THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

PUPILS' ITEM RESPONSE ANALYSIS REPORT ON THE STANDARD FOUR NATIONAL ASSESSMENT (SFNA) 2023

SCIENCE AND TECHNOLOGY

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05E SCIENCE AND TECHNOLOGY

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FOREWORD

The National Examinations Council of Tanzania has prepared the report on Pupils' item response analysis for the Standard Four National Assessment (SFNA) 2023 in Science and Technology subject. This report gives feedback to education stakeholders on how the Standard Four pupils responded to the National assessment questions and the extent to which the teaching and learning objectives have been attained in Science and Technology subject.

Each question has been analysed in order to show how pupils had mastered various competences when answering respective questions. The reasons which made the pupils respond correctly or incorrectly to the questions are presented. The analysis of pupils' responses shows that the pupils who performed well had adequate knowledge of the competences, understood the demands of the questions and had good presentation skills. Likewise, the pupils who did not perform well lacked knowledge about the competences assessed. Moreover, some pupils failed to understand the demands of the questions.

It is expected that the feedback provided in this report will enable various education stakeholders and other concerned authorities to take appropriate measures to improve the teaching and learning of Standard Four pupils in the future assessments.

The National Examinations Council of Tanzania would like to express heartfelt gratitude to all people who participated in the preparation of this report.

Dr. Said A. Mohamed
EXECUTIVE SECRETARY

1.0 INTRODUCTION

This report shows the analysis of pupils' performance in the Standard Four National Assessment in the Science and Technology subject which was conducted on October 2023. The assessment aimed at identifying the extent to which the competences stipulated in the Primary School Syllabus for standards III and IV in Science and Technology subject were attained.

A total of 1,693,438 pupils were registered for this assessment out of which 1,545,137 sat for the assessment and 148,301 were absent. The overall performance in Science and Technology subject was good as 1,341,838 pupils equivalent to 86.86 per cent passed the assessment and 203,022 pupils equivalent to 13.14 per cent failed the assessment. Data analysis shows that for the year 2023 the performance of the pupils increased by 3.69 per cent when compared to the year 2022.

The assessment paper had two sections A and B. Section A had three (3) questions and section B had two (02). Each question contained five (5) items making a total of 25 items. Each item carried 2 marks making a total of 50 marks thus, 30 marks in section A and 20 marks in section B. Pupils were required to attempt all the questions.

In Section A, pupils were required to answer multiple choice items, matching items and fill in the blank spaces by using the words provided in the given box. In Section B, they were supposed to read a passage and answer questions by writing the correct responses in the blank spaces in the question paper provided. In this part pupils were also required to study the given picture and answer the questions that followed.

This report analyses the quality of responses provided by the pupils to specific questions. The report also explains the number of pupils who attempted each question and the percent of their performance. The report also explains, the reasons for pupils' ability or inability to provide correct responses with respect to the question demands.

The report analyses the performance parameters for each question. The parameters are based on the percentage of pupils' performance on a given question. For the percentages 0 - 33, 34 - 66 and 67-100 the performance was considered to be poor, average and good, respectively. Moreover, the pupils' performance was categorized in four groups according to scores obtained, namely weak (0 - 2), average (4-6), good (8) and very good (10). Pupils with poor performance were considered to fail the assessment and those pupils with average, good and very good performance passed the assessment. Charts were used to show the performance in individual questions. Samples of extracts of good and poor performance were used to show how pupils answered the questions.

2.0 ANALYSIS OF PUPILS' PERFORMANCE IN EACH QUESTION

Analysis of pupils' responses was done for five (5) questions from sections A and B as follows:

2.1 Section A: Multiple Choice, Matching and Filling in the Blanks Items

This section comprised of multiple choice, matching items and filling in the blanks questions. The pupil were required to answer all questions. Analysis of pupils' performance in these questions was as follows:

Question 1: Performing investigations and Discoveries in Science and Technology

This question consisted of five items (i) – (v). A pupil was required to choose the letter of the correct answer from the given alternatives (A – D) and write it in the box provided. This question assessed pupils' competence in mastering various scientific investigation concepts.

Generally, this question had good performance as out of 1,545,137 pupils who attempted this question 1,323,405 (85.65%) pupils passed and 221,732 (14.35%) pupils failed. The analysis shows that this question had good performance compared to other questions in this assessment. Figure 1 shows the summary of pupils' performance in this question.

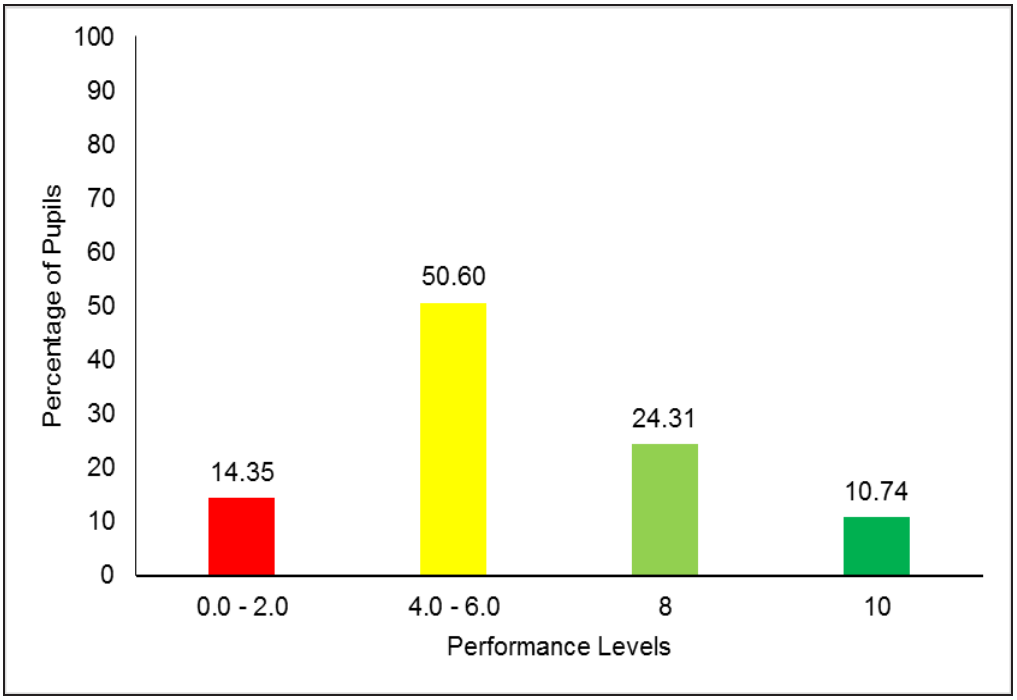


***Figure 1**: The summary of pupils' performance in question 1*

Figure 1 shows that pupils who scored 4 to 10 marks were 85.65 per cent. Among them, 50.60 per cent scored 4 to 6 marks. 24.31 per cent scored 8 marks and 10.74 per cent scored all 10 marks allocated for this question. Moreover, Figure 1 shows that only 14.35 per cent gave a wrong respond to the question and obtained 0 to 2 marks.

Pupils who performance well mastered various scientific investigation concepts hence they chose the correct alternatives.

In item (i) for instance, which assessed pupils' ability to identify dangerous animals to humans by asking:

(i) Which list contains dangerous animals to human?
   A Bee and snake
   B Butterfly and lizard
   C Cockroach and grasshopper
   D Butterfly and bee

The majority of the pupils choose the correct response; A, *bee and snake*. These pupils had good knowledge about dangerous animals to human beings. They recognised that a bee and a snake are dangerous to humans because they produce poison. When stung by a bee and bit by a snake, venom from these organisms flows through the body and can causes great damage to the human body and even death if the victim delays to get treatment.

Furthermore, pupils who gave wrong responses lacked knowledge of identifying dangerous animals to human as provided in the choices. Those who opted for distractor B, *butterfly and lizard,* C, *cockroach and grasshopper* and D *butterfly and bee* for instance, did not know that butterfly, lizard, cockroach and grasshopper are non-venomous organisms and their bites stings are not dangerous to humans. Pupils who gave wrong responses to this item were not competent in identifying dangerous and non-dangerous animals to humans from the choices provided.

Item (ii) assessed pupils' ability to identify the causes of a particular image to occur when looking at a mirror. The question was as follows:

(ii) When you look at the mirror you will see your image. Which event causes the particular image to occur?
   A Refraction of light
   B Absorption of light
   C Formation of light
   D Reflection of light

The correct response to this item was D, *reflection of light.* Pupils who chose the correct answer had sufficient knowledge of identifying the causes of a particular image formation when looking at a mirror. They understood that reflection of light is the bouncing back of light rays when it strikes on a smooth surface and shiny surfaces. Reflection of light rays produces different images on a shiny smooth surface. Furthermore, they understood that when light strikes a different medium it shows its various properties including reflection.

Pupils who did not perform well in the question chose the distractors A, *refraction of light*, B, *absorption of light* and C, *formation of light*. Those who respond to distractor A, *refraction of light* for example did not

understand that refraction of light is the process where light changes direction as it passes from one transparent medium to another. This is due to the variation in speed of light in different mediums. Those who chose distractor B, *absorption of light* failed to realise that absorption of light occurs when light strikes a black object and make light rays to be absorbed. Those who chose distractor C, *formation of light* failed to understand that formation of light does not cause a particular image to be formed. Formation of light occurs when there are changes in motion (vibration) when charged particles, such as electrons, accelerate at high speed.

Item (iii) required the pupils to identify the change in the state of matter occurred after Sikudhani boiled water in an electric jug for 30 minutes. The question was as follows:

(iii) Sikudhani was boiling water in an electric jug. After 30 minutes it all boiled and dried. Which change in states of matter occurred?
A Liquid to gas
B Gas to solid
C Solid to liquid
D Gas to liquid

Pupils who chose the correct answer A, *liquid to gas*, understood that the act of boiling or evaporation, is a process in which a liquid turn into steam when its temperature reaches boiling point that is 100 °C. These pupils, understood that water is in liquid state and steam is a gaseous state of matter.

Pupils who got this item wrong chose distractors B, *gas to a solid*; C, *solid to a liquid*, and D, *gas to a liquid*. These students failed to realise that Sikudhani boiled water which is in a liquid state. Moreover, all the final states of matter presented in the distractors are solid and liquid. There is no gas stated in the distractors as a final state of matter. Therefore, these pupils did not realise that boiled water was in liquid state and water vapour is in gaseous state and this state is formed after boiling the water. Hence, these pupils lacked the ability to recognise different states of matter and their characteristics.

Item (iv) assessed pupils' ability to identify what else is needed other than water, solar energy and moderate temperature for a plant to grow. The question was as follows:

(iv) For the plant to grow it needs water, solar energy and moderate temperature. What other requirement is needed?
A Shadow
B Wind
C Soil
D Air

The correct response to this item was D, *air*. Pupils who chose the correct answer knew all requirement needed by a plant to grow. These pupils knew that, apart from water, solar energy and moderate temperature, air is also a very important requirement for a plant to grow well. Plants take carbon dioxide gas from air and convert it to glucose through photosynthesis process. This glucose helps in various metabolic activities within the plant. Without air plants are not able to produce glucose and eventually they become weak and die.

Some pupils failed to answer this item correctly. They chose distractors: A, *shadow*; B, *wind* and C, *soil*. Pupils who chose distractor A, *shadow* for instance, failed to understand that a shadow is produced when an object blocks the path of light rays. It is not a requirement for plant growth. Those who chose distractor B, *wind*, did not realise that wind is air in motion from an area of high pressure to low pressure. Those who chose distractor C, *soil;* did not understand that plants can grow without the presence of soil. There are plants that grow on top of other plants and even in water. Plants requires nutrients that are within the soil to grow but not the soil itself.

Item (v) required the pupils to identify a natural source of light energy. The question was as follows:

(v) Light energy originated from natural and artificial sources. Identify one natural source?
A Candle
B Electricity
C The sun
D Lamp.

Pupils who chose the correct answer C, *the sun* had competence to identify the natural source of light energy. They were able to differentiate between natural and artificial sources of light energy. They understood that the major natural source of energy on earth is the sun.

Pupils who chose distractors: A, *candle;* B, *electricity* and D, *lamp* lacked the ability to identify the natural source of energy. They failed to realise that a candle, electricity and lamp produce light but they are artificial sources of light energy.

Question 2: Maintaining Health and the Environment.

This question had five items which assessed the functions of various parts of the human digestive system. In responding to items (i) – (v), the pupil was required to match the functions of the human digestive system in **List A** with the corresponding part in **List B** and then write the letters of the correct answers in the brackets provided. The question asked:

Answer items (i) - (v) by matching the functions of the human digestive system in **List A** with the corresponding part in **List B**. Write the letter of the correct answer in the bracket provided.

List A	Answer	List B
(i) Produce an acid that kills germs in the food and helps in digestion of food	( )	A. Stomach B. Mouth C. Oesophagus D. Large intestine E. Rectum F. Liver G. Stomach wall
(ii) Store food temporarily	( )	
(iii) Absorbs water and mineral salts	( )	
(iv) Carries soften food to the stomach	( )	
(v) Stores food residue	( )	

The question assessed the pupils' competence in identifying the functions of the different parts of the human digestive system. Pupils who had good performance were able to match correctly the functions of the human digestive system with the corresponding parts. Those who did not match correctly had insufficient knowledge on the functions of various parts of the human digestive system.

A total of 1,545,137 pupils attempted this question. Out of them 661,784 (42.83%) responded correctly. A total of 883,353 (57.17%) pupils failed to obtain the correct answer. Generally, pupils had average performance in this question. Although the performance of the pupils in this question was average it was the question that had lowest performance compared to other questions in this assessment. Figure 2 provides a summary of the pupils' performance in this question.

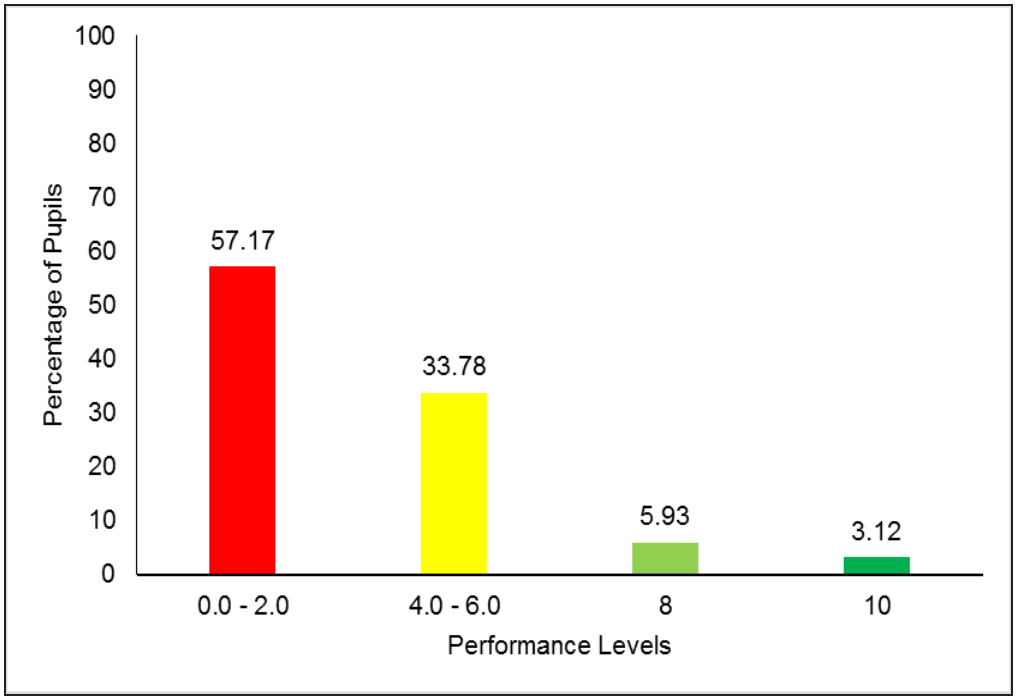


Figure 2: *The summary of pupils' performance in question 2*

Figure 2 shows that 57.17 per cent of the pupils failed this question as they scored 0 and 2 marks. 42.83 per cent of the pupils scored 4 to 10 marks; among them 5.93 per cent scored 8 marks. Only 3.12 per cent were able to score all 10 marks.

The analysis shows that, pupils with poor performance failed to make correct choices and hence, gave wrong responses to all items or got correctly only one item. This shows that, these pupils lacked competence to identify the functions of various parts of the human digestive system. In item (i) for example, required the pupils to identify the part of the human digestive system which produces an acid that kills germs in the food and helps in the digestion of food. Most of the

pupils chose distractors B, *mouth*, C, *Oesophagus;* E*, rectum* and F, *liver*.

Pupils who chose distractor B, *mouth* failed to understand that the mouth contains teeth for mechanical digestion by chewing the food. It also performs chemical digestion of food using saliva that contains enzymes that are used to digest food. Those who opted for distractor C, *oesophagus* did not recognise that the Oesophagus is the part that carries chewed and softened food to the stomach. Pupils who opted for distractor E, *rectum,* failed to realise that the rectum is the last part of the digestive system that stores food residues before being removed from the body as faeces. Those who chose distractor F, *liver;* were not aware that the liver produces bile which is essential for the digestion and absorption of fats. The correct answer was G *stomach wall*. Pupils who chose the correct answer understood that the stomach wall produces an acid that helps in killing of germs in the food and helps in the digestion of food.

Item (ii) assessed the pupil's knowledge about the parts of the digestive system responsible for storage of food temporarily. The pupils who chose the correct response *stomach,* had knowledge that a stomach stores food temporarily before moving food to the small intestine.

Most of the pupils failed this item by choosing distractors B, *mouth*; D, *large intestine* and G, *stomach wall*. Pupils who chose *B, mouth,* were not aware that the mouth contains teeth for mechanical digestion by chewing the food. Those who chose *D, large intestine* did not realise that the large intestine absorbs water and mineral salts from the indigestible material. Those who chose distractor G, *stomach wall*, did not understand that the stomach wall produces an acid that kills germs in the food and helps in digestion of food.

Item (iii) measured the pupils' ability to identify part of the human digestive system that absorb water and mineral salts. The correct answer to this item was D, *large intestine.* Pupils who chose the correct knew that the large intestine absorbs water and mineral salts from the food.

Pupils who failed in this item chose one among the distractors: A, *stomach*; *E, rectum* and G*, stomach wall*. Those who opted for A,

stomach did not understand that the stomach stores food temporarily before moving it to the small intestine. Pupils who chose E, *rectum* failed to recognise that the rectum stores food residues before being eliminated as faeces. Those who chose letter G, *stomach wall* lacked knowledge that the stomach wall contains acids that helps in killing germs and assist in digestion.

Item (iv) required the pupils to identify parts of the human digestive system that carries soften food to the stomach. Most of the pupils who failed in this item chose wrong answers like; B, *mouth*, D, *large intestine* and F, *liver*. These pupils had inadequate knowledge on the functions of the various parts of the human digestive system. Those who chose distractor B, *mouth*, for instance failed to understand that mouth helps in mechanical and chemical digestion of food. Pupils who chose D, *large intestine;* did not understand that the large intestine absorbs water and mineral salts from the indigestible materials. Those who chose F; *liver,* had inadequate knowledge on the functions of liver. They failed to understand that the liver produces bile which is essential for the digestion and absorption of fats. Pupils who chose the correct response C, *Oesophagus* understood the functions of the oesophagus is carrying softened food to the stomach.

Item (v) assessed the pupil's ability to identify parts of the digestive system used to store food residues. The pupils that failed to respond correctly to this item by chose the wrong alternative A, *stomach*; C, *oesophagus*, D; *large intestine* and G, *stomach wall.* These pupils had inadequate knowledge on the concept of functions of different parts of the human digestive system. Pupils who chose the correct response E, *rectum*, were competent in identifying the part of the digestive system that stores food residues before being released from the body.

Question 3: Maintaining Health and the Environment

The question consisted of five items. In each item (a) – (e), a pupil was required to choose the correct answer from the alternatives provided in the box and write it in the space given. The question was as follows:

Answer items (a) - (e) by choosing the correct disease from the box and write it in the space provided.

Cancer, Schistosomiasis, AIDS, Chickenpox, Malaria, Cholera, Asthma

Questions

(a) Which disease is transmitted through the air or direct contact with an infected person?

_____

(b) Which disease is transmitted by a housefly?

_____

(c) Which disease is caused by plasmodium?

_____

(d) Which disease is transmitted through worms from snails?

_____

(e) Which disease is caused by abnormal growth of body cells?

_____

This question measured pupils' competence in identifying the types of diseases according to their causes and ways through which they are transmitted.

A total of 1,545,137 pupils attempted this question. Out of which 810,197 (52.44%) pupils gave a correct response, A total of 734,940 (47.56%) pupils failed to provide correct answers. Generally, this question had average performance. Figure 3 provides the summary of the pupils' performance in this question.

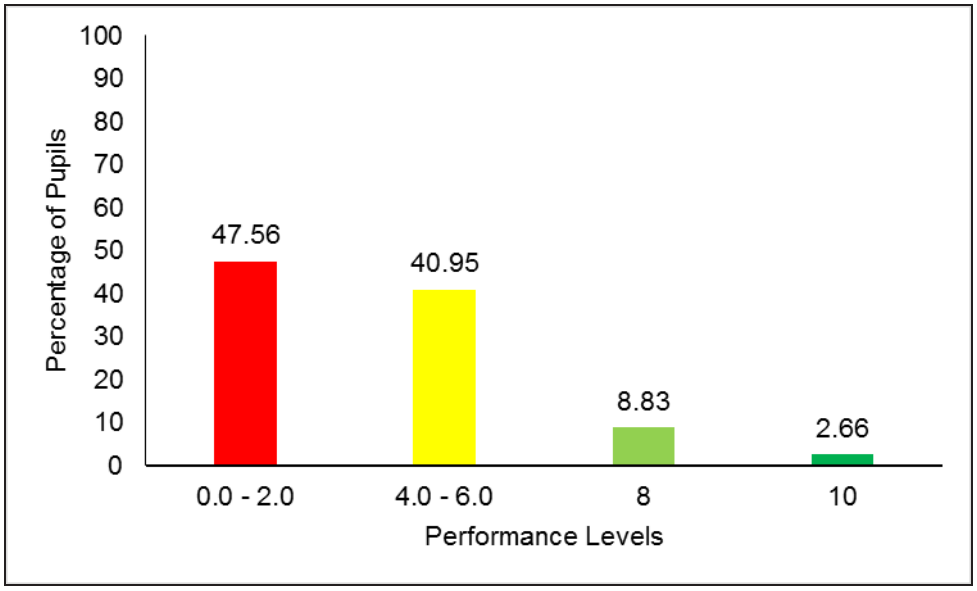
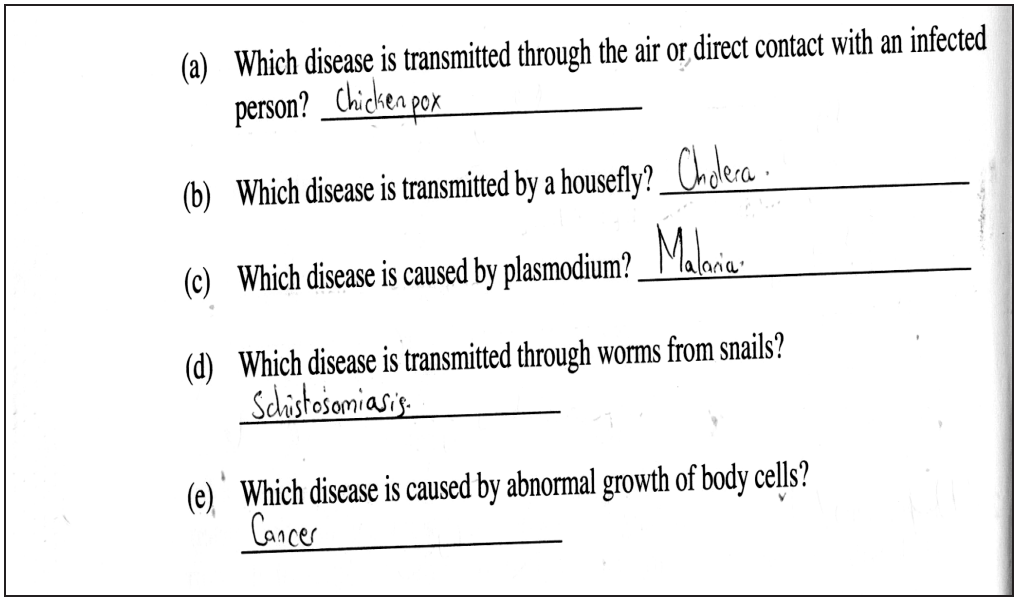


Figure 3: *The summary of pupils' performance on question 3*

Figure 3 shows that among 52.44 per cent of the pupils who passed, 40.95 per cent scored 4 to 6 marks, 8.83 per cent scored 8 marks and 2.66 per cent scored all 10 marks in this question. However, (47.56%) failed to provide correct answers to all items or provide correct responses to only one item and therefore obtained 0 to 2 marks.

Pupils that had a good performance level were competent in identifying different diseases based on their causes and the way they are transmitted. Extract 1.1 provides a sample from a pupil's correct responses to this question.


(a) Which disease is transmitted through the air or direct contact with an infected person? Chickenpox

(b) Which disease is transmitted by a housefly? Cholera.

(c) Which disease is caused by plasmodium? Malaria.

(d) Which disease is transmitted through worms from snails? Schistosomiasis.

(e) Which disease is caused by abnormal growth of body cells? Cancer

Extract 1.1*: A sample of pupils' correct response to question 3*

Extract 1.1 shows a sample from pupil who provide correct responses by choosing correctly the diseases listed in the box with respect to their causes and mode of transmission.

The analysis of pupils' responses to each item showed the following: In item (a) which required the pupils to name the disease that is transmitted through the air or direct contact with an infected person. The correct answer was *chickenpox*. Pupils who wrote the correct answer knew that chickenpox is among the communicable diseases and is transmitted through the air or in direct contact with an infected person. The majority of the pupils that failed wrote *asthma* and *cance*r. These pupils who wrote *asthma* did not realise that asthma is a disease that affects the respiratory airways and is caused by various substances called allergens. These allergens include dust, strong smell from sprays or perfumes and animal fur and pollen. Any contact with a person with asthma does not spread the disease. Those who wrote *cancer* did not know that cancer is a disease caused by abnormal growth of body cells.

Item (b), assessed the pupil's ability to identify the disease transmitted by a housefly. The majority of pupils wrote the correct response *cholera*. These pupils understood that houseflies pick cholera

pathogens from waste and contaminated food and water and then transmit them to humans who eat the food and drink the water. Pupils who failed in this item wrote incorrect answers. Some pupils for example wrote *schistosomiasis*. These candidates lacked competency in the concept of communicable and non-communicable diseases. They did to realise that *schistosomiasis* is a disease caused by parasitic worms known as *Schistosoma* and is transmitted by snails found in water.

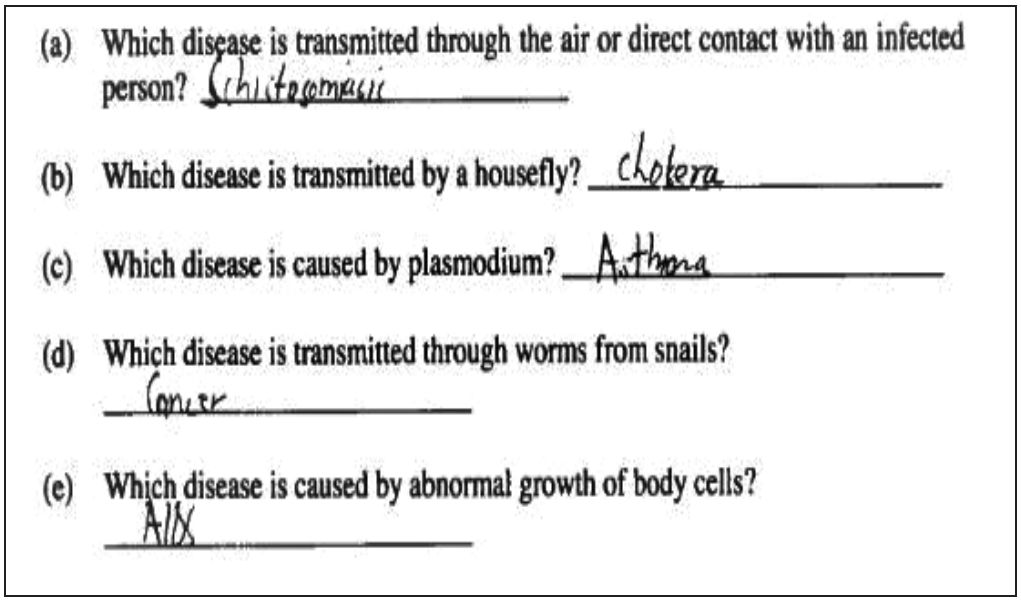
In item (c), pupils were required to identify the disease caused by *plasmodium*. The correct answer was *malaria*. Pupils who wrote the correct response had knowledge about communicable diseases. They knew that malaria is caused by a parasite called *plasmodium* and transmitted by a female mosquito called *anopheles*. However, some pupils wrote incorrect answers such as; *asthma, schistosomiasis, AIDS* and *cancer.* These pupils had inadequate knowledge about communicable diseases. Those pupils who wrote *AIDS* for example lacked competence on the knowledge of different diseases and their causative. They failed to understand that AIDS is a condition whereby the immune system becomes weak after being attacked by human immunodeficiency virus (HIV).

Item (d) assessed the ability of the pupils to identify a disease transmitted through worms from snails. The correct option was *schistosomiasis.* Pupils who responded correctly to this item had ability to recognise the disease transmitted through worms from snails. They knew that *schistosomiasis* is a communicable disease caused by parasitic worms and transmitted by a vector known as snail. Pupils who failed to answer this item wrote the wrong options such as; *Asthma* and *Cancer*. These candidates lacked knowledge about communicable and non-communicable diseases. They failed to recognise that asthma and cancer are non-communicable diseases which are due to allergy and abnormal growth of body cells respectively.

Item (e) assessed pupils' understanding on the diseases caused by abnormal growth of the body cells. The correct response was *cancer*. Pupils who wrote cancer had knowledge on the concept of infectious and non-infectious diseases. They understood that cancer is a non-communicable disease caused by abnormal growth of body cells and it

affects the concerned individual only. Pupils who failed in this item wrote options like, schistosomiasis*, AIDS, chickenpox* and *asthma.* This implies, they lacked adequate knowledge about the concepts of various diseases and how they are transmitted.

Extract 1.2 provides a sample of an incorrect response from one of the pupils to question 3.


(a) Which disease is transmitted through the air or direct contact with an infected person? Schistosomiasis

(b) Which disease is transmitted by a housefly? cholera

(c) Which disease is caused by plasmodium? Asthma

(d) Which disease is transmitted through worms from snails? Cancer

(e) Which disease is caused by abnormal growth of body cells? AIDS

***Extract 1.2**: A sample of pupils' incorrect response to question 3*

Extract 1.2 shows a sample from a pupil who got only one item. This indicates that the pupil lacked adequate knowledge on the causes and modes of transmission of some communicable and non-communicable diseases.

2.2. Section B: Short Answer Questions

This section consisted of two questions. Question one required the pupil to read the passage and answer the questions that followed. To the following question was required to observe the given pictures and answer the questions.

Question 4: Performing Investigations and Discoveries in Science and Technology

This question requested a pupil to read the passage and answer the questions related to it. The question asked:

Read the following passage and then answer items (a) - (e).

A group of three Standard Four pupils in Lokome primary school did an experiment to investigate seed germination in school environment. They did an experiment by sowing maize seeds in two different tins labelled “R’’ and “X’’. In each tin, they put same type and amount of soil. The seed sown in tin “R’’ were watered and germinated after five days, while the seeds in tin “X’’ were not watered and there were no any seed germinated in this tin. The pupils asked their teacher the reasons for the seeds not to germinate. The teacher asked them to recall the steps for conducting scientific experiment. The steps are identification of the problem, formulation of hypothesis, conducting an experiment, collection of data, analysis of data, interpretation of data and making a conclusion.

Questions

(a) What was the aim of the experiment conducted by pupils at Lokome primary school?

_____

(b) Name two things required in performing the experiment.
(i) _____
(ii) _____

(c) Why the seeds in tin “X’’ did not germinate?

_____

(d) The act of pupils to ask for the reasons for the seeds not to germinate is similar to which step in science experiment?

_____

(e) What have you learnt from the experiment in the passage you have read?

_____

This question assessed pupils' competence in Performing Investigations and Discoveries in a scientific experiment.

The performance of pupils in this question was average since out of 1,545,137 pupils who attempted this question, 708,969 pupils (45.88%) passed and 836,168 (54.12%) pupils failed. Figure 4 provides a summary of the pupils' performance in this question.

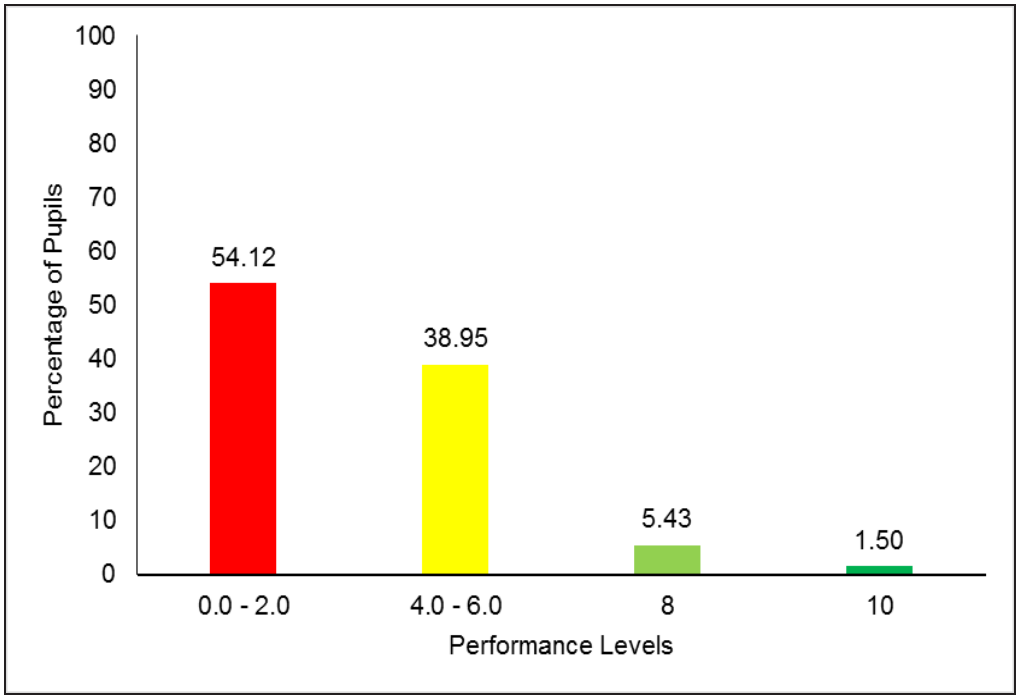


Figure 4: *The summary of pupil's performance on question 4*

Figure 4 shows that out of 45.88 per cent of pupils who passed this question 38.95 per cent scored 4 to 6 marks, and 5.43 per cent scored 8 marks. Only 1.50 per cent were able to score all 10 marks allocated to this question.

However, the majority of the pupils failed to provide the correct answers to most items of the question. This implies they did not grasp

well the information that was present in the passage and answer the respective question.

In responding to item (a) for instance, which required them to write the aim of the experiment conducted by pupils at Lokome primary school.

Most of the pupils failed to respond correctly to this item by writing incorrect the aim of the experiment such as; *in order to know experiment and investigate seed germination in school environment, to know which seed will germinate and seed germination.* These pupils did not give the correct aim of the experiment instead they gave the type of experiment conducted. Others wrote, *to grow maize crops*, *by sowing maize seeds, doing an experiment to investigate* and *identification*. This indicates that the pupils did not comprehend the passage and were not competent to recognise the aim of the experiment. They didn't realise that, watering one tin of seeds and leaving the other tin without water, was the most important part of the experiment in this item as the way to obtain the correct response. Those pupils that provide correct responses wrote: *importance of water in seed germination*. This indicates that these pupils read and understood the passage. Hence, they stated the correct aim of the experiment.

Item (b) measured the pupil's ability to name two things required in performing the experiment described in the passage. The pupils who answered this item correctly wrote; *seeds, water*, *tins* and *soil*. This shows that these pupils comprehended the passage and had ability to identify the things required in performing the experiment. Likewise, some pupils failed to respond correctly to this item and wrote responses that did not correspond to the demand of the question. They wrote*, identification of the problem, formation of hypothesis*, *data collection* and *data analysis* for example. These candidates wrote the steps of conducting scientific experiments rather than the things required in performing the experiment. This implies that these pupils failed to adhere with the demand of the question in this item.

Item (c) required pupils to explain why the seeds in tin "X'' did not germinate. Pupils who responded correctly wrote; *the seeds lacked water.* This shows that they had knowledge about the importance of

water for seed germination. They recognised water is among the basic requirements for a seed to germinate.

Pupils who respond incorrectly in this item did not give the correct responses and some of these pupils wrote; *there were no seed germination, they made an experiment to investigate Lokome primary school, doing cleaning* and *diseases*. These pupils lacked adequate knowledge and provide irrelevant reasons as per demand of the question.

Item (d) measured the pupils' ability to name the scientific step following the act of pupils asking their teacher the reasons why the seeds did not germinate in tin **"**X''. Pupils who answered it correctly wrote *identification of the problem*. This shows that these pupils were competent in understanding the steps to be followed when conducting scientific experiments. They understood that before getting the solution to the problem, the problem must be identified first. Likewise, pupils who failed to obtain the correct answer wrote responses like; *conducting scientific experiments, recall the steps for conducting experiments.* Such responses depicted that the pupils had inadequate knowledge on the concepts of scientific steps for conducting experiments in accordance with the relevant context.

Item (e) assessed the pupils' ability to explaining what they learnt from the experiment in the passage. Pupils who responded correctly wrote, the *importance of water in seed germination.* These pupils had adequate knowledge about the aim of the experiment and the importance of watering the seed as seen in tin "R''. Some pupils however wrote responses that are not related to the requirement of the question such as; *steps for conducting scientific experiment*, *germination of maize seeds* and *planting trees*. This shows that these pupils did not know what to answer. Extract 2.1 shows a sample of a pupil's incorrect response to question 4.

(a) What was the aim of the experiment conducted by pupils at Lokome primary school?

Data analysis

(b) Name two things required in performing the experiment.

(i) ~~Data expert~~ Data collection

(ii) Data analysis

(c) Why the seeds in tin **X** did not germinate?

To recall the steps of conducting scientific experiments

(d) The act of pupil's to ask for the reasons for the seeds not to germinate is similar to which step in a scientific experiment? X in each tin

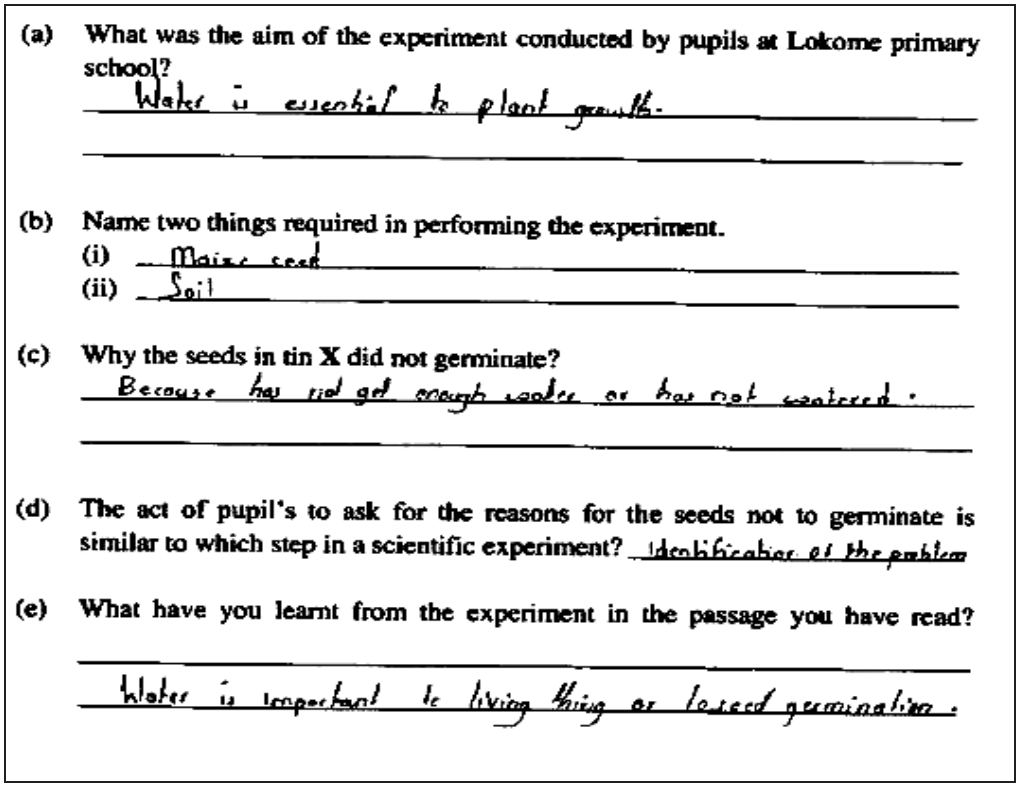
(e) What have you learnt from the experiment in the passage you have read?

investigate seed germination in school environment

***Extract 2.1**: A sample of pupils' incorrect response to question 4*

In extract 2.1 the pupil wrote responses that were not relevant to the requirement of the question in all items. This implies that this pupil did not have adequate knowledge about the passage he/she read.

Moreover, (45.88%) pupils were able to get correct 2 to 5 items. This shows that these pupils read and understand the passage and applied the knowledge they acquired to answer respective question. Extract 2.2 shows a sample of a pupil's correct response to question 4.


(a) What was the aim of the experiment conducted by pupils at Lokome primary school?
Water is essential to plant growth.

(b) Name two things required in performing the experiment.
(i) Maize seed
(ii) Soil

(c) Why the seeds in tin X did not germinate?
Because has not get enough water or has not watered.

(d) The act of pupil's to ask for the reasons for the seeds not to germinate is similar to which step in a scientific experiment? Identification of the problem

(e) What have you learnt from the experiment in the passage you have read?
Water is important to living thing or to seed germination.

***Extract 2.2**: A sample of pupils' correct response to question 4*

Extract 2.2 shows a sample of a response from a pupil who responded correctly to all five (5) items. This pupil understood well the demand of the question and had competence in investigation in a scientific experiment specifically, on seed germination.

Question 5: Applying Fundamentals of Science and Technology

The question had five items. In each item (a) - (e), a pupil was required to observe the picture and then answer the questions that followed. The question asked:

Observe the following pictures and answer the questions in items (a) - (e).

A 

B 

Question

(a) Identify activities observed in pictures **A** and **B**.

A _____

B _____

(b) Give the name of the tool used in pictures **A** and **B**.

A _____

B _____

(c) If the tool used in picture **A** is not available what part of the body can be used to perform the activity?

_____

(d) What other tools can be used to perform activity in picture **A**? Mention two tools.

(i) _____

(ii) _____

(e) What is the scientific importance of using the tools shown in pictures **A** and **B**?

_____

The question assessed pupils' competence in mastering of science-related skills, specifically on the identification of tools used for simplifying work in the environment.

Generally, this question had average performance. Out of 1,545,137 pupils who attempted this question, 925,968 (59.93%) pupils passed and 619,169 (40.07%) pupils failed. Figure 5 illustrates the summary of the pupils' performance in this question.

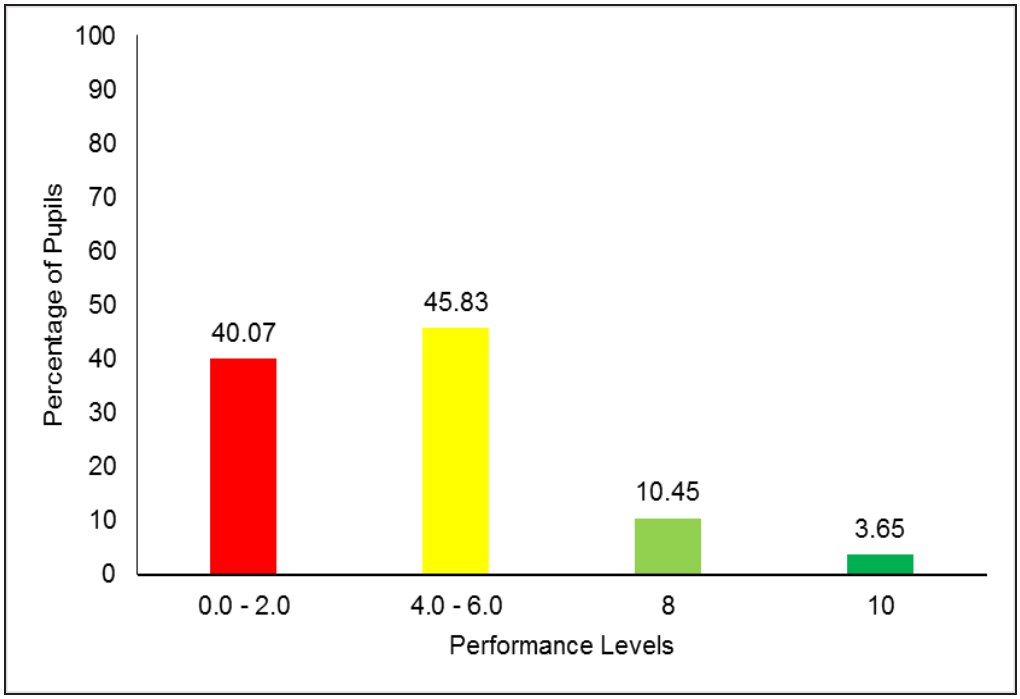


Figure 5: *The summary of pupils' performance on question 5*

Figure 5 shows that 59.93 per cent of pupils were able to provide correct answers whereas 45.83 per cent scored 4 to 6 marks, and 10.45 per cent scored 8 marks. Only 3.65 per cent were able to score all the10 marks.

The analysis of the pupils' responses shows that most of the pupils (59.93%) got 2 to 5 items. These pupils were competent in identification of tools for simplifying work in the environment. Extract 3.1 is a sample of a pupil's correct response to question 5.

(a) Identify activities observed in pictures **A** and **B**.

A He is carrying the rubbish.

B He is sweeping the compound.

(b) Give the name of the tool used in pictures **A** and **B**.

A Wheel barrow.

B Broom.

(c) If the tool used in picture **A** is not available what part of the body can be used to perform the activity?

Hands.

(d) What other tools can be used to perform activity in picture **A**? Mention two tools.

(i) Spade/dustpan.

(ii) Dustbin.

(e) What is the scientific importance of using the tools shown in pictures **A** and **B**?

It simplfy work and It makes our environment clean.

***Extract 3.1**: A sample of pupils' correct response to question 5*

Extract 3.1 shows a response from a pupil who correctly responded to all items. This shows that the pupil understood the question well and respond appropriately.

In item (a) for example which assessed the pupils' ability to identify the activities observed in the pictures A and B, most of the pupils were able to identify the activities and wrote; A, *carrying a luggage or dirt; pushing a wheelbarrow* and B, *sweeping*. These pupils were able to observe and recognise the activities illustrated by the pictures. However, the majority of pupils wrote the incorrect answer. This implies that they lacked observational skills and did not have ability to interpret the activities shown in the pictures. In part A, for example, some pupils wrote: *doing little jobs*, *cleaning mirrors* and in part B, *picking up trash, he/she is carrying leaves*.

Item (b) assessed the pupils' ability to provide the names of the tools used in the pictures A and B. The correct responses were; A, *wheelbarrow* and B, *broom*. Pupils who responded correctly had good observational skills and had ability to identify the tools used in the pictures.

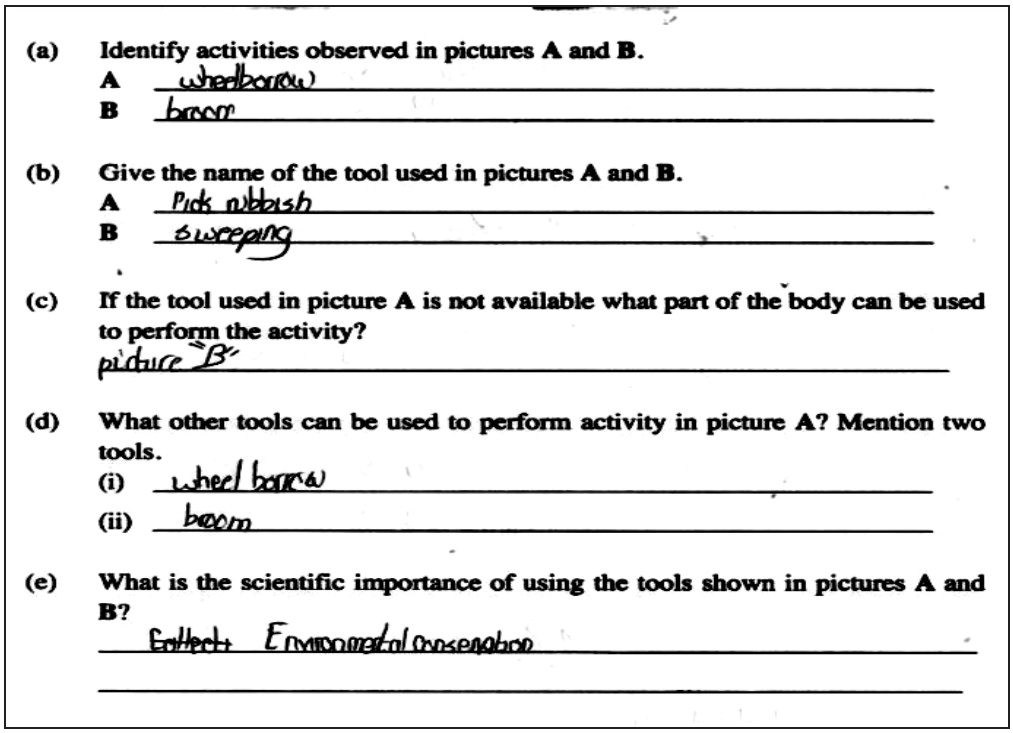
Some pupils provided incorrect answers to this item and wrote; A, *causing various diseases* or *pollute the environment*, and in part B, they wrote; *results into cholera*, *sweeping the home surrounding*. These pupils wrote the effects of not taking care of the environment instead of the tools used in picture A and B respectively. Some pupils wrote down the activities represented by the pictures instead of mentioning the tools used. One pupil for example, wrote the following answers: A: *the child is driving a wheelbarrow* and B, *the child is sweeping the ground*. This shows that this pupil did not understand the demand of the question and failed to identify the tools used in the picture.

Item (c) required the pupils to identify parts of the body that can be used to perform the activities of the tools shown in picture A in case it is not available. Pupils who identified correctly the parts of the body wrote; *carrying using the head*, *hands* or *shoulder*. They correctly related the functions of the wheelbarrow with some parts of the body. Most of the pupils who failed in this item wrote: *using trolley, be tough* and *using legs.* These pupils did not realise that using town trolley and being tough are not part of the human body used to perform the activities similar to the tool used in picture A. Those who wrote legs failed to understand that legs cannot carry such a load observed in the picture. These pupils failed to understand the requirement of the question.

Item (d) assessed the pupils' ability to mention two other tools that can be used to perform the activity shown in picture A. The pupils who answered correctly wrote one of the following: *dustbin, bucket, bags, bicycle, tractor, lorry and motorcycle.* These pupils had knowledge of other tools that can be used to perform the activity shown in picture A. Therefore, they were competent in maintaining a safe and a healthy environment.

Some pupils however provided incorrect responses such as: *tire, hoe, slasher, a metal* and *a sword.* Those pupils never knew that such tools neither can carry any luggage nor allow litter to get into such tools. Some of those tools are only used for cleaning the environment, for example: slashers, swords and hoes are used for cutting tall grasses, cutting trees and digging respectively. These pupils lacked adequate knowledge about activities done by the tools shown in picture A.

Item (e) assessed the pupils' ability to explain the importance of the tools shown in the pictures A and B scientifically. The pupils who explained correctly wrote; *they simplify work.* The pupils had knowledge about the importance and functions of the tools in pictures A and B in our surrounding environment. The pupils who failed in this item provide incorrect explanations on the importance of using the tools shown in pictures A and B. Some of these pupils wrote: *washing dishes* and *doing experiment*. These responses indicate that, these pupils lacked adequate knowledge on the scientific importance of using the tools shown in the pictures A and B. Extract 3.2 is a sample of a pupil who responded incorrectly to question 5.


(a) **Identify activities observed in pictures A and B.**
A wheelbarrow
B broom

(b) **Give the name of the tool used in pictures A and B.**
A Pick rubbish
B sweeping

(c) **If the tool used in picture A is not available what part of the body can be used to perform the activity?**
picture B

(d) **What other tools can be used to perform activity in picture A? Mention two tools.**
(i) wheel barrow
(ii) broom

(e) **What is the scientific importance of using the tools shown in pictures A and B?**
Collect Environmental conservation

Extract 3.2*: A sample of pupils' incorrect response to question 5*

Extract 3.2 shows a sample of pupil's incorrect response to question 5. This pupil failed all five items that were asked. In item (c) for example, instead of explaining the parts of the body he/she wrote picture 'B'. This implies the pupil did not understand the requirement of the question.

3.0 ANALYSIS OF PUPILS' PERFORMANCE IN EACH COMPETENCE

The Standard Four National Assessment (SFNA) 2023 for Science and Technology subject assessed three main competences which were: *Applying Fundamentals of Science and Technology; Performing Scientific Investigation and Technological Discovery* and *Maintaining Health and the Environment*. The analysis shows that the pupil's had average performance in all competences. The competence in *Performing Scientific Investigation and Technological Discovery had a higher per cent of performance (65.77%)* compared to performance in other competences. The competence of *Applying Fundamentals of Science and Technology* had 59.93 per cent and that of *Maintaining Health and the Environment* had 47.64 per cent. Although the performance in all three competences was average, the competence of *Maintaining Health and the* Environment was the one that had the lowest performance in this assessment.

The performance of the competence of Performing Investigations and Discoveries in Science and Technology has increased by 23.15 per cent in the year 2023 compared to the year 2022, where the performance in this competence was 42.62 per cent. Performance in the competence of Applying Fundamentals of Science and Technology and that of Maintaining Health and the Environment decreased by 20.92 per cent from 80.85 per cent in the year 2022 to 59.93 per cent in the year 2023 and 6.26 per cent from 53.90 per cent in the year 2022 to 47.64 per cent in the year 2023 respectivelly.

The lowest performance in the competence of Maintaining Health and the Environment was attributed by the inability of the pupils to identify the functions of different parts of the human digestive system. The summary of the statistical performance in each competence is shown in the Appendix.

4.0 CONCLUSION

The general performance of the pupils in each competence in the Science and Technology subject for the year 2023 was average as 57.78 per cent of the pupils passed the assessment. The analysis of the responses of pupils shows that there were pupils, who were more competent in mastering various scientific investigation concepts such as Performing Investigations and Discoveries in Science and Technology compared to others. The competence of *Maintaining Health and the Environment* had the average performance as compared to others due to reasons like; inadequate knowledge in respect to concepts assesed, inability to know the demand of the question and good presentation skills.

5.0 RECOMMENDATIONS

In order to improve the level of performance in the competence of Maintaining health and the Environment especially in identifying the human body systems and its parts the following are recommended:

(a) Teachers should guide the pupils to make friendly and attractive models of different organs and body systems by using locally available materials such as; card boards clay soil and used newspapers. This will enhance pupil's ability through learning by doing and seeing real pictures. Hence, leading to meaningful learning.

(b) Teachers should be encouraged to use Information and Communication Technology (ICT) in the competences that require the pupils to study virtually. This can be done through the use of projectors and television to teach concepts about various human body systems and organs.

(c) Teachers/schools are advised to invite health experts/consultants to provide health education especially about different human body systems and organs. This will help pupils to acquire wide knowledge about the functions and importance of each organ of the body systems such as the digestive system.

APPENDIX

THE COMPARISON OF THE PUPILS' PERFORMANCE IN EACH COMPETENCE IN SFNA 2023 AND 2022 SCIENCE AND TECHNOLOGY SUBJECT

S/N	Competence	SFNA 2023				SFNA 2022			
		Question Number	Performance in each Question (%)	Average performance on each competence (%)	Remarks	Question Number	Performance in each Question (%)	Average performance in each competence (%)	Remarks
1.	Applying fundamentals of Science and Technology	5	59.93	59.93	Average	1	80.85	80.85	Good
2.	Performing Scientific Investigation and Technological Discovery	1	85.65	65.77	Average	2	38.70	42.62	Average
		4	45.88			3	46.53		
3.	Maintaining Health and Environment	2	42.83	47.64	Average	4	59.75	53.90	Average
		3	52.44			5	48.05		