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Using a combination of activity methods to improve upon the understanding of the concept of heat conduction of basic school pupils in Kechebi circuit of Nkwanta South Munucipality, Ghana

Research article

Robert Kwame Kpaliba[1], Mathew Tichem Tibamba[2] & Godwin Attitsogbui[3]
Department of Science, Dambai College of Education, Ghana
Correspondence: rkpaliba@dace.edu.gh
https://orcid.org/0000-0002-5041-0855

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Abstract
The research work was primarily geared towards the improvement of pupils' performance in Integrated Science for the Basic School pupils using the activity and demonstration methods. Purposive sampling technique was used to draw thirty-five (35) pupils for the study. Qualitative and quantitative data were collected through observation, questionnaire and evaluation tests and descriptive statistics such as frequency tables and charts were used to describe the data. The study revealed inappropriate teaching methodologies, wrong perceptions about integrated science, inadequate learning materials for science were among the major causes of poor performance in Integrated Science. The study also showed how effective the activity and demonstration methods improved pupils' understanding of the concept of heat conduction. Prior to intervention, pupils scored on the average of 25.35% marks in the pre-tests. After ministering the intervention, however, pupils' performance in terms of average score rose to 71.2%. Using the t-test of significance, the difference between the two averages was found to be statistically significant at the 0.001, 0.05 and 0.10 levels of significance. The activity and demonstration methods were also found to have had a significant impact on the understanding some basic concepts in science.

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Public Interest Statement:
The activity and demonstration methods had positive impact on performance and improved pupils understanding of concepts, willingness to learn, doing class assignments and participation in class discussions. It is therefore recommended that; The Ministry of Education should do well to supply teachers with adequate Teaching and Learning Materials to aid them deliver Integrated Science lessons very well. It is thus recommended that Science teachers choose activity-based teaching methods that involve pupils. Parents should also provide an enabling environment for their children in the house to learn always after school. Students should also make conscious efforts to take experiments taught them more seriously and repeat them anytime they go home. This will boost their knowledge and confidence in the subject.

1.0 Introduction

Ghana as a nation needs qualified scientists to explore her natural resources such as; human, agriculture, minerals, in order to solve the many problems that have overwhelmed the country. Therefore, it is imperative that, any nation that wants its citizens to be the best in this world needs to take the study of science very seriously. Hence, the compulsory study of science in both basic and second cycle institutions. It is in this respect that the subject requires the support of all concerned including opinion leaders, policy makers and educationists in the country. Irrespective of the challenges and inadequate logistics in our educational sector, the study of science should be elevated through motivation. This would go a long way to leverage the interest and performance of pupils in integrated science, even at higher levels. This research was conducted in selected basic schools in the Nkwanta South Municipality as it was observed that pupils of this school performed poorly in integrated science over the years in their Basic Education Certificate Examinations (BECE). The researcher decided to find out the root causes and proffer a combination of activities to remedy the situation

2.0 Materials and Methods

2.1 Population and sampling procedure

This research was conducted in Odumase D/A J.H.S located in the Nkwanta South Municipality a typical farming community of the Oti Region. The researcher used purposive sampling technique to draw total population of thirty- five (35) pupils comprising of twenty-three (23) boys and twelve (12) girls for the study. Observation, questionnaire and evaluation tests constituted the main data collection instruments. Descriptive statistics such as frequency tables and charts were used to summarise and describe both qualitative and quantitative data.

2.2 Intervention Processes

To address the problem the researcher adopted the activity method of teaching as the major intervention measure. Demonstration and discussion methods were however used as the minor interventions adopted in the classroom on the topic conduction of heat to address the situation.

2.3 Using the demonstration technique

The demonstration method consists of showing the learners how new skills should be performed. This was done by the researcher while the learners observe. The demonstration was accompanied by explanation of how the skill was performed. This method was based on the assumption that, the pupils will see exactly

what takes place. For a good demonstration teaching, the researcher: arrange the groups so that all can hear and see clearly. The needed materials and equipment to be used were properly arranged and objectives clearly stated to motivate pupils. Each step was explained thoroughly in the operation as it is being performed. The researcher used the demonstration method in teaching the topic heat conduction in integrated science. The researcher used (4 weeks) to administer demonstrations as an intervention measure in teaching the concept. In using the demonstration technique as an intervention measure, the researcher put pupils into groups and assigned to them different task. The pupils were instructed to write down their findings from the experiment.

A small piece of shear butter was smeared on one end of the rod about 1/2cm and clumped with the other end of the rod to a candle flame, while the pupils observe the shear butter for some time and account for what they see.

The pupils were again taken through another demonstration in groups of three to fill a tin with boiling water and put into it a metal spoon, pencil, screw driver, long nail and a barrel of a ball pen for a while before feeling the top of each object. The pupils were then asked to record their findings from that simple experiment. For another group, the researcher guided the pupils to make a coil of a thick copper wire around a candle flame and hold the straight end. After a while the pupils were asked to feel the top of the coil and take note of the changes they have noticed.

2.4 Using the Discussion Strategy

Discussion is an activity in which pupils used "think pair and share" talk in order to share information on the topic or problem or to seek possible and available evidence or solution to a problem. This method was also used to teach the topic heat conduction in integrated science. After administering the demonstrations, it was followed it up with discussions. After each demonstration lesson the researcher leads the pupils in a discussion session. This was meant to guide pupils to discuss the findings arising out of the demonstration sessions. The researcher used questions to initiate the discussion and direct the pupils to the salient ideas. For instance, the pupils were asked questions such as, 'what happened to the rod and the shear butter after a while when the other end was put in the flame of the candle?', 'what happened to the other end of the rod and the shear butter in the demonstration', what happened to the pen barrels, spoons, long nails, screw driver when they were put in the boiling water?'. This questions and many others stimulated the discussion and were used to guide pupils come out with the findings arising out of the demonstration sessions on the concept "heat conduction". Below is a detailed account of how discussion technique was applied as an intervention.

Discussion may be implemented in a variety of ways. The types of discussion available to the researcher are the "whole-class discussion and the small group discussion". The class or each group should know the topic under discussion. The teacher plays the role of a moderator and advisor. Language is corrected by the researcher where necessary. Here, the researcher used the small group discussion to teach the topic heat conduction. Small group of approximately two to seven were used to help in sharing ideas and bringing individuals together for discussion or problem solving. Different tasks were given to each group and the purpose of the task was clearly stated and time limit imposed.

2.5 Data collection Instruments and procedure

The researcher used three distinct research instruments. These are observation, questionnaire and evaluative test (Pre-test and Post-test) to collect requisite data for the study.

2.6 Observation

In order to render the study holistic and devoid of alterations, a close look at the behavioral pattern of the pupils towards the study of Integrated Science was observed. The methods and teaching techniques of the main classroom teacher was observed and noted. Among the features observed during the observation at the pre-intervention stage was the class teachers approach to the teaching of integrated science, the use of appropriate methods in teaching the subject and pupil's involvement and participations during lessons delivery. These guided the post-intervention observations.

2.7 Evaluation Test

The researcher conducted a test with the help of the classroom teacher to find out the performance level of the pupils on the topics used during the administration of interventions. The tests were conducted prior to and after the intervention stage. This implies that the test was administered at two stages of the study as pre-test and post-test. The pre- test was conducted to find-out the extent of the problem. The post-test was administered to determine the effectiveness of the interventions and to find out whether or not the problem has been corrected.

2.8 Methods of data analysis

Observation and evaluation test were used as the data collection instruments. The types of data collected were qualitative and quantitative. Data collected with observation was primarily qualitative in nature and the evaluation test was quantitative in nature. The quantitative data was analyzed using statistical tools such as percentage and tables. The qualitative data was analyzed qualitatively by describing vividly what was observed in a prose form.

3.0 Results and Discussions

Data analysis and presentation of results are discussed in accordance with the specific objective of the research and research questions.

3.1 Background of Respondents

The backgrounds of pupils related to their age and sex. Males and females constituted 66% and 34% of sampled pupils respectively. It was also revealed that the majority (63%) of pupils are between 10 and 12 years of age. Pupils of the age 13 constituted 26% whereas 11% of students were 13+ years

Table 1: Background of Respondents

Sex	Frequency	Percentage (%)
Male	23	**66**
Female	12	**34**
Total	**35**	**100**

Age	Frequency	Percentage (%)
10-12	22	**63**
13	9	**26**
13+	4	**11**
Total	**35**	**100**

3.2 Causes of Low Performance in Integrated Science among Pupils

Causes of Low performance in integrated science in Odumase D/A J.H.S School basic seven are due to a number of factors that includes teacher motivation Okendu, 2008), psychological stability of the teacher (Asamoah, 2009) and availability of teaching aids Cook (1980). The observation on the pupils revealed that factors included class size smaller class sizes perform better academically than schools with larger class sizes Kraft 1994), teachers' style of teaching, perception that integrated science is difficult, lack of motivation from parents (Asiedu-Akrofi, 1978), lack of study time, lack of Integrated Science Text Books and materials. Table 2 shows the reasons why students perform poorly in Integrated Science. It is important to point out that even though the total number of pupils was 35, the total frequency is 106 because pupils were allowed to choose multiple reasons why they do not perform well in integrated science. As a result, the percentage column also totals 302.84%.

Table 2 Causes of low Performance in integrated Science

Factors	Frequency	Percentage (%)
Lack of study time	14	40
Teachers' style of teaching	30	85.71
Lack of motivation from parents	17	48.57
Perception that Integrated Science is difficult	25	71.42
Lack of Science text books and other materials at home and in the school	20	57.14
Total	**106**	**302.84**

3.3 Lack of Motivation from Parents

Parents play a very important role in complimenting teacher's effort in their children's education (Rainforth & York-Barr, 1997 cited in Amoako- Gyimah, 2007). This is because children live with their parents for the greater parts of their lives and the inability of parents to prevail and motivate their wards to study may result in poor performance as suggested by Dampson & Dominic (2010). From Table 2 above, about 48.57% of pupils complained of lack of motivation and poverty of their parents as a factor accounting for their poor performance in Integrated Science as confirmed by Asiedu-Addo (2009).

3.4 Lack of Study Time

It is common knowledge that the amount of time devoted to doing something helps one to gain greater knowledge of it. However, the situation of Odumase D/A J.H.S Basic Seven is different as pupils reported that they do not have enough time to study. About 40% of pupils stated they do not have enough time at home to study their notes and other materials due to farming activities hence their poor performance. This attest to Etsey (2005) citing Butler (1987) found homework to be a correlate of academic performance. Also, the time allocated for integrated science on the school time table is not enough to enable teachers cover more topics in the subjects with pupils, hence a contributory factor for their poor performance.

3.5 Teachers' Style of Teaching

The transfer of knowledge from the teacher to the learner could be done in various ways. The way and manner the transfer of knowledge is presented can improve or hinder performance. This was the major factor that led to poor performance in Integrated Science. The majority (85.71%) of pupils complained that

the way their teachers teach the subject does not enable them to understand most of the concept being taught. This may be due to the reason that some teachers are also not competent enough according to (Numale & Yelkpieri, 2008 to teach some aspect of the subject, or does not have both academic and professional teacher qualification (Agyemang, 1993). This revelation by pupils was not surprising because the researcher, during his observation period with the school, observed that most of the teachers including Integrated Science teachers use teacher-centered approach when teaching. Some also are also deficient in certain areas as pointed out by Durotoye 1993; Akinboye 1981; Balogun 1986; Baikie 1996 because teachers are the bedrock of any educational setting Ikonta (2008). Inconclusive and inconsistent evidence about what teacher attributes really contributed to desired educational outcomes (Rice, 1987). Therefore, using teaching aids is very essential (Farrant, 1968). But teachers must be competent enough

3.6 Wrong Perception about Integrated Science

Some pupils also agreed that the perception they had about Integrated Science as very difficult was among the factors that hindered their performance in the subject. About 71.42% of pupils attested to the fact that the perception that Integrated Science was difficult led to apathy towards studying it. Pupils thought that no matter how they learnt the subject, they would not understand it because it was difficult. This mentality of pupils was largely responsible for poor performance in subject leading to the decline in perusing the course at higher levels (Jenkins, 1994; Lepkowska, 1996).

3.7 Lack of Science Text Books and other Relevant Materials

The availability of learning resources to pupils is a key to good performance in education. On the other hand, the lack of those resources could retrogress performance in any subject. Almost 58% of students in table 4, alluded to the fact that they lacked Science text books both in school and at home. If pupils cannot have adequate access to reading materials to revisit what has been taught in class, then it is obvious their performance will be low since pupil's interest will not be connected to practice (Rutherford and Ahlgren, 1990). It was observed that science materials in the school were inadequate and could not be given to students to study in school and even at home. As a result, pupils shared the limited number of text books among themselves during science lesson and such is demotivation (Schreiner and Sjoberg, 2004). This rendered teaching and learning ineffective and could result in demotivation for the subject. Das (1985), agrees with Eshun and Ossie-Anto (2000) that there are several methods of teaching but a teacher's choice of a method depends on a variety of factors: the teacher's experiences, interests and availability of textbooks and extra- reading materials, class size, and students' learning preferences (Etsey, 2005).

3.8 Improving the Performance of the Pupils Using Demonstration Activities

Science demonstrations are examples of focused interaction (Goffman, 1963) that occur "whenever two or more people explicitly acknowledge a jointly maintain focus of attention" Kendon, 1973).

To be able to measure the impact of the Activity Method on performance, two tests were conducted. One test was conducted before the Activity Method and second test after the Activity Method was used for three weeks. According to Wynne Harlen (1985), pupils in their activities use scientific concepts and attitudes, but whether or not this happens depends critically on the way activities are carried out as well as on what these activities are. Table 3 below presents the marks obtained by pupils in the pre-intervention stage with the weight of hundred (100) marks. From the table the majority (37.14%) of pupils obtained between 10 and 20 marks. The proportion of pupils who scored between 21 and 30 constituted 34.28%. About 20% and 8.57% of pupils scored between 31-40 marks and 41-50 marks respectively. Sadly, none

of the pupils scored above 50 marks to 100 marks. Jos Elstegeet said teachers must fruitfully organize activity periods during which encounter, interaction and dialogue would be encouraged. Here, the main task of the teacher is to provide materials for the pupils to work with Broom (1973). Since this was not the case, the overall average score of pupils in the pre-intervention stage was 25.31 marks, an indication of poor performance.

Table 3: Pre-intervention scores

Marks	Mid-Point (m)	Frequency (f)	Percentage	Fm
10-20	15	13	37.14	195
21-30	25.5	12	34.28	306
31-40	35.5	7	20	248.5
40-50	45.5	3	8.57	136.5
51-60	55.5	0	0	0
61-70	65.6	0	0	0
71-80	75.5	0	0	0
81-90	85.5	0	0	0
91-100	95.5	0	0	0
Total		∑f = 35	100	∑fm = 886

Mean = $\frac{\sum fm}{\sum f}$

= $\frac{886}{35}$

= 25.31

Table 4: Post Intervention Table Scores

Marks	Mid-Point (m)	Frequency(f)	Percentage	Fm
10-20	15	0	0	0
21-30	25.5	0	0	0
31-40	35.5	0	0	0
40-50	45.5	0	0	0
51-60	55.5	6	17.14	333
61-70	65.6	8	22.86	524
71-80	75.5	16	45.71	1208
81-90	85.5	5	14.29	427.5
91-100	95.5	0	0	0
Total		**∑f = 35**	**100**	**∑fm = 2492.5**

Mean = $\frac{\sum fm}{\sum f}$

= $\frac{2492.5}{35}$

= 71.21

Table 4 above presents the marks of pupils after the intervention. Because of the effectiveness of the

intervention, none of the pupils scored below 50 marks. Pupils who scored between 51 and 60 marks constituted 17.14%. Also, 22.86% of pupils scored between 61 and 70 marks. However, Majority (45.71%) of pupils had between 71 and 80 marks. A few (14.29%) pupils also scored between 81 and 90 marks which confirms the accession of Ausubel, (1973) that, pupils can learn abstract things through the use of teaching aids. None of the pupils scored between 91 and 100 marks. The overall performance of pupils in the post intervention stage was very good as pupils recorded a mean mark of 71. 21. This goes to affirm Wynne and David (1985) who agree that, our existing knowledge and concepts affect what we see, hear or feel. Since demonstration stimulates inquiry on an application of a principle or as a visual aid to add reality to a concept (Eccles, 1963), pupils scores after intervention increased significantly.

The test of significance of the difference between the pre-intervention and post intervention means was used at 0.05 level of significance. Table 5 presents the test for significance for the pre-intervention and post intervention.

Table 5: Test for Significance

Variable	Mean	Standard Deviation	P-value	Computed t	T- critical
Post-Intervention	72.31	9.14	0.000	20.73	1.96
Pre-Intervention	26.17	9.50			
Difference	**46.14*****[1]				

From table 5 above, the mean marks for the Post Intervention and Pre-Intervention were 72.31 and 26.17 respectively. The Standard Deviations for the Post and Pre-Interventions were 9.14 and 9.50 respectively. For the difference (46.14) to be statistically significant the chosen significant level should be less than the generated p-value or the t-critical should be less than the computed t. Since the p-value (0.000) is far less than the chosen level of significance (0. 05) or since the t-critical (1.96) is far less than the computed t (20.73), the difference between the two means is statistically significant at the 0.05 level of significance. Therefore, we conclude that the activity method used had had a highly significant impact on pupils' performance in Integrated Science.

3.9 The Discussion Technique and Pupils' Understanding of Heat Conduction

The information below relates with research question two which states "how would the use of discussion technique assist Basic Seven (7) pupils of Odumase D/A J.H.S understand the concept heat conduction. Jos Elstgeest (1986) in his book, 'Encounter, Interaction and Dialogue' asserts that, science means partaking, interaction and dialogue. Children by nature interact with objects around them. The interest or lack of interest in the study of a particular subject is crucial in determining performance in that particular subject. This was the main reason why the researcher took the pain to improve pupils understanding using the discussion technique. Understanding was measured using indicators such school attendance, doing home works and taking part in group discussions.

3.9.1 School/Class Attendance

Understanding of concepts and also enjoying a lesson could be determined through the way pupils attend their school/class. This attest to Lockheed's (1991) assertion that, lack of motivation and professional

commitment produce poor attendance and unprofessional attitudes towards students which in turn affect their performance academically. If many pupils attend school/class regularly, then it implies, in part, that they enjoy every bit of what goes on in the School/class (Paaku 2008). Hence they gets some understanding on the concepts of whatever they learn in school/class. Figure 6 displays pupils' school attendance before and after the discussion technique was employed in the Teaching and Learning. It is clear from the figure below that the discussion method had an impact on school attendance.

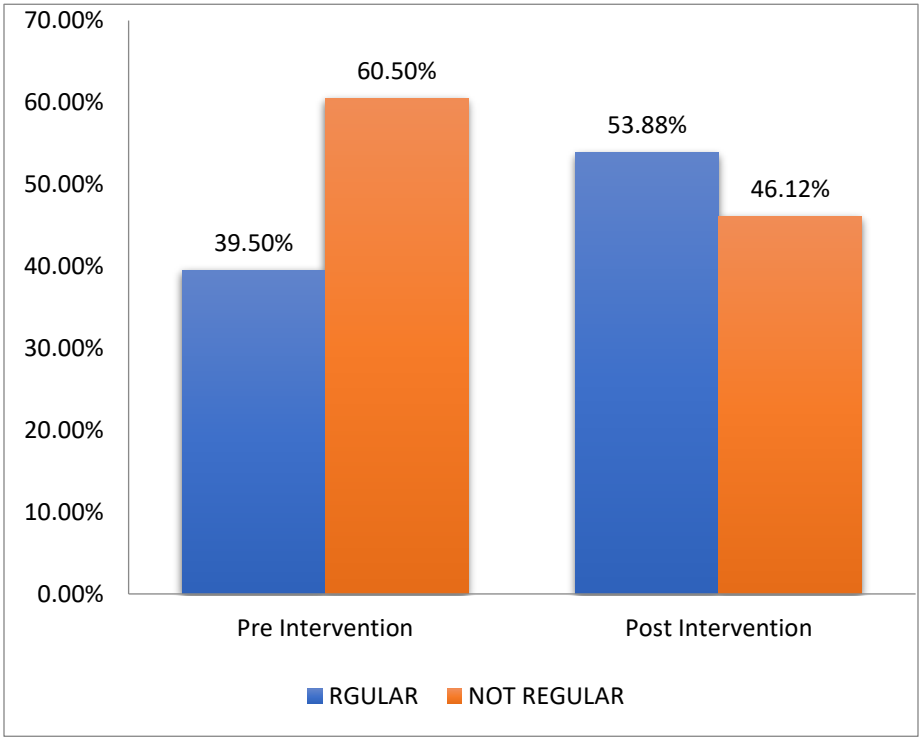

Figure 6: school attendance

From the chart, (39.50%) of pupils attended school regularly. The rest (60.50%) did not attend school regularly. However, after the intervention, regular school attendance raised from 39.50 % to 53.88%. This is an indication that the discussion method had boosted school attendance of pupils who participated in the research. This is in line with Atwater, Wiggins and Gardner, 1995 which says when pupils are motivated, it brings up eagerness or interest to learn science. In fact, Cavalluzzo (2004) in citing Rice (1987) said teacher quality matters in student's achievements.

3.9.2 Understanding of Concepts

The discussion method has also had an impact on the extent to which pupils understood the concepts that were taught in class. Prior to the discussion method, only 34% understood the concepts taught whereas 66% did not understand. After the intervention, those who understood Science concepts raised from 34% to 72% and explains what Flolu, Dzansi-McPalm & Awoyemi (2007) when appropriate methods are used in the teaching and learning process, high performance will be achieved. Whereas those who did not understand the concepts decreased from 66% to 28% as depicted in Figure 7 Below.

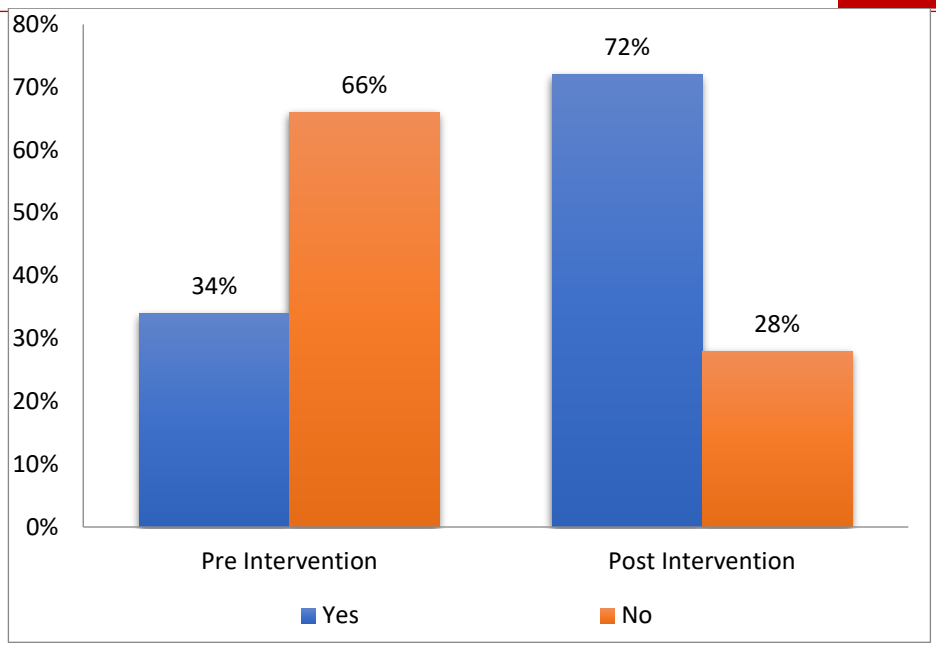

Figure 7: Understanding Concepts

3.9.3 Willingness to Learn integrated Science

It was observed that students' willingness to learn was well improved by the discussion method. This was because the discussion method made integrated Science lessons very easy to understand as a result they developed interest in learning the subject very often. The bar graph below displays data on students' willingness to learn integrated Science.

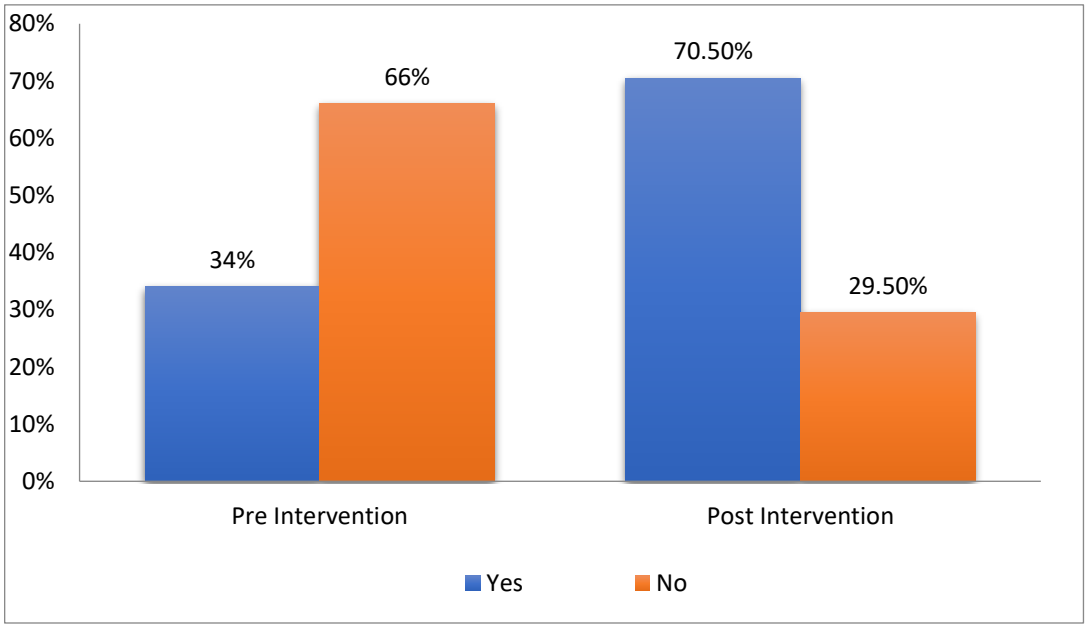

Figure 8: willingness to learn

It can be deduced from the graph above that pupil' willingness to learn in the pre-intervention stage has been very much improved after using the discussion method. This affirms the need to attitudinal change in the study of science (Mathews, 2004; Osborne et al., 2003; Jones et al., 2000; Simon, 2000; Ramsden,

1998). In the pre intervention stage, only 34% of pupils were unwilling to learn integrated Science as compared to 66% of pupils who stated that they were not willing to learn integrated Science. However, after the discussion method was used, unwillingness to learn reduced from 66% to 29.50% whereas willingness to learn integrated Science increased from 34% to 70.50%.

3.9.4 Doing of assignments

Another area that the activity method had impacted was pupils doing of assignment. It was observed before the discussion method that only 37% of pupils did their assignment regularly. The majority (63%) did not do their assignments regularly. After the discussion method was initiated, pupils who did their assignment regularly rose from 37% to 79%. And this achievement is largely on the teacher (Sanders 1998).
These statistics are presented in figure 8 below.

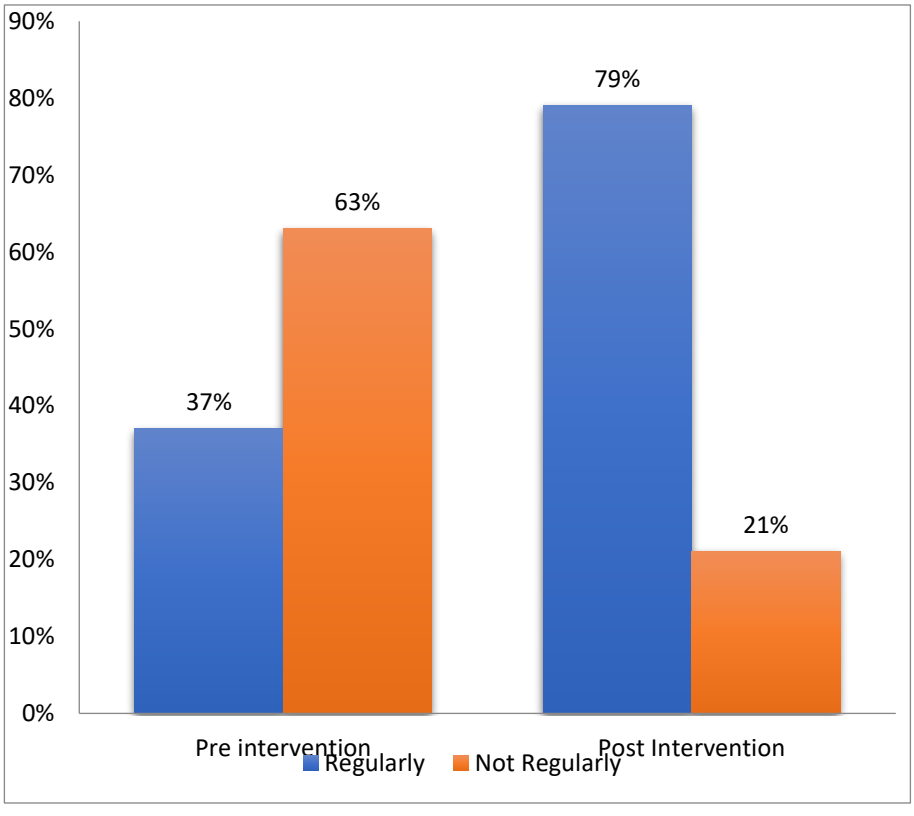

Figure 9: Doing Assignments

3.9.5 Taking Part in Class Discussions

Class discussions are very important aspects of teaching and learning process because it is easier for pupils to remember what they have discussed with their colleagues and the teacher than when a lesson is presented in class by the teacher alone. It was observed at the pre intervention stage that only eleven (11) pupils representing 31.43% of pupils were active in class discussions. The rest twenty-four (24) representing 68.57% were not active during class discussions in integrated Science. However, after the discussion method, it was realized that pupil's activeness in class discussions was boosted confirming the accession of Akey (2006). The proportion of pupils who were active in class increased from 31.43% to 85.71% whereas the proportion of students who were not active in class discussions reduced from 68.57% to just 14.29% as can be seen on table 6.

Table 6: Class Discussions

Class Discussion	Intervention		
	Pre Intervention		**Post Intervention**
Active	11 *31.43%*		30 *85.71%*
Not Active	24 *68.57%*		5 *14.29%*
Total	**35** **100%**		**35** **100%**

Conclusion

This section uses field data to answer research questions that were raised in this research. "To what extent would the use of demonstration activities assist Basic Seven pupils of Odumase D/A J.H.S to understand the concept heat conduction?" The research revealed that there were many reasons why Basic Seven pupils of Odumase D/A J.H.S School did not do well in integrated science. Prominent among them were teachers' styles of teaching, where 85.71% of the pupils revealed that teachers' style of teaching did not enhance their understanding of concepts and therefore were unable to perform well in their examinations and class exercises This implies that teachers of science should be critical of the approach, they adopt in teaching integrated science. Also, more than half (71.42%) of Pupils said they did not perform well in the subject because they thought integrated science was difficult. This finding is in line with the assertion of Nakhleh (1992) that misconceptions interfere with pupils' learning of science resulting in poor performance. About 40% of Pupils said, the lack of study time in the house was among the reasons why they did not perform well in the subject. Other factors found contributing to low academic performance include lack of teaching and learning materials and lack of parents' involvement in Pupils studies.

What is the impact of the demonstration Method on pupils' performance in Science?

The impact of the demonstration method on Pupils' performance in Integrated Science was measured by comparing the pre-intervention and post-intervention results. Generally, Pupils performed better in the post-intervention test than the pre-intervention test. The difference between the pre–intervention and post-intervention mean marks was 46.14. This difference was subjected to T-test of significance and was found to be statistically significant at the 0.05 level of significance. This implies that the demonstration method has had a significant impact on Pupils academic achievement on the concept "heat conduction" of the integrated science. This result was found to be consistent with the findings of Ekyi (2013) that pupils taught with demonstration method performed better than those who were not. The situation at Odumase D/A J.H.S is not different from that of Pakistan where Hussain (2010) reported that pupils taught with direct teaching methods performed better than those taught with traditional methods.

What is the impact of the discussion method on pupils' understanding to learn Integrated Science?

Understanding was measured by indicators such as willingness to learn, doing class assignment, school attendance and participation in class discussions.

In the area of understanding of concepts, it was found that only 34% of pupils understood concepts and 66% did not. After the intervention period, the number of pupils who understood concepts increased 34% to 72% while those who did not understand reduced from 66% to 28%. This signifies that the discussion method had a profound impact on pupils' level of understanding.

Willingness to learn also increased after the researcher used the discussion method. Prior to using the activity method, only 34% of pupils were willing to learn whereas 66% said they will not. After the discussion method, the number that were not willing to learn reduced from 66% to 29.50% while willingness to learn increased from 34% to 70.50% as shown in figure 8 above. The study also showed that understanding of concepts was positively related to willingness to learn.

School attendance has also been improved through the activity method. Prior to the intervention, only 39.50% of pupils attended school regularly. The rest (60.50%) did not attend school regularly. However, after the intervention, regular school attendance shot up from 39.50 % to 53.88%as shown in figure 6 above. This is an indication that the discussion method had boosted school attendance of pupils who participated in the research.

Another area that the discussion method had impacted was pupils doing of assignment. It was observed before the discussion method that only 37% of pupils did their assignment regularly. The majority (63%) did not do their work regularly. After the discussion method was used in teaching, pupils who did their assignment regularly rose from 37% to 79%.

Class discussions are very important aspects of teaching and learning because it is easier for pupils to remember what they have discussed with their colleagues than what when a lesson is presented in class by the teacher alone. It was observed at the pre intervention stage that only 31.43% of pupils were active in class discussions. The rest (68.57%) were not active during class discussions in Integrated Science. However, after the discussion method, it was realized that pupils' activeness in class discussions was boosted. The proportion of pupils who were active in class increased from 31.43% to 85.71% whereas the proportion of pupils who were not active in class discussions reduced from 68.57% to just 14.29%.

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Conflicts of Interest: There are no conflicts to be declared.

Biographies

[a] Robert Kwame Kpaliba is a Science Tutor and researcher at Dambai College of Education, He holds Bachelor of Education, Science Education and Master of Philosophy in Nuclear and Environmental Protection from the University of Education, Winneba and University of Ghana, Legon respectively. He is currently a PHD candidate in Physics of the University of Cape Coast, Ghana. His main research area focuses on Science Education, climate change and effects of naonparticles of the environment.

[b] Mathew Tibamba Tichem obtained his Bachelor of Education in science Education and Master of Education. in Science Education from University of Education, Winneba in Ghana in the 2009 and 2015 respectively. He is currently a Science Tutor/Researcher at Dambai College of Education.

[c] Godwin Attitsogbui obtained his Bachelor of Education in science Education and Master of Philosophy in Geophysics from University of Cape Coast and Kwame Nkrumah University of Science and Technology in Ghana respectively. He is currently a Science Tutor/Researcher in the Department of Science at Dambai College of Education.

Authorship and Level of Contribution

Mathew Tibamba Tichem and Godwin Attitsogbui both helped in data collection, analysis and processing of data of the research work, and developing of the manuscript.

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