

Effectiveness Of Task Instruction Sheet Strategy In Enhancing Pupils' Interest and Performance in Some Difficult Basic Science and Technology Concepts under Covid-19 Preventive Protocol

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Abstract. The study sought to find out the effectiveness of task instruction sheet strategy in enhancing pupils interest and performance in some difficult basic science and technology concepts under covid-19 preventive protocol. Two research questions and two hypotheses were formulated to guide the study. The non-equivalent quasi experimental research design was adopted. The sample consisted of 178(92 boys and 86 girls) primary six pupils drawn through simple random, sampling technique from 21 public primary schools in Jos North West of Plateau State. The instrument for collecting the data was a valid 20 item interest inventors and 25 item multiple choice performance test with reliability indices of 0.78 and 0.84 respectively. The experimental and control groups were taught the difficult concepts for 8 weeks using task instruction sheet strategy and conventional lecture methods respectively. The data collected were analyzed using mean and standard deviation for research questions and analysis of covariance for the hypotheses at 0.05 level of significance. The result of the study revealed that task instruction sheet strategy enhanced pupils' interest and performance in basic science and technology than the conventional lecture method. The experimental group developed significantly higher interest in the difficult concepts thereby performing better than the control group. It was recommended among others that teachers adopt the task instruction sheet strategy in teaching especially when dealing with difficult basic science and technology concepts.

Keywords: Interest, Performance, difficult concepts, task instruction sheet strategy, and Covid19 Prevention Protocol.

1. Introduction

Science education is very important in today's quest for global challenges and technological world. Without the knowledge of Science, one cannot live effectively in everyday life (Adejo, Amali & Omega, 2017). Taber (2009) stated that the global aim of science education is to enable learners acquire knowledge, skills and attitude that would be relevant to their future likelihoods. It is through science and technology that modern gadgets in all aspects of life are invented, such as computers, mobile phones, electricity, aircrafts, medical kits like facemask, hand sanitizers among others. For any nation to develop and be considered civilized, she has to embark on purposeful and strategic scientific education of its citizens. Science and technology is the bedrock of sustainable development of any nation (Agogo, 2017, Nnoli & Okafor, 2017). Science institutions in our schools should be such that enables young people to have access to new knowledge to expect change, and to behave rationally and be able to solve problems that might arise as a result of change or global challenges (Felder, 2014, Dorier & Garcia, 2018 & Gauer, 2019).

Primary education is the first stage of organized formal education in institutions for children aged 6-11 years. In the

National Policy on Education, the Federal Republic of Nigeria (FRN, 2004) recognizes science as the key to success or failure of the whole system. The policy statements lend strength to the study of science in the primary school. These statements, otherwise known as objectives (FRN, 2004), include: laying a sound basis for scientific and reflective thinking; develop in the child the ability to adapt to the child's changing

environment; giving the child opportunities for developing manipulative skills that will enable the child function effectively in the society within the limits of the child's capacity(p.14).

Primary Six is the final stage of primary education. This implies that whether pupils proceed to secondary school or not, the learning of basic science and technology ought to inculcate in them, scientific attitude like open-mindedness, curiosity, and optimistic method to challenges which will be beneficial to them throughout life. Basic science and technology is a compulsory subject for primary school pupils. It is structured around core activities and events like observation, manipulation, experimentation, classification, prediction and communication designed to assist children, retain and apply basic and functional intellectual skills and operations needed to cope with the rapid global changes in a science-dominated society. Science consists of sequences of meaningful experience which provide for each child, the unique opportunities to develop the learning strategies, attitudes and values for sustained acquisition and processing scientific information. Simple machines, force and are some of the topics taught to Primary Six pupils under theme 4, you and energy, module 4, in Basic Science and Technology curriculum. A research carried out by Dawal (2020) indicated that simple machines, force and are some of the topics which majority of teachers of primary schools find them difficult to teach. The researcher also found out that every year, questions are set on the topic in the National Common Entrance Examination, but pupils find this particular section difficult to answer.

Despite the efforts of Nigerian Government in giving due recognition to science and technology education which is a tool for national development, the issue of how the interest and performance of pupils in basic science and technology can be improved through the teaching and learning process is a serious concern to science educators among whom are: Taber (2009) Alfred, Brooks, Aldrich and Tenanbaum (2013) Adejo, Amali and Omega (2017) and Agogo (2017). These researches found out that teachers could not teach concepts like simple machines, force and air effectively which in-turn declines interest and affects the performance of students in the subject. The problems were attributed to poor instructional method such as the conventional lecture method, which is teacher centered.

Available statistics from the National Common Entrance Examination from 2014 – 2019 in Plateau State indicated consistent low performance of pupils.

Pupils' Interest and performance in Science and Technology subjects have continued to decline yearly in Nigeria as a result of poor foundation at the primary school level which is the base for furtherance of Science and Technology disciplines.

Apart from the issues discussed above, there is the problem of Covid-19 pandemic which has engulfed the world with Nigeria inclusive. Covid-19 is a respiratory illness and the primary transmission route is through person to person contact and through contact with respiratory droplets generated when an infected person coughs or sneezes (Federal Ministry of Health, 2020). Federal Government covid19 guidelines for school resumption emphasized children should limit interaction and sharing of classroom between classes as much as possible and social spaces between individual pupils to minimize transmission risks. It also emphasized maintaining a distance between pupils inside the classroom and reducing amount of time they are in face to face contacts. During the lockdown period, private and public schools moved to online learning. Many of the private schools were successful in doing that, but the public schools were at the disadvantage as government couldn't provide the required facilities. Many pupils couldn't follow the online teaching due to inaccessibility to digital tools which means many have been left behind during the covid-19 challenges. It is generally understood in Plateau State and Nigeria as a nation that pupils in rural and underserved communities are being left behind as they are not equipped to adapt or face new method of learning. With the problem of poor performance of pupils as earlier mentioned, and as also reported by Nbina (2012), Utibe and Agwagah (2015), Universal Basic Education (2019) and Dawal (2020), the effect of the Covid-19 Pandemic further worsens the situation. Based on these reports, there is need to explore methods that would enhance the interest and performance of pupils in understanding difficult concepts like simple machines force and air and one of such is the task instructional sheet strategy.

Task instruction sheet strategy (TISS) is a series of curriculum materials carefully organized towards individualized competency-based instruction. Each set of task instruction sheet includes instruction, assignment, task objectives, equipment needed, instructions, procedure and task evaluation. It is also a sheet containing a step by step procedure for accomplishing a task individually (Bruner, 1961, Dorier & Garcia, 2018). This strategy sustains the interest and curiosity of pupils in the learning process thereby enhancing their performance in basic science and technology. It is typically characterized by

having minimal teacher guidance, fewer teacher explanations, solving problems with multiple solutions and use of hands-on materials, minimal repetition and memorization. It is problem-based learning, experimental learning and 21st century learning. In task instructional sheet strategy, pupils are actively participating in discovering learning through formulated and evaluated hypothesis (Gauer, 2016) (Mandrid & Peckel, 2009, Dcan & Kuhn, 2016).

In teaching the concept of simple machines, force and air through task instructional sheet strategy, every individual child will develop mental assimilation resulting from physical mental activity that promotes all forms of obtaining knowledge for oneself by the use of one's mind. Pupils learning to investigate and discover lead to better understanding and promoting of interest (Agwagah & Ojoko, 2017). So also, learning takes place in problem solving solutions where the learner draws on his or her own experience and prior knowledge. Pupils learn by exploring and manipulating objects and performing experiments individually in a covid19 compliant environment. As directed by Federal Ministry of Health (2020) that covid19 preventive protocols should be observed at all levels, it is expected that during the teaching and learning process, densification solutions and rules on covid19 preventive protocol should be presented and implemented in accordance to the regulations at all times. The 2 meter social distance must be maintained and the wearing of face mask compulsory in case of a contact in person's learning activity. Also the covid19 preventive protocol to be observed are regular checking of temperature, frequent and thorough hand washing, or use of hand sanitizer and avoidance of touching of the face and eyes, avoid sharing any personal items, and body contacts/hugging. The practice of cough etiquette should be maintained by coughing into the elbow or a tissue and disposing of the used tissue in the bin with a lid. In a covid19 challenging situation TISS encourages individual learning of every child where the teacher ensures that throughout the classroom instruction the maintenance of covid19 preventive protocol is strictly adhered to in order to avoid transmission. It is based on the preceding that this study sought to find out the effectiveness of task instruction sheet strategy in enhancing pupils' interest and performance in some difficult basic science and technology concepts under covid-19 prevention protocol.

1.1 Purpose of Study

Specifically, the study was to determine:

- If the use of task instructional sheet strategy can help in improving pupils' interest some difficult basic science and technology concepts.
- The effectiveness of task instructional sheet strategy on the performance of pupils in difficult Basic Science and Technology Concepts.

1.2 Research Questions

The following research questions were raised to guide the study:

- What is the effect of task instructional sheet strategy on pupils interest in some difficult basic science and technology concepts?
- What is the effect of task instructional sheet strategy on the performance of pupils in some difficult basic science and technology concepts?

1.3 Hypotheses

The following hypotheses were tested at 0.05 level of significance:

There is no significant difference in the interest of pupils taught some difficult basic science and technology concepts using task instructional sheet strategy and those taught using conventional lecture method.

There is no significant difference in the mean performance scores of pupils taught difficult basic science and technology concepts using task instructional sheet strategy and those taught using conventional lecture method.

2. Method

The study employed quasi experimental research design. Specifically, the non-equivalent pretest, post-test control group design. The design was considered appropriate because intact class settings were used (Ugodulunwa, 2008). To guide the study, two research questions and two hypotheses were addressed. The sample consisted of 178 Primary six pupils (92 boys and 86 girls) from two schools out of the population size of 3,458 pupils (1955 boys and 1503 girls) from 21 public primary schools in Jos North-West of Plateau State. Experimental group had 89 pupils and control group also had 89 pupils. Simple random sampling technique of hat and draw method was used in selecting two schools. In each of the selected schools, one intact class was used as the

experimental group and one intact class was used as the control group from the streams of primary six in each of the schools. The instruments for collecting the data was Basic Science and Technology Interest Scale (BSTIS) and Basic Science and Technology Performance Test (BSTPT). The face and content validity of the instruments were determined by giving them to two experts in science education and one expert in measurement and evaluation for scrutiny. The reliability of the instrument was determined by administering it to a group of pupils outside the study group who had similar characteristics. BSTIS is a 20 item – 4 point interest scale sampling pupils' interest in difficult basic science and technology concepts. The reliability of the BSTIS was estimated using the Cronbach Alpha method and was calculated to be 0.78. The BSTIS was considered to be reliable in collecting credible data for the study. The BSTPT was made up of 25 multiple choice questions adapted

from their past common entrance examination questions. Kuder-Richarson formula (KR-20) was used to determine the internal consistency and 0.84 was obtained indicating that the BSTPT was good for collecting appropriate data. The experimental group were taught difficult basic science and technology concepts which were simple machines, force and air using task instructional strategy and the control group were taught the same concepts using conventional lecture method in a covid19 preventive classroom instruction measures. The covid19 rules and regulations concerning classroom teaching earlier stated were strictly adhered to. A post-test was administered to both the experimental and control groups after eight weeks. The data collected were analyzed using mean and standard deviation for the research questions and analysis of covariance (ANCOVA) for the hypotheses at 0.05 level of significance.

3. Results

The results of the study are discussed as follows:

Research Question 1: What is the effect of task instruction sheet strategy on pupils' interest in some difficult basic science and technology concepts.

Table 1: Mean Interest Scores and Standard Deviation of scores of Experimental and Control Groups in some Difficult Basic Science and Technology Concepts.

Groups	No of Pupils	Pre-test Mean	S.D	Post-test Mean	S.D	Mean Difference
Experiment	89	35.36	7.13	37.03	6.99	1.67
Control	89	14.49	2.58	15.57	2.59	1.08
Total	178					

Table 1 shows that experimental group has a mean post test score of 37.03 and a mean gain score of 1.67 while the control group has a mean post test interest score of 15.57 and mean gain interest score of 1.08. The experimental group had higher mean gain score than the control group, indicating that task instructional sheets strategy apparently enhances students' interest in difficult basic science and technology concepts than the conventional lecture method. The experimental group had standard deviation score of 6.99 greater than that of the control group which had 2.59. It indicates that experimental group were homogeneous than those of the control group.

Research Question 2: What is the effect of task instructional sheet strategy on the performance of pupils in some difficult basic science and technology concepts?

Table 2: Mean Performance Scores of Pre-test and Post-test of Primary Six Pupils in the Experimental and Control Groups in Difficult Basic Science and Technology Concepts

Groups	No of Pupils	Pre-test Mean	S.D	Post-test Mean	S.D	Mean Difference
Experiment	89	14.41	4.11	35.36	7.13	20.96
Control	89	14.13	4.02	14.49	2.58	0.37
Total	178					

Table 2 shows that the experimental group has a mean pretest score of 14.41 with a standard deviation of 4.11, and mean posttest score of 35.36 and standard deviation of score of 7.13 respectively. Thus the experimental group has a

mean gain score of 20.96 and standard deviation of scores 3.02 after treatment. On the other hand, the control group has a mean pretest score of 14.13 with standard deviation of 4.02, and posttest mean score of 14.49 and standard deviation of 12.58 respectively. Thus the control group had a mean gain score of 0.37 and standard deviation of scores 1.44. Obviously the experimental group scored higher mean score than the control group. Since the standard deviation of score for experimental group 1.44 is less than 3.02 for the control group, the scores of both groups are not homogenous in clustering around the mean. It can therefore be concluded that the experimental group out-scored the control group, indicating that task instructional sheet strategy is more effective than lecture method in enhancing pupils' performance in difficult basic science and technology concepts.

Hypothesis 1: There is no significant difference in the interest of pupils taught difficult basic science and technology concepts using task instructional sheet strategy and those taught using conventional lecture method.

Table 3: Analysis of Covariance of the Mean Retention Scores of Pupils in Experimental and Control Groups.

Source of Variance	Sum of Squares	df	Mean Square	f.cal	Sig
Corrected Model	27360.887	4	7007.000	2.0184	.000
Intercept	4.417	1	4.417	12.436	.000
Pre-test Performance	5071.083	1	5071.083	1.4403	.000
Treatment	8.006	1	8.006	22.844	.000
Error	64.072	184	.223		
Total	145343.000	189			
Corrected Total	27426.070	188			

Table 3 presents data on the effectiveness of task instruction sheet on pupils' interest in the difficult basic science and technology concepts. The result shows that there is significant difference in the interest mean scores of experimental and control groups, in favour of the experimental group ($P < 0.05$). Therefore it can be concluded that pupils taught the difficult basic science and technology concepts with task instruction sheet developed more interest in learning the difficult basic science and technology concepts than the pupils taught using conventional method.

Hypothesis 2: There is no significant difference in the mean performance scores of pupils taught difficult basic science and technology concepts using task instructional sheet strategy than those taught using conventional lecture method.

Table 4: Analysis of Covariance of Pupils' Performance Scores in Some Difficult Basic Science and Technology Concepts.

Source of Variance	Sum of Squares	df	Mean Square	f.cal	Sig
Corrected Model	24827.215	4	6373.443	835.641	.000
Intercept	1111.500	1	1111.500	148.538	.000
Pre-test performance	3731.758	1	3731.758	501.701	.000
Treatment	20862.813	1	20862.803	2.6282	.000
Error	1382.228	184	2.547		
Total	140472.000	189			
Corrected Total	26320.444	188			

Table 4 presents the result of the analysis of covariance conducted on the effectiveness of task instructional sheet strategy on the performance of pupils in difficult basic science and technology concepts. The result clearly reveals that a significant difference exists in the performance of pupils taught difficult concepts using task instructional sheet strategy and those taught using conventional lecture method, with ($f\text{-cal} = 18.49$, $F\text{-crit} = 12.71$, $df = 1$, at 0.05 level of significance. Thus null hypothesis was rejected. It can therefore be concluded that task instructional sheet is more effective in enhancing pupils' performance in difficult basic science and

technology concepts than conventional lecture method.

4. Discussion

Result in table 1 shows that pupils in the experimental group obtained higher mean interest scores of 37.03 than those in the control group with 15.57. The result in table 3 further confirms that the experimental group significantly retained higher interest than the control group in knowledge of simple machines using GDLA. The finding of this study is in agreement with that of Njoku and Ezenwa (2014) Agwagah and Ojoko (2017), Nnoli and

Okafor (2017), Nnoli and Offiah (2017) who confirmed that using appropriate instructional approaches enhance pupils' interest and growing knowledge. Agwagah and Ojoka 2017 explored the effectiveness of fishing tools instructional method in enhancing students' interest and performance in Junior Secondary School geometry and revealed that students taught with this method had higher performance and development of interest than those taught with conventional lecture method. In the same way Nnoli and Okafor (2017) explored the effects of enhancing students' academic interest and performance through the use of chemistry instructional materials and reported that the chemistry instructional materials significantly enhanced students' interest and performance in chemistry. The findings of the present study is also in agreement with that of Onoli and Offiah (2017) who conducted a study on the effect of the use of improvised organic reagents on senior secondary students' level of motivation, performance and retention in chemistry and discovered among other things that the use of improvised organic reagent enhances students' level of motivation, interest and performance in chemistry taught during the period of the study. Using Covid-19 preventive protocol as directed by Federal Ministry of Health (2020), the use of TISS was very effective in enhancing pupils' performance and developing of interest in a difficult basic science and technology concepts as they acquired the knowledge individually with less interaction.

The findings of this study showed a significant difference in the mean performance scores of pupils in the experimental group exposed to task instructional sheet strategy and those in the control group taught using conventional lecture method. In table 2, the mean performance of the experimental group in post-test is higher than that of the control group. This indicated that the use of TISS improved pupils' performance in difficult basic science and technology concepts. This result was confirmed by the result in table 4 which revealed that the method was a significant factor on pupils' performance in difficult basic science and technology concepts using TISS. It indicates that pupils who were taught difficult basic science and technology concepts performed higher than those taught using the conventional lecture method. The findings of this study support the findings of previous researchers such as Taber (2009), Nbina (2012), Felder (2014) and Agogo (2017), where experimental group performed higher than the control group. The above researchers used activity-based, inquiry, scaffolding and process method respectively.

The finding equally agrees with that of Mandrin and Preckel (2009) and Adejo, Amali and Omega (2017) who confirmed that using the appropriate instructional method leads to enhancing pupils' performance in Basic Science and Technology concepts particularly topics that teachers find difficult to teach like simple machines, force and air. The finding could have been as a result of active individual participation of pupils due to the fact that each pupil was engaged in solving problems with multiple solutions and using of hands-on, minds-on materials in acquiring knowledge. This confirms the reports of Alfred, Brooks, Aldrich and Tenanbaum (2011) and Dawal (2020) who stated that teaching method should enhance the children's ability to think critically by way of obtaining knowledge for oneself through the use of one's mind. This type of exposure to individual learning made the understanding of difficult basic science and technology concepts easier for pupils.

5. Conclusion

The findings of this study showed that pupils taught some difficult basic science and technology concepts using task instruction sheet strategy under Covid-19 prevention protocol developed interest and performed better than those taught using conventional lecture method. This implies that pupils can learn on their own in the midst of challenges like the Covid-19.

6. Recommendations

Based on the findings of this study, the following recommendations are made:

- Teachers should adopt the use of task instruction sheet strategy for the teaching of difficult Basic Science and Technology Concepts.
- Curriculum planners, Federal and State Ministries of Education should emphasize the use of task instruction sheet strategy in the teaching and learning of Basic Science and Technology especially difficult basic science and technology concepts like simple machine, force and air in a global challenging situation like the Covid-19 that engulfed the world.
- Teacher training institution like Colleges of Education, Faculties of Education and Institutes of Education should incorporate task instruction sheet strategy in schools as substitute for online learning as majority of schools do not have digital tools to

encourage learning during challenging periods that children have to stay at home.

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