motivation, and learning outcomes by encouraging active participation, knowledge sharing, and peer support.

Hence, this study will attempt to study the influence of individual and group laboratory works on students' academic performance among physics students in Ijumu Local Government Area of Kogi State

Statement of the Problem

Since the Nigerian vision to build a stable and developed economy emphasizes the role of science, technology and innovation (STI) in a modern economy, then, good performance in Physics and other related sciences is crucial. Poor performance of students in physics is a major concern to teachers, policy makers and curriculum developers who are all geared towards achieving a more technologically advanced Nigeria.

Group Physics laboratory work are given a central and distinctive place in the teaching and learning of Physics at the secondary school level. Although physics teaching and learning

essentially involves Group physics laboratory work and has a long tradition of student experimental work in schools. Questions have been raised about the appropriate role and the reality of what is actually achieved by the group physics laboratory work especially with continued decline in performance in the subject. Despite the widespread use of Group Physics laboratory work as a teaching and learning strategy in school Physics, and the view that increasing its amount would improve physics learning, some science educators have raised questions about its effectiveness due to improper counselling on the group either before, during or after the group practical work. Hence, this study seek to investigate the role plays by counselling on group laboratory practical on physics students' academic performance:

Purpose of the Study/Objective

The purpose of this study is to investigate the influence of group laboratory work on Physics students' academic performance in public secondary school in Ijumu Local Government Area of Kogi State. The specific objectives of the study are to investigate:

1. Influence of group laboratory practical work on students' academic performance in physics among secondary school in Ijumu Local Government Area of Kogi State
2. Influence of gender on group laboratory practical work on academic performance among secondary school students in Ijumu Local Government Area
3. Counselling interventions on group laboratory practical work in physics

Research Questions

The following questions were raised to guide the study:

1. What is the influence of group laboratory practical work on students' academic performance in physics among secondary school in Ijumu Local Government Area of Kogi State
2. What is the influence of gender on group laboratory practical work on academic performance among secondary school students in Ijumu Local Government Area
3. What is the Counselling interventions on group laboratory practical work in physics

Method

Descriptive design was adopted for the study. This design was chosen because according to Fajonmi (2022) survey is used for descriptive, explanatory and exploratory purposes, and this method is descriptive in nature and therefore is more appropriate for this study.

The target population of the study comprises of all public senior Secondary Schools in Ijumu Local Government Area of Kogi State. There are a total of 22 public senior Secondary Schools in the study area.

Threehundred (300) students were randomly sampled for the study which comprises of 100 students each from the three geographical districts of Gbede, Ijumu Arin and Ijumu Oke respectively. Two schools each from the regions were selected randomly. A total of six schools participated in the study while purposeful random technique was adopted to ensure homogeneity of the students which comprise of 160 males and 140 females' students. The schools are: Government Girls Secondary School, Aiyetoro Gbede, OkoroGbedde High School, Okoro, Anglican Secondary School, Iyara, Baptist High School Ekinrin – Ade, Government Secondary School, Iyamoye. And Ogidi community Secondary school

Self- structured questionnaire titled “Influence of Group Laboratory Work on Physics Students’ Academic Performance in Physics (IGLWSAPP) was used for the study. It contained two sections. Section “A” influence of group laboratory piratical on students’ academic performance among secondary schools in Ijumu Local Government Area and ‘B’ influence of group laboratory piratical on gender performances among secondary school students in Ijumu Local Government Area

The questions were structured using modified four (4) Liker scales rating, where respondents were to tick the option that best appeal to their senses. The scales are; Strongly Agree (SA) Agree (A) Disagree (DA) and Strongly Disagree (SD)

The content of the instrument was validated by four experts in test and measurement of Department of Educational Foundations, Prince Abubakar Audu University, Anyigba. While the reliability was pilot testing of test-retest procedure on five students who did not participate in the

study in two weeks interval. The researchers personal distributed and collected the questionnaire from the respondents

Result

Data collected was analysed using descriptive statistics particularly the mean scores, tables and percentages. However, a criterion mean (a mid-point mean score) of 2.50 is adopted and any mean that ranked from 2.50 and above were regarded as positive and accepted, whereas 2.49 and below is regarded as negative and rejected.

Research Question One

What is the influence of group laboratory practical on students' academic performance among secondary schools in Ijumu Local Government Area?

Table 1: Showing the influence of group laboratory practical on students' academic performance among secondary schools in Ijumu Local Government Area

SN	ITEMS	SA	A	D	SD	CM		Rank	DECISSION
1	Physics students perform very well in group laboratory practical work	96	80	73	51	300 817	2.72	2 nd	ACCEPTED
2	The students are not so much interested in group practical work and therefore performed below average	52	74	95	79	300 699	2.33	10 th	NOT ACCEPTED
3	Group laboratory practical work helps students lot in the external examinations	79	97	71	53	300 802	2.67	5 th	ACCEPTED
4	The group laboratory practical work proved to have effects on students' academic performance in physics	97	81	72	50	300 825	2.75	1 st	ACCEPTED
5	Students that partake in group laboratory practical work perform better than those who did not	78	94	53	75	300 775	2.58	9 th	ACCEPTED
6	Group laboratory practical work in physic is better than individual laboratory work	95	81	71	53	300 818	2.72	2 nd	ACCEPTED

7	Group laboratory practical work encourages cross fertilization of ideas among the students	84	98	68	50	300	816	2.72	2 nd	ACCEPTED
8	Group laboratory practical work encourages social interactions among the students	81	97	50	72	300	787	2.62	6 th	ACCEPTED
9	Group laboratory practical work makes teachers work easy in students supervision	76	96	65	63	300	785	2.61	7 th	ACCEPTED
10	Group laboratory practical work covers the weaker students' participation in the class	77	95	60	68	300	781	2.60	8 th	ACCEPTED
	TOTAL MEAN SCORES							2.63	6 th	ACCEPTED

Table 1 reveals that the item four (The group laboratory practical work proved to have effects on students' academic performance in physics) with mean scores of 2.75 ranked first among the influence of group laboratory practical on students' academic performance among secondary schools in Ijumu Local Government Area. While items 1, 6 and 7 with equal mean scores of 2.72 ranked second. The 5th in the ranking order with the mean scores of 2.67 is item 3 (Group laboratory practical work helps students lot in the external examinations) and item 8 (Group laboratory practical work encourages social interactions among the students) with mean scores of 2.62 rank 6th, the 7th in the ranking order is item 9 (Group laboratory practical work makes teachers work easy in students supervision). Both items 10 and 4 with mean scores of 2.60 and 2.58 respectively ranked 8th and 9th. The only rejected statement in the items is the 2nd item (The students are not so much interested in group practical work and therefore performed below average) However, the calculate mean score of 2.63 is greater than the mean scores, this implies that, all the statements are accepted that group physics laboratory practical positively have impact on students' academic performance among the physics students in Ijumu Local Government Area of Kogi State

Research Question Two

What is the influence of group laboratory practical on gender performances among secondary school students in Ijumu Local Government Area?

Table 2: Showing the influence of group laboratory practical on gender performances among secondary school students in Ijumu Local Government Area

S N	ITEMS	SA	A	D	SD	MEAN	CM	RANKIN	DECISION
1	Male students perform better than female students in physics practical work	86	88	64	62	300 798	2.66	1 st	ACCEPTED
2	Male students are not so much interested in group practical work than female students	70	80	71	79	300 741	2.47	2 nd	NOT ACCEPTED
3	Group laboratory practical work helps male students more than female students in the external examinations	68	77	73	82	300 731	2.43	4 th	NOT ACCEPTED
4	The group laboratory practical has not proved to have effects on male students more than female students in academic performance in physics	71	79	69	81	300 740	2.46	3 rd	NOT ACCEPTED
5	Male students are generally more interested in physics practical work than female students	67	78	73	82	300 730	2.43	4 th	NOT ACCEPTED
	TOTAL MEAN SCORES						2.49		NOT ACCEPTED

Table 2 reveals that item 1 (Male students perform better than female students in physics practical work) with 2.66 mean score rank first among the all items and the only item that is generally accepted while the 2nd ranking is item 2 (Male students are not so much interested in group practical work than female students) with the mean score of 2.47 and the 3rd ranking item is

item 4 (Male students are not so much interested in group practical work than female students) with 2.46 mean score. The 4th ranking items are items 3 and 5 with 2.43 mean scores each. The calculated mean score of 2.49 is less than the criteria mean scores of 2.50, therefore, all the statements cannot be totally withhold as the actual true of the statement

Discussion

The study reveals thatThe group laboratory practical work proved to have significant effects on students' academic performance in physics which is in line with Miller (2019) on his study on the role of the laboratory on the Academic Achievement of Students in Physics and found that the students' academic performance in physic was greatly improve through practical work. This finding was equally supported by Akinsolu (2010) finding on his study on critical appraisal of the role of laboratory Physics practical in science teaching in Nigeria

The study further revealed thatPhysics students perform very well in group laboratory practical work. This is because group practical work encourages cross fertilizations of ideas among the students which Aburime (2020) on his study on enhancing undergraduate Physics laboratories: Pre- laboratory and post-laboratory exercises found that group laboratory practical was very effective and was equally supported by Adeolu et al (2013) on interpretation of gender differences: Science and society, that both male and female students do benefit greatly on group laboratory practical work

Equally, the study revealed that, group laboratory practical work in physic is better than individual laboratory work because apart from cost implication, the students would be able to work within the limited specimen available and still achieve the same result or even much more better which is in line withAkinyemi (2017), Bruner (2020) and Anaso (2020). All these was supported by Gee and Deckson (2023) on a study of practical teaching of prospective teaching model and found that group laboratory practical work in physics is better than individual practical work

The study revealed a negative impact on students' interest toward group laboratory practical work. Hence, the study did not support that the students are not so much interested in group practical work and therefore performed below average, because, majority of students are

even more committed in group laboratory work more than individual work. Okeke (2017) in his study Does Physics practical's really work? Affirmed that physic group practical work really work among the students

On gender sensitivity issues, the study revealed that Male students perform better than female students in physics practical work which some findings like Nyandwi (2014) on Gender Dimension in Predictors of Students' Performance in physic practical work believed that both male and female are at par in their academic performance in physic practical work. While Leften (2020) on Sex-Related Differences in Physics Achievement, Spatial Visualization and Affective Factors perceived both sexes a good predictors of success in physic practical work

The study did not agree with some of its items such as: Male students are not so much interested in group practical work than female students, Group laboratory practical work helps male students more than female students in the external examinations, The group laboratory practical has not proved to have effects on male students more than female students in academic performance in physics and Male students are generally more interested in physics practical work than female students. Otherresearchers like, Okafor, 2020; Miller, 2019 Kithinji (2017) in particular on Multiple intelligences: A comparative study between Males and Females performance, who noticed that both male and female physics students are good in group laboratory practical work

Counselling interventions

According to Denga (2018) guidance is refers to a more directive, or prescriptive form of assistance which is more democratic in nature because it refers to advice or information provided by a person of experience (counsellor) to solve problems or improve something which in a process of helping individuals to discover and develop their potentials, while Malami (2019) stressed that guidance is 'to direct', 'to point out' and 'to show the path 'and it is the assistance or helprendered by a more experienced person to a less experience person to solve certain major problems of the individual"less experienced" such as educational, vocational, personal and the likes. It is therefore, implies that when counseling students for group laboratory work, it's important to focus on fostering effective collaboration, communication, and problem-solving

skills. The counsellor must clarify goals and expectations of the group by ensuring that all group members understand the objectives of the lab work and what is expected of them. This includes their individual responsibilities and how their contributions fit into the overall project.

Orientation must be given to the students before they are allowed to be engaged in group practical work. The orientation could be extended to the laboratory assistance as well as those laboratory attendance

There must be formulation or formation of rules and regulations that will, band on all students in order to maintain decorum during the practical exercise. All the specimen must be thoroughly cleaned before and after the group practical work

The physic teachers must be counsel on how to foster collaboration among the students by emphasizing the importance of teamwork. Encourage students to leverage each other's strengths and work together to solve problems. This could be achieved by ddefining roles or tasks to each group member based on their skills and interests. This can help ensure that everyone is engaged and contributing effectively during the group work.

Both the students and physic teachers must be counsel on how to promote open and respectful communication among group members. Encourage them to share ideas, ask questions, and discuss problems openly. The students in particular, should also be counsel on how to manage conflicts among themselves by encouraging them to address issues early and work towards compromises or solutions collaboratively during the practical work.

Counsel the group on how to develop a plan and timeline for completing their tasks. This can help them stay organized and manage their time efficiently. This could be achieved by supporting and guiding the students when needed, but encourage them to take initiative and solve problems on their own. This helps build their confidence and problem-solving skills.

After the lab work is completed, encourage the group to reflect on their experience. Discuss what worked well, identify challenges faced, and how they can improve in the future. However, each group member's individual contributions are recognized and assessed fairly. This will help to maintain accountability and encourages active participation during the group work.

Offer constructive feedback on both the group dynamics and the technical aspects of the lab work. Positive reinforcement and suggestions for improvement can help students grow in future. This could be achieved by focusing on these aspects, you can help students develop effective teamwork skills and succeed in their group laboratory work.

Conclusion

It is crystal clear that group laboratory practical work is of a good beneficial to the student if only the students are well guided. Through group practical work, the students are able to cross fertilization of ideas, working independently, sharing their personal views among themselves. However, it will work much better if both the students and the teachers are well counselled on the rudiment of group cooperative work. If not, the aims and the objectives of initiating the group practical work will be defeated

Recommendations

Physic teachers should lay more emphasizes on group laboratory work more than individual work and should be thoroughly supervised by the teachers,

Group laboratory practical work among the students should be highly encouraged. The teachers' in charge should monitor the students closely throughout the period of the work

A trained laboratory attendant must be available to offer a helping hands, not only to the teachers alone, but the students who will be putting them on the right track during the group laboratory practical

Orientation must be given to the students before they are allowed to be engaged in group practical work. The orientation could be extended to the laboratory assistance as well

There must be formulation or formation of rules and regulations that will, band on all student in order to maintain decorum and orderliness during the practical exercise

All the specimen must be thoroughly cleaned before and after the group practical work

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