



**THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA**



**STUDENTS' ITEMS RESPONSE ANALYSIS
REPORT ON FORM TWO NATIONAL
ASSESSMENT (FTNA) 2023**

BUILDING CONSTRUCTION



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071 BUILDING CONSTRUCTION

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FOREWORD

This report represents Students' Items Response Analysis (SIRA) on Form Two National Assessment on the subject of Building Construction which was conducted in November 2023. The report aims to provide feedback to all education stakeholders on the factors that contributed to the students' performance in the Building Construction subject.

The Form Two National Assessment (FTNA) is a formative evaluation that intends to monitor students' learning outcomes and provide feedback that teachers, students and other education stakeholders can use to improve the teaching and learning process. This analysis shows justification of the students' performance in the Building Construction subject. The students who attained high scores demonstrated their ability in understanding the requirement of the questions, knowledge, skills and competence in the subject matter. Students who scored low marks lacked adequate knowledge of the concepts tested and failed to respond accordingly.

The report identifies students' strengths and weaknesses, which, in turn, will help to improve the learning process before sitting for their Certificate of Secondary Education Examination (CSEE). It will also help teachers to identify the challenging areas and act appropriately during the teaching and learning process.

The National Examinations Council of Tanzania (NECTA) expects that the feedback provided in this report will enable the education stakeholders to take appropriate measures to improve teaching and learning of the subject of Building Construction. Consequently, students will be able to acquire knowledge, skills and competence indicated in the syllabus for better performance in future assessments and examinations.

The Council appreciates the contribution of all those who participated in preparing this report.



Dr. Said A. Mohamed
EXECUTIVE SECRETARY

1.0 INTRODUCTION

This report provides a detailed analysis of the students' performance on Form Two National Assessment (FTNA) 2023 in the Building Construction subject. The assessment adequately covered the Form Two Syllabus for Technical Secondary School Education issued in 2019 and as per Examination format issued in 2021. The Building Construction assessment paper consisted of 10 questions distributed in three sections namely A, B and C.

Section A comprised of two (2) questions; question 1 and question 2 weighing 10 and 5 marks respectively, to make a total of 15 marks. Question 1 had ten (10) multiple-choice items composed from nine (9) topics namely; *Building Materials, Building Construction Science and Technology, Foundation Setting Out, Walls and Workshop Orientation*. Question 2 was a matching item question composed of five (5) items drawn from the topic of *Temporary Support* specifically '*Scaffolding*'.

Section B comprised of seven (7) short answer questions (question 3 to 9) derived from various topics namely: *Building Construction, Science and Technology, Building Materials, Temporary Support and Walls*. Each of these questions carried 10 marks to make a total of 70 in the section. The last section of the paper was section C, comprised of one question from the topic of *Walls* in *Walls Finishes*. This question had a total of 15 marks.

A total of 545 students sat for this assessment. The performance was generally average, whereby 316 (57.98%) students passed while 299 (42.02%) of the students failed. The students' performance in the Building Construction Assessment is shown in Figure 1.

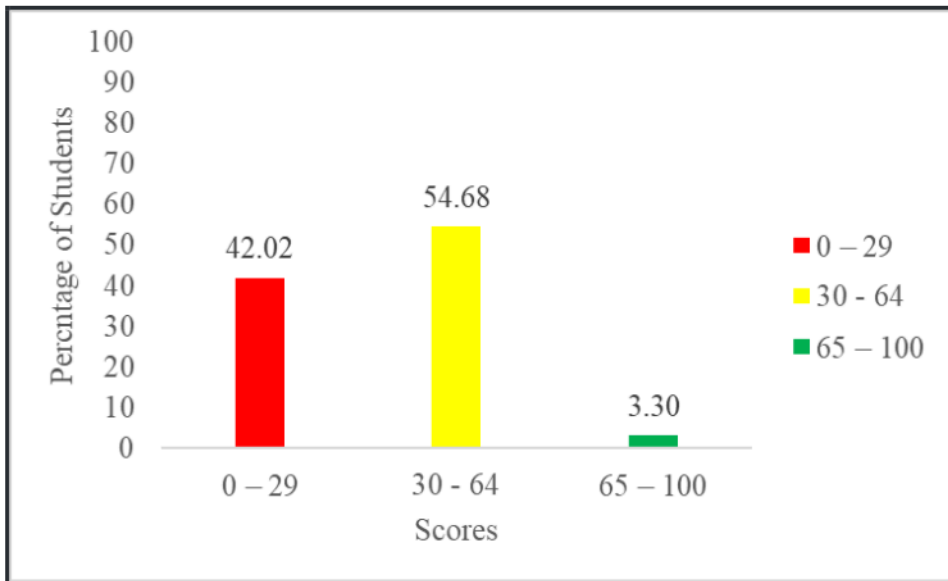


Figure 1: The Students' Performance in the Building Construction Assessment

Among the students who sat for the Building Construction assessment in the year 2023, only 18 scored grade B while 298 students scored grades C and D, respectively while the remaining 229 students failed by scoring grade F.

The range of the students' performance for each question was determined and an analysis of the strength and weakness of the students' responses was carried out. Extracts of students' good or poor responses are used to illustrate the cases presented. At the end of this report, conclusion and recommendations were made to help education stakeholders in taking necessary measures to improve the future students' performance.

2.0 ANALYSIS OF THE STUDENTS' RESPONSES IN EACH QUESTION

2.1 Section A: Multiple Choice and Matching Items

This section consisted of two questions. Question 1 had ten multiple-choice items, each carrying 01 mark to make a total of 10 marks. Question 2 had five matching items, each carrying 01 mark to make a total of 05 marks. The score ranges used for grading students' performance on each question have been shown. The students were considered to pass if they scored grade D and above.

2.1.1 Question 1: Multiple Choice Items

The score intervals used for grading students' performance in this question is shown in Table 1.

Table 1: Score Intervals of Students' Performance in Question 1

Scores range (marks)	General Performance	
	Remark	Grade
0 – 2	Weak	F
3 - 6	Average	C – D
7 - 10	Good	A - B

A total of 545 (100%) students attempted the question, whereby 33 (6.10%) scored from 0 to 2 marks, 391 (71.70%) scored from 3 to 6 marks, while 121 (22.20%) scored from 7 to 10 marks. The performance on this question was good due to the fact that more than 90% of students who attempted it scored from 3 to 10 marks. The performance of the students in this question is summarized in Figure 2.

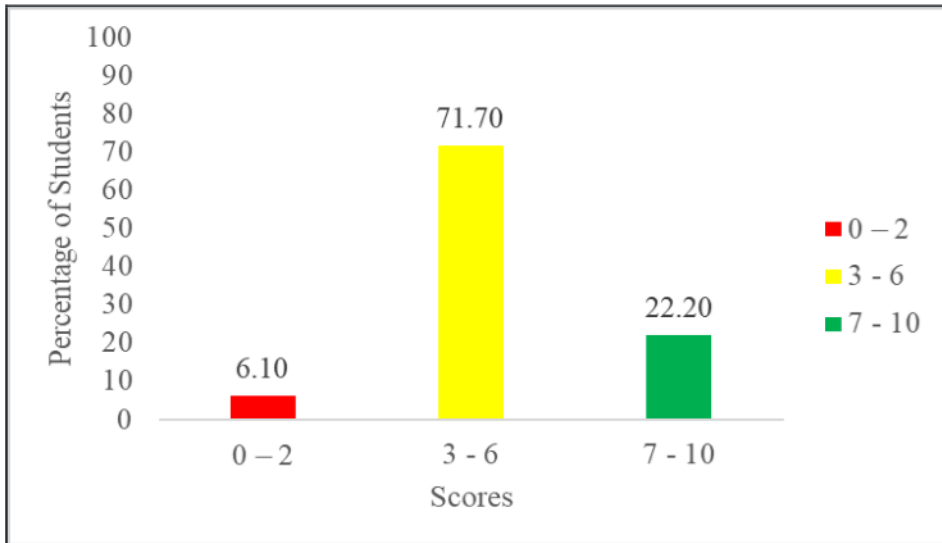


Figure 2: Trend of Students' Performance in Question 1.

The students' strengths and weaknesses in choosing responses for individual items of the question are analyzed as follows:

(i) *Suppose a client have finished preparing building drawings, specifications and bills of quantities. Whom is to enter into contract with for the construction?*

A *General foreman*

B *Main contractor*

C *Sub-contractors*

D *Laboures*

Item (i) was developed from the topic of *Building Construction Science and Technology*. Students were required to identify the building construction team occupations that can enter into contract with the client for construction. The question intended to measure students' ability to identify the role of each occupation involved in the construction industry. The correct response for this item was B, '*Main contractor*'. The students who opted for alternative B were aware that after the bidding process, the one who receives the building documents from client is the main contractor, while those who opted for alternatives A '*General foreman*', C '*Sub Contractor*' and D, '*Laboures*' were incorrect because all of other alternatives are the part of the main contractor. This group of students lacked knowledge on construction team, they try to attempt this item without a skill on construction team.

(ii) *What is the disadvantage of using tubular scaffolding in construction of buildings?*

A *Takes less space when stored.*

B *It is more rapidly erected.*

C *Has high initial cost.*

D *It is used for multi-storey buildings.*

Item (ii) was set from the topic of *Temporary Support*. Students were required to give the disadvantage of using tubular scaffolding in construction of buildings. The question intended to measure the students' understanding of the disadvantages of using tubular scaffolding in construction of buildings compared to other type of scaffolding. The correct alternative was C, '*Has high initial cost*'. The students who opted for alternative C were aware of the advantages and disadvantages of tubular scaffolding in building construction. But those who failed to get correct answer on this item lacked knowledge on the types of scaffolding used in construction works, if you remove the answer from option C, the remaining

options A, B and D all are advantages of using that tubular scaffolding compared with other types.

(iii) *A village committee chose to use plastic pipes for construction of a water supply system. Why do you think they made the best choice to use plastic pipes?*

- A They are durable than metal.*
- B They are not affected with hard water.*
- C They are heavy in weight.*
- D They can be installed with ordinary tools.*

Item (iii) was constructed from the topic of *Building Materials*. Students were required to analysis the best pipes used in water supplying system. The question intended to measure the students' awareness and understanding of the advantage of using plastic pipes in water supplying system compared to other materials like galvanized pipes or asbestos pipes. The correct response was B, '*They are not affected with hard water*'. This is the real reason why we choose plastic pipes compared to other pipes. Students who opted for this alternative were correct because plastic pipes (unlike metal pipes) cannot be affected by rust caused by hard water. Those who opted for alternative A, '*They are durable than metal*', were incorrect because metal pipes are durable compared to plastic pipes. Those students who opted for alternative C, '*They are heavy in weight*', were incorrect because the weight of the given material cannot guarantee its durability. Students who opted for alternative D, '*They can be installed with ordinary tools*', were incorrect because in installation works, both ordinary tools and machines can be used in metal and plastic pipes.

(iv) *You have been requested to prepare cost valuations and bill of quantities for the construction of students' toilet at your school. Which profession are you supposed to possess for the work?*

- | | |
|---------------------------------|-----------------------|
| <i>A Quantity surveying</i> | <i>B Accountancy</i> |
| <i>C Structural engineering</i> | <i>D Architecture</i> |

Item (iv) was developed from the topic of *Building Construction Science and Technology*. Students were required to identify the career responsible for preparing cost valuations and bill of quantities. The correct alternative was A, '*Quantity surveying*', Quantity surveyors, estimate and manage the costs of materials and labour on large building projects. Students who opted for alternative A were aware that quantity surveying deals with

preparing bill of quantities and cost evaluations. Those who opted for alternative B, 'Accountancy', were incorrect because accountancy deals with financial related matters. Those students who opted for alternative C, 'Structural engineering', were incorrect because structural engineering deals with structural analysis of tall buildings and bridges. Students who opted for alternative D, 'Architecture', were incorrect because architecture deals with buildings and landscape design.

- (v) *A hospital building is to be constructed on a black cotton soil. Which set of deep foundation should be used?*
- A *Raft and mat foundation*
 - B *Mat and spread footing foundation*
 - C *Combined footing and strap footing foundation*
 - D *Pile and pier foundation*

Item (v) was set from the topic of *Foundation setting out*. Students were required to select the suitable set of foundation that would suit the nature of the soil (black cotton soil) found at the hospital building site. The question intended to assess students' knowledge on suitability of foundation types depending on nature of the soil during construction. The correct response was alternative D, '*Pile and Pier foundation*' because piles or piers are used if the bearing capacity of soil at shallow depth is not enough to withstand the structural load. So the piles are driven to transfer the loads from the structure to the high bearing capacity soil/rock stratum. This group of students had enough knowledge and skills on choosing the suitable type of foundation according to the nature of the site soils.

Those students who opted for alternatives A '*Raft and mat foundation*', B '*Mat and spreading footing foundation*' and C '*Combined footing and strap footing foundation*,' were incorrect because all of these sets of foundation are in shallow types of foundation and they are used where the soil mass contains compressible lenses or where the soil is sufficiently erratic. The students who opted for these alternatives lacked knowledge and skills in foundation.

- (vi) *What is the lower half portion between the crown and skew back of a circular arch used to bridge a door opening?*
- | | |
|-----------------|----------------------------|
| A <i>Haunch</i> | B <i>Spandril</i> |
| C <i>Rise</i> | D <i>Centre of an arch</i> |

This item (vi) was extracted from the topic of *Walls*. Students were required to identify the lower half portion between the crown and skew back of a circular arch used to bridge a door opening. The students with adequate knowledge on wall and bridging of an opening so opted for the correct alternative A ‘*Haunch*’ that stiffens the beam at the supports, thereby reducing bending possibility at mid-span of door or window opening and the students were aware that a haunch is correct a lower half portion of the arch between the crown and skew back. Students who opted for B, ‘*Spandril*’, were wrong because spandril is a curved triangular space formed between the extrados and the horizontal line through the crown, while alternative C, ‘*rise*’, were also wrong because rise is the clear vertical distance between the highest point on the intrados and the springing line.

Likewise, students who opted for alternative D, ‘*Center of an arch*’, were also wrong because the center of an arch is the geometrical center point from the arcs where forming the extrados, arch ring and intrados are described or struck.

(vii) *What is the mortar mix ratio is recommended to be used for making blocks for fence wall construction?*

<i>A</i>	<i>1:1½</i>	<i>B</i>	<i>1:4</i>
<i>C</i>	<i>1:6</i>	<i>D</i>	<i>1:9</i>

Item (vii) was constructed from the topic of *Building Materials*. Students were required to identify the suitable mortar mixing ratio for making blocks for wall construction. The question intended to measure students’ awareness or understanding of the suitable ratio for blocks that will be used for fence wall construction. The correct alternative was C, ‘*1:6*’. Students who opted for the correct alternative were familiar with various mixing ratios used in the construction industry in which 1:6 means 1 part of cement to 6 parts of fine aggregates (sand). This is a suitable ratio for making blocks for fence wall construction because it is exposed to weather conditions. Students who selected alternative A, ‘*1:1½*’, misunderstood the application of this ratio. This ratio is used in areas where heavy loads/weights are applied such as in bridges and dock yards. Students who opted for alternative B, ‘*1:4*’, were wrong due to the fact that this ratio means the accurate 1 part of cement to 4 parts of fine aggregates (sand) is suitable for mortar joint and external rendering. Students who opted for alternative D, ‘*1:9*’, were incorrect because this mixing ratio means 1 part

of cement to 9 parts of fine aggregates (sand) which is technically weak for block making specifically for blocks used in fence construction.

(viii) Which terminologies stand for the termination of a wall in a stepped fashion?

- | | | | |
|---|--------------|---|---------|
| A | Toothing | B | Perpend |
| C | Racking back | D | Frog |

Item (viii) was extracted from the topic of *Walls*. Students were required to identify the terminology that stands for the termination of a wall in a stepped fashion. The correct alternative was C, '*Racking back*', this is a construction technique that involves stepping bricks at the ends of the wall being laid or constructed. This allows the bricklayer to use the stepped bricks as a guide for establishing level and line when constructing the wall. Students who opted for alternative C were correct because racking back is the only construction technique that make a termination of a wall in a stepped fashion. Those students who opted for alternative A, '*Toothing*', failed because this technique terminate the wall in such a fashion that each alternate course at the end projects in order to provide an adequate bond if the wall is continued horizontally at a later stage. For those who opted for alternative B, '*perpend*', they are wrong because perpend is an imaginary vertical line that includes the vertical joint separating two adjoining bricks. Likewise, to the students who opted for alternative D, '*Frog*', this is an indentation kept in the face of a brick to form a key for suitable holding of the mortar during brick laying.

(ix) What makes the timbering system stable in deep foundation trench?

- A Screwing members together
- B Nailing the members together
- C Using wedges to secure the members
- D Placing timbers in position to the sides of trenches

Item (ix) was developed from the topic of *Temporary Support*. Students were required to remember the factor for a stable timbering system in deep foundation trench. '*Nailing the members together*' is the correct decision to makes the timbering system in trench to be stable in deep foundation. This alternative B is correct answer because fastening by nails the two or more pieces of timber produces a stronger joint of timber trench in deep foundation. Those students who opted for other alternatives such as A, '*Screwing member together*', C '*Using wedges to secure timber*' and D

'Placing timbers in position to the sides of trenches', were incorrect because we are fixing to ensure the timber kept in position all the time during trenching.

(x) Which tools is used in bricks laying for lifting, spreading mortar and forming joint?

A	Scratch	B	Square
C	Bolster	D	Trowel

Item (x) was set from the topic of *Workshop Orientation*. Students were required to identify the correct tool used in bricks laying for lifting, spreading mortar and forming joint. The correct alternative was D, 'Trowel', because trowel is the only tool among the four alternatives that can lift and spread the mortar over the bricks. Those students who opted for alternative A, 'scratch', were incorrect because scratch is used for cutting soft bricks and dressing out surfaces. Those students who opted for alternative B, 'Square', were incorrect because a square is used for checking right angles. Those students who opted for C, 'bolster', were incorrect because bolster is used for accurate cutting of bricks. Therefore, the only tool is trowel that can be used for the particular work of lifting, spreading mortar and forming joint in bricks laying works.

2.1.2 Question 2: Matching Items

The question required the students to match items (i - v) described in List A with responses in List B by writing the letter of the corresponding correct response beside the item number. Each item in this question carried 01 mark, making a total of 05 marks. The question was designed to test the students' ability to know the technical terms used in Scaffolding for *Temporary Support*.

Question 2: Matching Items

<i>List A</i>	<i>List B</i>
(i) Poles fixed diagonally to stiffen the scaffold by forming a triangle.	A Base Boards B Bridles
(ii) Cross pieces that have one end built into the wall of the building.	C Ledgers D Base plate
(iii) Horizontal pole that are fixed above the working platform to stop workers falling off.	E Guard rails F Standards
(iv) The horizontal poles that connect the standards and are parallel to the building.	G Put logs H Brace
(v) Timber boards that support the base plate on soft or uneven ground.	

The score ranges used to grade students' performance in this question are presented in Table 2.

Table 2: Students' Performance in Question 2

Scores range (marks)	General Performance	
	Remark	Grade
0 – 1	Weak	F
2 - 3	Average	C – D
4 - 5	Good	A - B

The performance on this question was good because majority of the students scored from 2 to 3 marks, followed by those who scored from 4 to 5 marks and the last group comprises of those students who scored from 0 to 1 mark. Figure 3 shows the overall trend of students' performance in question 2.

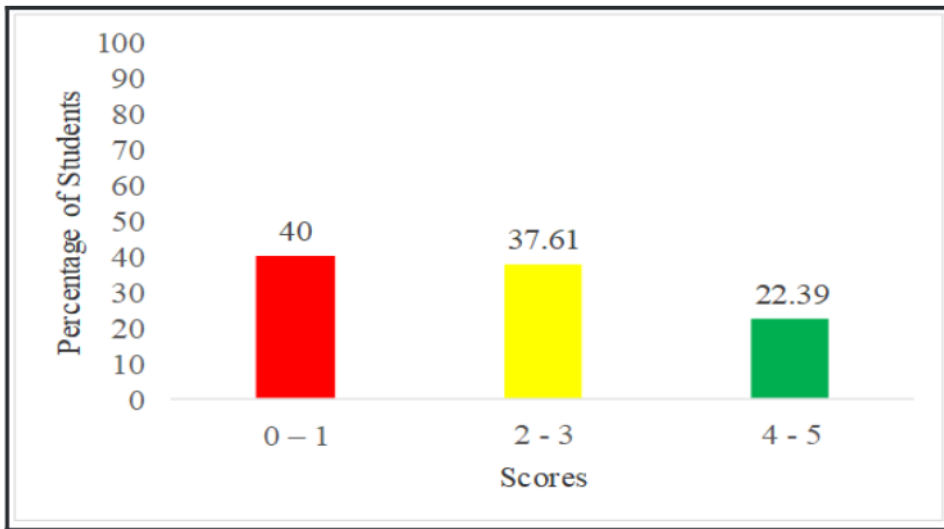


Figure 3: Students' Performance in Question 2

Figure 3 shows that, there 60 per cent of the students who scored from 2 marks and above. In this group, the students managed to score from 2 to 5 marks. This indicates that students had an adequate knowledge on the topic of *Temporary Support* in *Scaffolding*. The students in this group were able to match correctly, either all items or two items and above. The students in this group showed great competence in *Temporary Support* specifically in scaffolding as they were able to match the given description to each correct part of the scaffold. The use of the scaffold on daily construction tasks has made it easier for students to recall and give correct answers. Extract 1.1 shows a sample of students' correct matches in question 2.

Answers

List A	(i)	(ii)	(iii)	(iv)	(v)
List B	H	G	E	C	A

Extract 1.1: A sample of the student's correct response in Question 2

The rest of the students, 218, scored from 0 to 1 mark. This might be attributed to inadequate understanding on the topic of *Temporary Support* in *Scaffolding*. This group of students failed completely for all items or scored only one item. Lack of knowledge and practical skills might be a reasons that made them fail in this question. Extract 1.2 is a sample of a student's incorrect matches in question 2.

Answers

List A	(i)	(ii)	(iii)	(iv)	(v)
List B	F	B	F	G	D

Extract 1.2: A sample of the poor responses to Question 2

2.2 Section B: Short Answer Questions

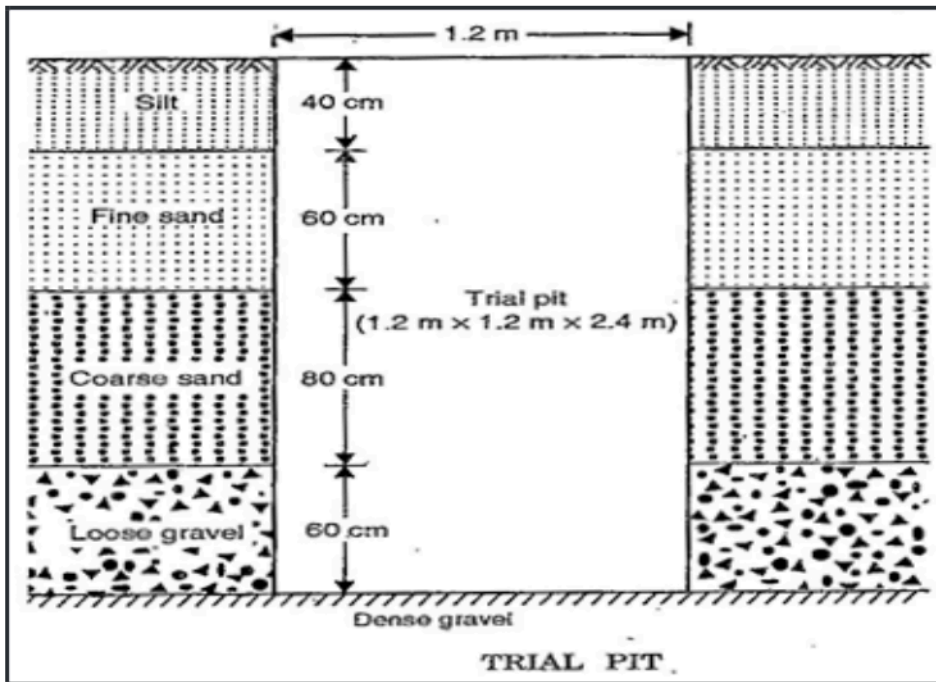
This section consisted of seven (7) questions from 3 to 9, each carrying 10 marks. This section tends to stimulate the students to remember, give short explanation, little calculations and understand and apply the concepts related to the topic coverage. The score intervals used for grading the performance of students in this section are indicated in Table 3.

Table 3: Score Intervals for Questions 3 to 9

Scores range (marks)	General Performance	
	Remark	Grade
0 – 2.5	Weak	F
3 - 6	Average	C – D
6.5 - 10	Good	A - B

2.2.1 Question 3: Building Construction, Science and Technology

This question consisted of parts (a) and (b), where part (a) required the students to state the importance of conducting site analysis before starting construction and in part (b), they were given a well labelled sketch of the Trial Pit used for site analysis; by using the given sketch the students were required to determine the excavated volume of each layer of the soil.



The question was attempted by 545 students, where 303 (55.60%) students scored from 0 to 2.5 marks, 127 (23.30%) students scored from 3 to 6 marks and 115 (21.10%) students scored from 6.5 to 10 marks. This performance implies average performance. Figure 4 represents the students' performance who attempted this question.

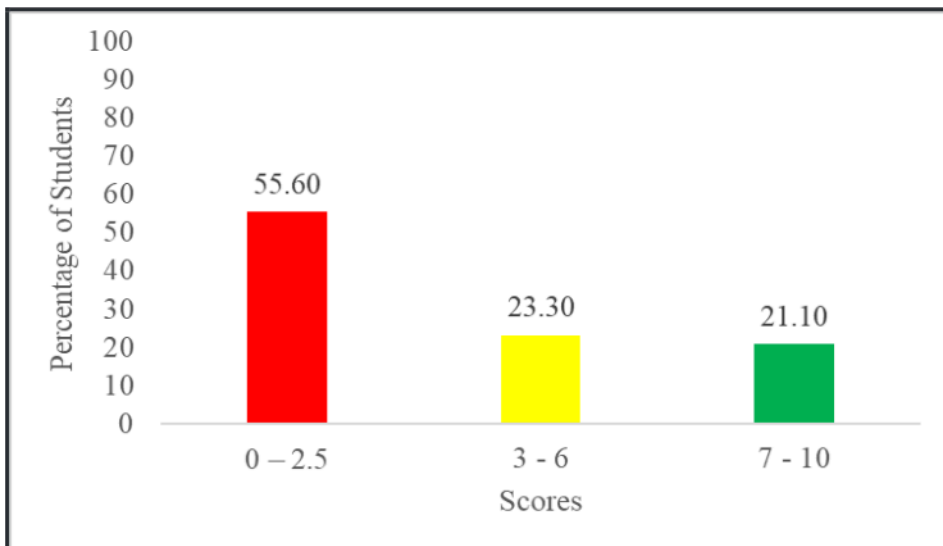


Figure 4: Students' Performance in Question 3

Figure 4 implies that 44.40 per cent of the students demonstrated an ability to understand soil profile and mathematical skills as well as good arrangement of mathematical procedures which led to score from 3 to 10 marks. Most the students in this category scored high marks in part (b) of this question, because the question needs only mathematical skills to calculate the volume of four given layers of trial pit area according to the soil excavated depth in each layer. Meanwhile, 303 (55.60%) of students failed to interpret the provided cross sectional drawing of soil profile. Some students failed to convert the units, for example, centimeter (cm) to meter (m). Those students who failed this question lacked sufficient mathematical operations and had poor systematic arrangement of mathematical procedures. Extracts 2.1 and 2.2 show the correct and incorrect responses from the students respectively.

3. (a) Why is it necessary to conduct site analysis before starting construction?

(i) It helps to know nature of the soil and water table level.

(ii) It helps to determine the nature and bearing capacity of the soil.

(iii) It helps to know and identify climatic conditions at the site.

(iv) It helps to choose best options for construction eg. type of foundation, type of masonry etc.

(b) An open excavation is used for the site analysis and the results obtained were as indicated in Figure 1. If the area of a trial pit is 1.2 m x 1.2 m, determine the excavated volume of each layer of the soil.

TRIAL PIT

Figure 1

$$\begin{aligned} \text{Silt} &= 1.2 \times 1.2 \times 0.4 \text{ m} \\ &= 0.576 \text{ m}^3 \end{aligned}$$

∴ Volume of silt is 0.576 m^3

$$\begin{aligned} \text{Fine sand} &= 1.2 \times 1.2 \times 0.6 \\ &= 0.864 \text{ m}^3 \end{aligned}$$

∴ Volume of fine sand is 0.864 m^3

$$\begin{aligned} \text{Coarse sand} &= 1.2 \times 1.2 \times 0.8 \\ &= 1.152 \text{ m}^3 \end{aligned}$$

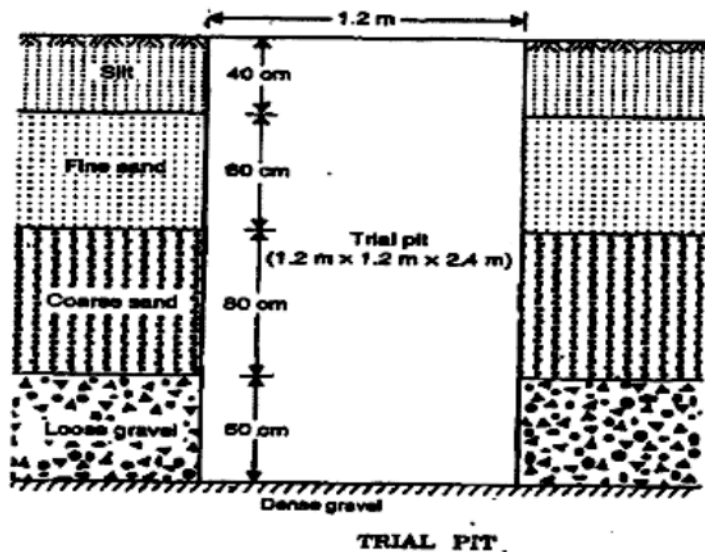
∴ Volume of coarse sand is 1.152 m^3

$$\begin{aligned} \text{Loose gravel} &= 1.2 \times 1.2 \times 0.6 \\ &= 0.864 \text{ m}^3 \end{aligned}$$

∴ Volume of loose gravel is 0.864 m^3

Extract 2.1: A sample of the correct responses to Question 3

3. (a) Why is it necessary to conduct site analysis before starting construction?
- Because to make and providing the demolition of old structure before starting other activities.
 - Because to make site surveying and localizing before starting construction activities and other works.
 - Because to preparing the Underground size and size Mapping before starting construction works.
 - Because to preparing composition/compaction of the construction project and other Earth works.



Data given:

The Area = $1.2\text{ m} \times 1.2\text{ m}$

The Silt = 40 cm

The Fine sand = 60 cm

The coarse sand = 80 cm

The loose gravel = 80 cm

From the formula:

Excavated Volume = The pit sand gravel Area

Excavated Volume = $40\text{ cm} \times 60\text{ cm} \times 80\text{ cm}$

$1.2 \times 1.2 \times 2.4$

The excavated Volume of each layer of the soil = 2.368 m^3

Extract 2.2: A sample of the incorrect responses to Question 3

2.2.2 Question 4: Building Materials

The question consisted of two parts (a) and (b). In part (a), the students were required to identify five raw materials expected to be observed during preparation of moulding composition of plastic. In part (b), the students were required to identify the materials made from plastic that can be used in preparing building components: like (i) Floor, (ii) Furniture, (iii) Roof, (iv) Decorations and (v) Fittings and fixtures.

This question was attempted by 545 (100%) students, where 443 (81.30%) students scored from 0 to 2.5 marks. The students who scored from 3 to 6 marks were 100 (18.33%) while 2 (0.37%) of the students scored from 6.5 to 10 marks.

Generally, the students' performance in this question was weak as 443 (81.30%) of the students scored from 0 to 2.5 marks. Figure 5 represents and summarized the data in the students' performance who attempted this question.

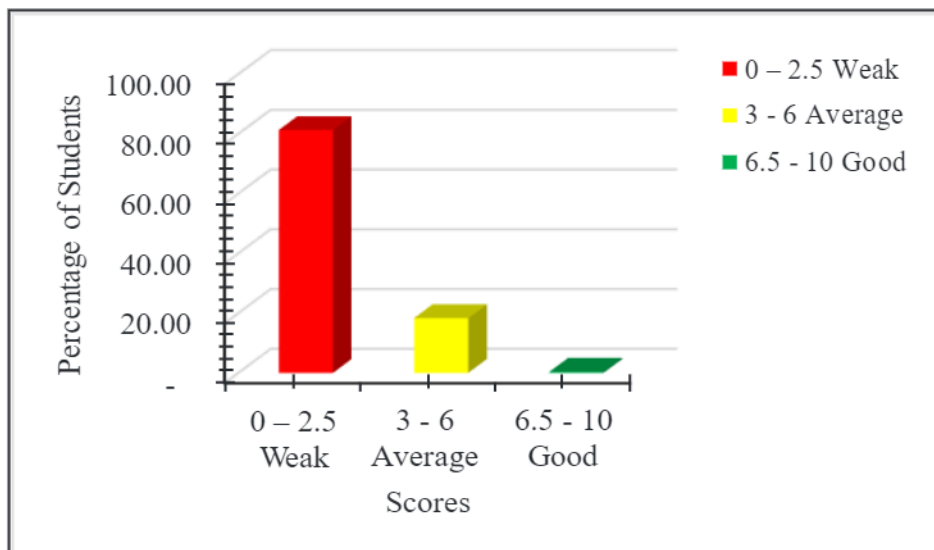


Figure 5: Students' Performance in Question 4

About 81.30 per cent of the students failed in this question. Their failure is an indication that they had insufficient knowledge on the tested topic of *Building Materials*, especially on plastic materials. Students were required to cover more content on plastic materials content to have an extensive understanding on plastic materials. Most of the students in this category wrote irrelevant responses and some of them copied some words or phrases from other questions and wrote them as their responses.

Further analysis shows that the students confused and failed to comprehend the demand of the question, the question required a mixture used or added in plastics that are used to create shapes of objects with special shapes for decoration and various works. Most of the students failed in this question and wrote some of the plastics composition used during the manufacturing itself contrary to the demand of the question as depicted in Extracts 3.1.

4. (a) Suppose you are planning to visit a plastic pipe manufacturing industry; what are the five raw materials you expect to observe during preparation of moulding composition of plastic?

(i) *polyvinyl materials.*

(ii) *polyethylene materials.*

(iii) *polycarbonate materials.*

(iv) *Composites materials*

(v) *Concrete materials*

(b) Identify materials made from plastic that can be used in the following building components:

(i) Floor
wall paper.

(ii) Furniture
Polyvinyl materials

(iii) Roof
Gypsum surface

(iv) Decorations
Curves

(v) Fittings and fixtures
Lines and pins

Extract 3.1: A sample of the poor responses to Question 4

Despite of the massive failure of the students in this question, a few students scoring a pass marks but below the allotted 10 marks distributed in this question. The students did well in the second part of the question by identifying the materials made from plastic that can be used to the given building components. Extracts 3.2, shows correct responses given by the students who scored pass marks in the question.

4. (a) Suppose you are planning to visit a plastic pipe manufacturing industry; what are the five raw materials you expect to observe during preparation of moulding composition of plastic?

(i)

(ii) Filled materials to improve material properties

(iii) Plasticizers materials for soft and toughness of building.

(iv) Polymers materials

(v) Polyvinyl materials

(b) Identify materials made from plastic that can be used in the following building components:

(i) Floor
Carpet is made from plastic materials.

(ii) Furniture
Varnish and Paint, sheet/Paper for covering the table and chairs.

(iii) Roof
sheets (clear plastic sheets)

(iv) Decorations
Bulbs and flowers, sheets curved on ceiling body also made from plastic

(v) Fittings and fixtures
Pipes (PVC, PPR and LPP are examples)

Extract 3.2: A sample of the student's correct responses to Question 4

2.2.3 Question 5: Walls

In this question, the students were required to respond to three parts: (a), (b) and (c). The question stated that, *suppose you are appointed to be a supervisor of the cement mortar plastering work of a new constructed residential building: (a) identify two tools that would be used for the work, (b) describe the procedures that will be followed in doing the work, and (c) identify two defects that might occur in the finished work.*

This question was attempted by 545 students, where 205 (37.62%) students scored from 0 to 2.5 marks. The students who scored from 3 to 6

marks were 238 (43.66%), while 102 (18.72%) students scored from 6.5 to 10 marks. The performance in this question was generally average as the majority of the students who attempted the question scored pass marks and above. The distribution of students' scores in this question is summarized in Figure 6 respectively.

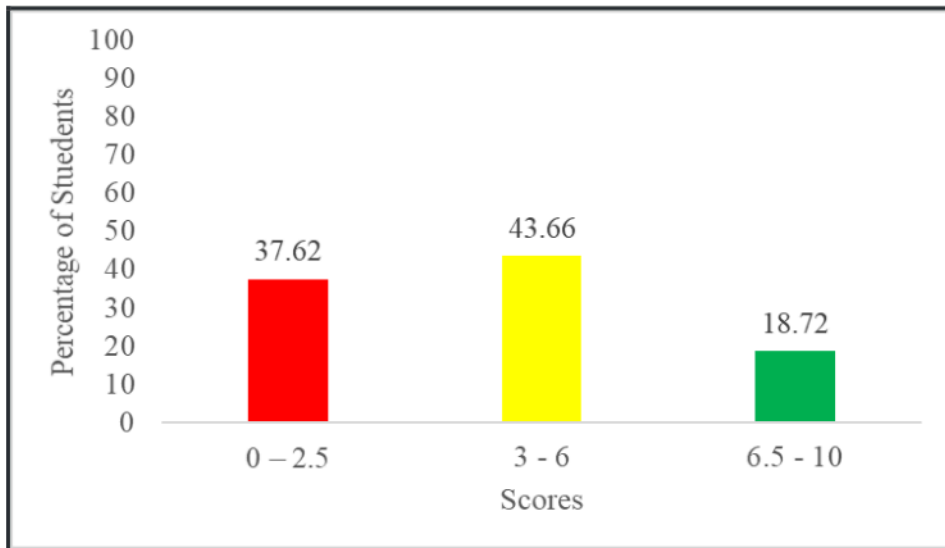


Figure 6: Students' Performance in Question 5

Figure 6 shows that 62.38 per cent of the students scored pass marks and above. These students managed to understand the topic of *Walls*. Also, these students had the ability to apply the practical procedures in conducting plastering works which made them easier to recall and recognize the tools and their use. Further analysis, shows that the rest 205 (37.62%) of the students demonstrated inability to conduct plastering works and they failed to recall and recognize any tools for plastering works. This group of students indicate the lack of knowledge and skills in walling specifically in wall finishing (plastering).

The students failed even to list only two tools that may be used for the work. Also they failed to describe the procedure that followed during plastering. Lack of practical skills for students has led many students to fail to answer this question correctly. If the students had enough practical skills it would be easier for them to remember and be able to give the right answers. Moreover, some of the students misunderstood the demand of the question, instead of writing plastering tools, procedure for plastering or the

defect that might be occur in the finished work they wrote the raw materials used in plastering such as cement and sand. Extracts 4.1 and 4.2 show the samples of correct and incorrect responses, respectively, from the students who attempted this question.

5. Suppose you are appointed to be a supervisor of the cement mortar plastering work of a new constructed residential building;

(a) Which tools would you use for the work? (Identify two)

.....i. trowel.....ii. float.....

(b) Briefly describe the procedures you will follow in doing the work.

.....i. Preparation of mortar components (water, cement etc) and other materials i.e float, trowel for plastering.....

.....ii. Mixing the mortar components to get required and right proportion of mortar with good quality as required.....

.....iii. By help of a flea trowel carry some amount of mortar and apply it onto the wall.....

.....iv. Then use a float to level and smoothne (smoother) the wall onto which mortar was applied.....

(c) Identify two defects that might occur in the finished work.

(i) Cracks and removal of the cement mortar due to environmental effects.

(ii)

Extract 4.1: A sample of good responses to Question 5

5. Suppose you are appointed to be a supervisor of the cement mortar plastering work of a new constructed residential building;

(a) Which tools would you use for the work? (Identify two)

Mortar
Cement

(b) Briefly describe the procedures you will follow in doing the work.

i. Block

ii. glass

iii. Brick

iv. Mortar

v. cement Cement

(c) Identify two defects that might occur in the finished work.

(i) Accountancy

(ii) Architecture

Extract 4.2: A sample of poor responses to Question 5

2.2.4 Question 6: Temporary Support

This question had two parts, (a) and (b). In part (a), students were required to explain the key issues that will be observed during inspection of a formwork of one storey building slab before allowing pouring of the concrete to proceed. In part (b), students were required to examine four types of loads that may be carried out by the formwork.

This question intended to test the ability of the student to understand the temporary supports especially quality of a good fixed formwork in one storey building slab and loads that might be carried by the fixed formwork.

A total of 545 students attempted this question whereby 464 (85.14%) students scored from 0 to 2.5 marks, 80 (14.68%) students scored from 3 to 6 marks and 1 (0.18%) student scored from 6.5 to 10 marks.

The performance in this question was generally poor as the majority of the students who attempted it scored below the pass mark. The students' performance in this question is summarized in Figure 7.

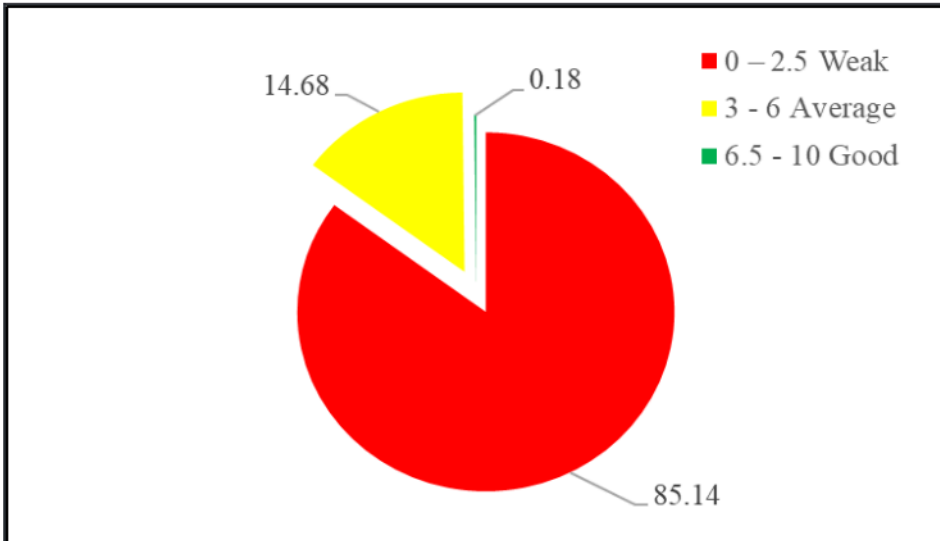


Figure 7: Students' Performance in Question 6

The analysis shows that 85.14 per cent of the students scored below pass mark. These students did not comprehend the requirements of the question and also had inadequate workshop activities. Students had inability to understand the concept of formwork design. Most of the questions on this assessment are prepared more practically, this is the real meaning of the technical subjects. Students clearly show that they do not have enough knowledge on various topics due to the lack of practical activities during their learning period. If the students participated at least once or twice in the preparation of the various formwork, it would be easier for them to remember the issues to be observed for the formwork before pouring of the concrete activities proceed.

Due to the analysis done on this question, most of the students provided irrelevant responses, others wrote the things which were not related to the question asked and some of them classified the formwork according to the materials used. Extract 5.1 portray the sample script of such student.

6. (a) Suppose you have been assigned to inspect a formwork of one storey building slab, what are the key issues you will observe before allowing pouring of the concrete to proceed?

(i) Cement

(ii) Sand

(iii) Water

(iv) Fine aggregate

(v) Coarse aggregate

(vi) Reinforced

(b) Examine four types of loads that may be carried out by the formwork.

(i) Timber

(ii) Reinforced

(iii) Metal

(iv) Concrete or glass

Extract 5.1: A sample of incorrect responses to Question 6

2.2.5 Question 7: Walls

In this question, the students were required, with the aid of an elevation sketch, to describe briefly the following brick bonds: (a) *Stretcher bond*, (b) *Header bond*, (c) *English bond* and (d) *Single Flemish bond*. This question intended to assess the ability of the students to draw and differentiate between the bonds as used in the brickwork and masonry works.

This question was attempted by 545 students. A total of 205 (37.61%) students scored from 0 to 2.5 marks and 133 (24.41%) students scored from 3 to 6 marks, while 207 (37.98%) students scored from 6.5 to 10 marks.

The general performance in this question was average as 345 students who attempted this question scored pass marks. The distribution of students' performance in this question is summarized in Figure 8.

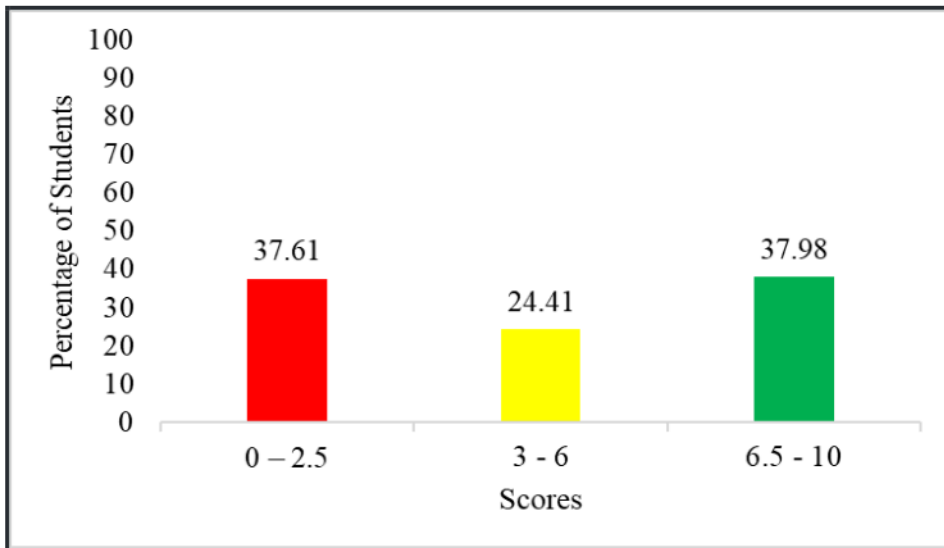


Figure 8: Students' Performance in Question 7

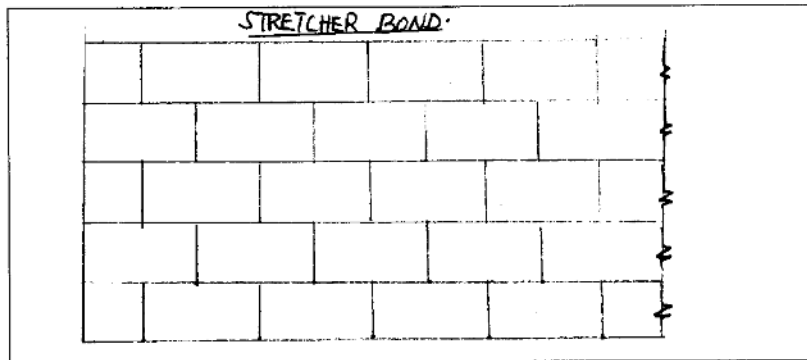
Figure 8 shows that the performance of students in this question was good as 62.39 per cent of the students had pass and above marks. These students had sufficient knowledge in describing and sketching elevations of various types of brick bonds.

In addition to the fact that some of the questions seemed to have failed to be answered well by the students due to their lack of practical knowledge on this question, there is a high probability that the students were able to give good answers based on the knowledge they gained during the practical work on the masonry works, what they do at school. But the teachers also may use simple examples during teaching to illustrate bonds because masonry works are widespread throughout the country. More than 25% of the students scored full marks compared with the other questions in this assessment. Extracts 6.1 depict the sample of correct responses from student who attempted this question.

7. With the aid of an elevation sketch, briefly describe the given brick bonds:

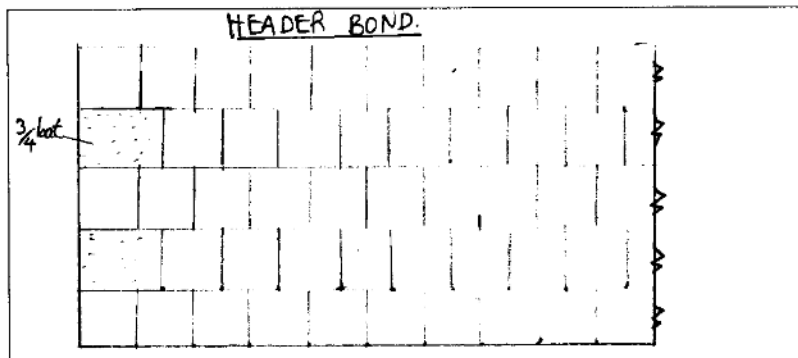
(a) Stretcher bond

This is the type of bond in which stretcher face of bricks or blocks are exposed in each course except at the corner where header face is exposed.



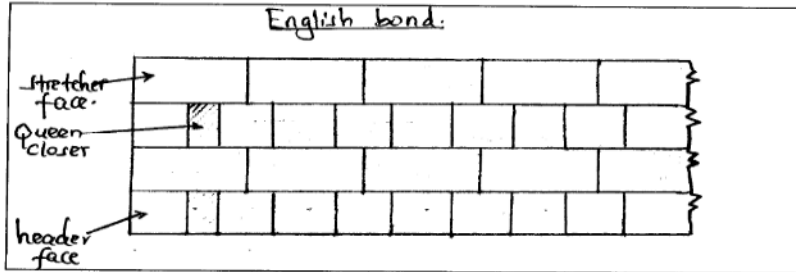
(b) Header bond

This is the type of bond in which header faces of brick or block is exposed in each course except at the corner where $\frac{3}{4}$ bats are used as quoins.



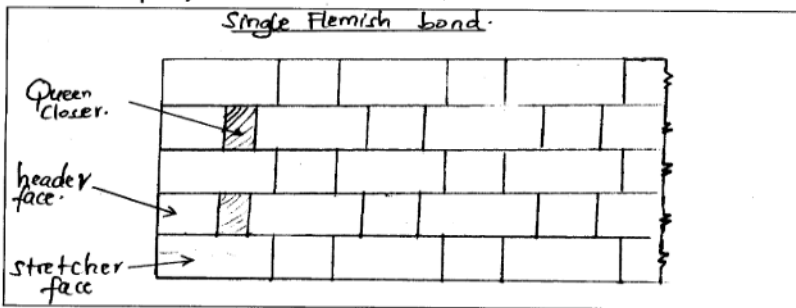
(c) English bond

This is the type of bond in which stretcher and header faces are exposed in alternate different courses employ the use of queen closers after the quions.



(d) Single Flemish bond

This is the type of bond in stretcher and header faces are exposed in alternate same course employing the use of queen closers next to the quions.



Extract 6.1: A sample of the correct responses to Question 7

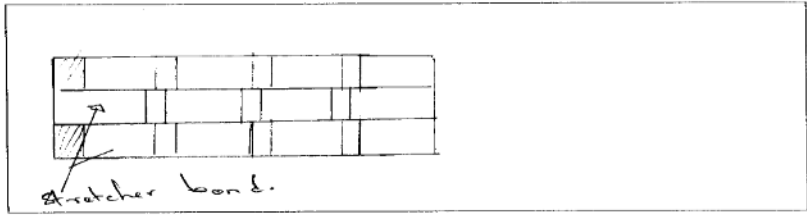
Despite of the good performance for many students to get high marks, there are still some of students scored lower or zero marks in this question.

Those students who scored from 0 to 2.5 marks lacked knowledge on the types of bonds and bonding in general. Some of these students who failed this question provided irrelevant responses contrary to the requirements of the question. These students also demonstrated that they had inadequate practical skills. Some of them lost their marks due to poor sketches and failed to provide a detailed sketch of various types of brick bonds and failed to describe the types of brick bonds especially: (i) *Stretcher bond*, (ii) *Header bond* (iii) *English bond* and (iv) *Single Flemish bond*. Extracts 6.2 depict a sample of incorrect responses from students who attempted this question.

7. With the aid of an elevation sketch, briefly describe the given brick bonds:

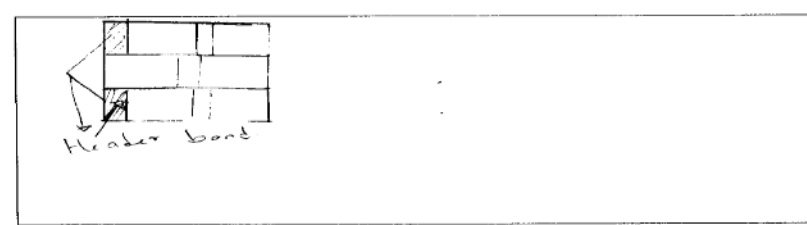
(a) Stretcher bond

.....
.....



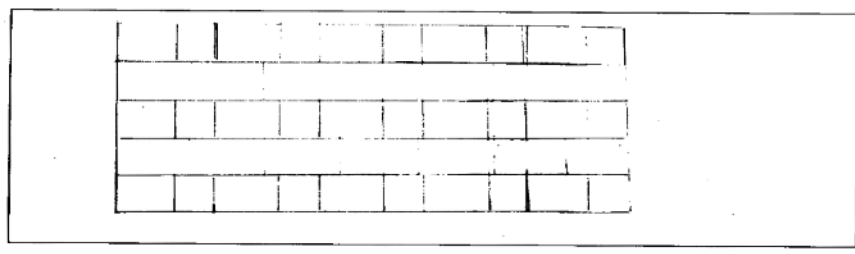
(b) Header bond

.....
.....



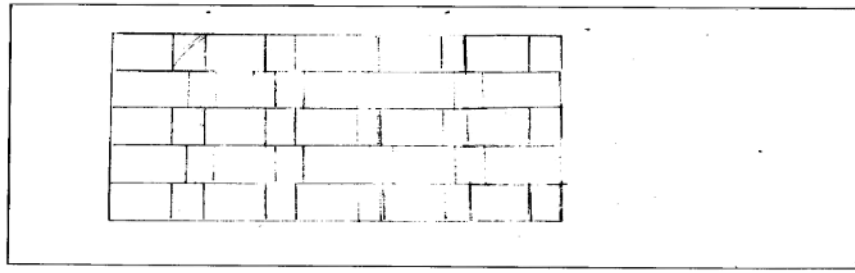
(c) English bond

.....
.....



(d) Single Flemish bond

.....
.....



Extract 6.2: A sample of the poor responses to Question 7

2.2.6 Question 8: Building Materials

The question was extracted from the topic of *Building Materials* and it stated that; *Suppose the village infrastructure committee plans to use timber as a main construction material for all public structures in the village:*

- (a) *Support their idea by explaining five usefulness of timber in construction industry.*
- (b) *What are the five obstacles that they might encounter for their choice of using timber?*

This question intended to measure the awareness or understanding of students on the usefulness of timber as a building material for all public structures such as schools, community centers, libraries, courts, information centers, washrooms in parks, government buildings, and public housing etc.

It was attempted by 545 (100%) students whereby 136 (25%) students scored from 0 to 2.5 marks, 215 (39.82%) students scored from 3 to 6 marks while 194 (35.41%) students scored from 6.5 to 10 marks.

The general performance in this question was good because 409 students who attempted this question scored pass marks. The students' performance in this question is summarized in Figure 9.

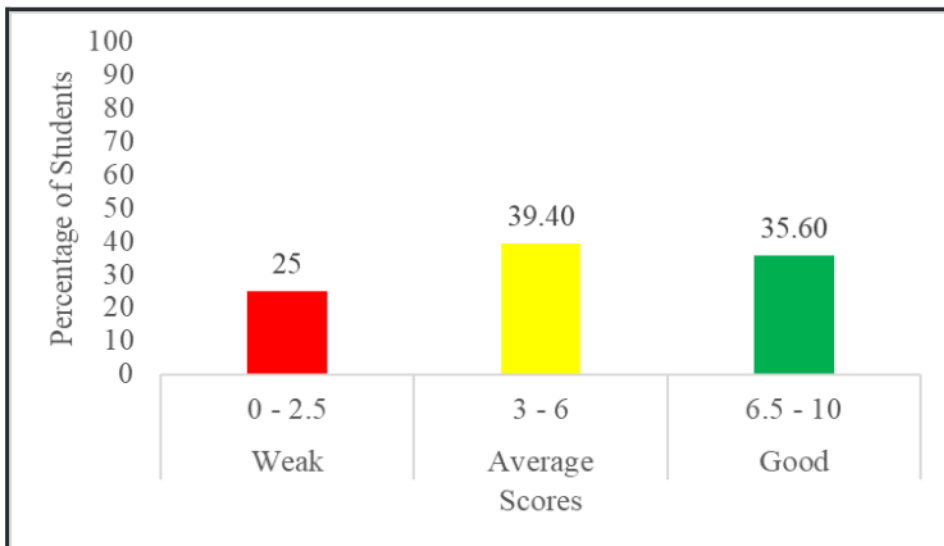


Figure 9: Students' Performance in Question 8

Figure 9 shows that 75 per cent of the students scored pass and above mark.

These students demonstrated their awareness on the use of timber as a building material because it is a common material compared with other materials such as plastic, steel and concrete. The students were able to describe the usefulness of the timber compared with other materials but also were able to remember some obstacles that they might encounter for the choice of using timber. Timber is a very simple raw material available in this country but it can also be used very easily and efficiently, according to huge usefulness most of students recall easily and scored pass marks and above. Extract 7.1 shows the sample of correct responses, from a student who attempted this question.

8. Suppose the village infrastructure committee plans to use timber as a main construction material for all public structures in the village;

(a) Support their idea by explaining five usefulness of timber in construction industry.

(i) Timber can be used in making of door and window.

(ii) Timber can be used make a form work for making of different shape.

(iii) Timber can be used for supporting the roof.

(iv) Timber can be used in making of columns to support super structure.

(v) Timber can be used in Making furniture.

(b) What are the five obstacles that they might encounter for their choice of using timber?

(i) It can be easily attack by insect.

(ii) They can form cracks if there were not well seasonal.

(iii) They are not moisture resistance.

(iv) It can catch fire easily.

(v) It is not as tough as Iron.

Extract 7.1: A sample of the student's correct response to Question 8

In addition to the good answers given by the majority of students on this question, there are still about 25 percent of students who either scored below pass marks or absolutely scored a zero mark. This group of the students indicated to have lower knowledge obtained during their two years

of learning period. They failed to write correct answer even using the experience of the furniture they use at home that made by timber.

Possibly, students failed to score high marks on this question due to failure to understand the demand of the question hence they failed to give correct answers. For example, some of students focused on either the properties of timber or the type of timber used in various construction works. Most students in this group copied the terms from question one in item (viii) and (x) and write as their answer in this question. Extract 7.2 shows a sample of incorrect responses from a student who attempted this question.

8. Suppose the village infrastructure committee plans to use timber as a main construction material for all public structures in the village;

(a) Support their idea by explaining five usefulness of timber in construction industry.

(i) Scratch.....

(ii) Bulster.....

(iii) frog.....

(iv) Perpend.....

(v) frog.....

(b) What are the five obstacles that they might encounter for their choice of using timber?

(i) timber to get set trents.....

(ii) the knke to timber.....

(iii) ther abe ei by wather.....

(iv) Len...not tramethravybed.....

(v) Can net be used for kna time.....

Extract 7.1: A sample of the incorrect responses to Question 8

2.2.7 Question 9: Building Materials

In this question, the students were required to (a) explain five indicators that show improper curing of concrete and, (b) with examples, give the properties of a hardened concrete. This question intended to measure students' skills on concrete technology especially in curing and properties of a hardened concrete.

This question was attempted by 545 students, whereby 236 (43.30%) students scored from 0 to 2.5 marks, 206 (37.80%) students scored from 3 to 6 marks, while 103 (18.90%) students managed to score from 6.5 to 10 marks.

Generally, the performance in this question was average as 309 (56.70%) students scored pass and above the pass marks. The distribution of students' performance in this question is summarized in Figure 10.

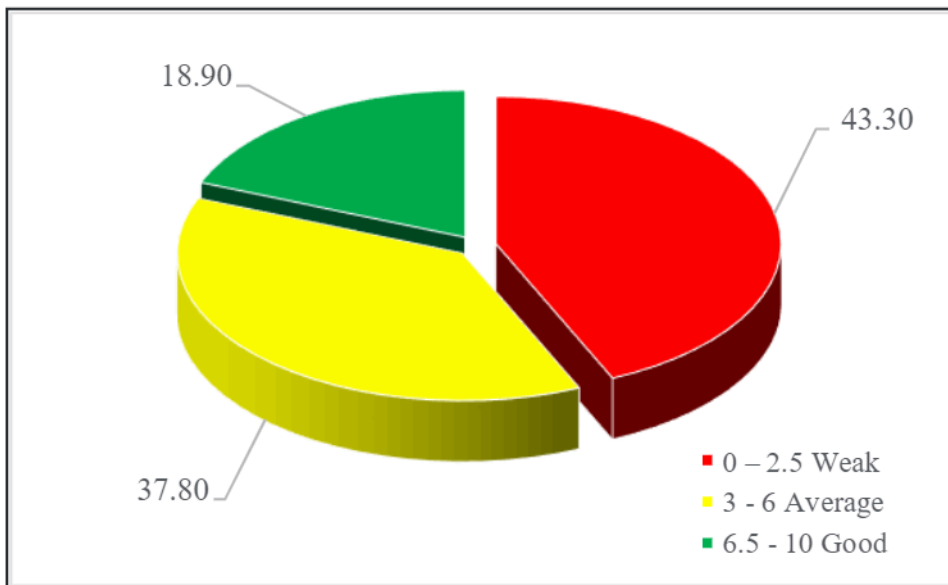


Figure 10: Students' Performance in Question 9

Analysis shows that 56.70 per cent of the students scored pass marks, which is an indication that they had sufficient knowledge on proper concreting works especially on concrete curing. They also had adequate understanding on the properties of a hardened concrete. It also implies that the students had enough practical sessions in the workshop activities related to building materials, especially concreting.

Normally, concrete setting and hardening is a result of a chemical reaction between cementitious materials and water by the process called hydration. During setting and hardening, curing is performed, which is the process of maintaining a satisfactory temperature and moisture conditions in concrete long enough for hydration to develop the desired concrete properties. If this process was not done properly some effect may occur, such as appearance

of cracks, development of internal cracks, development of an even strength, increases in the permeability etc. The students in this group were conversant on curing of concrete and the properties of matured concrete, thus they scored pass and above pass marks. Extract 8.1 is a sample of responses from a student who provided correct responses.

9. (a) What are the five indicators that show the improper curing of concrete?

(i) Cracking of concrete

(ii) Breaking early after compaction

(iii) Having less strength

(iv) Have low water resistant

(v) Have low compaction

(b) With examples, give five properties of a hardened concrete.

(i) Impermeability

(ii) Water resistant
Can not be affected by atmospheric agencies like Rain

(iii) Strong and tough
The stability of concrete is determined by its strength strength so the concrete in hardened is strong

(iv) chemical resistant
chemicals from the atmosphere cannot affect the concrete

(v) Fire resistant
in the hardened concrete the concrete can not be attacked by fire

Extract 8.1: A sample of the correct responses to Question 9

However, 236 (43.3%) of the students failed to score pass marks and 158 of 236 students (66.95%) among them scored a zero mark. These students failed to describe the indicators of improper curing of concrete likewise the properties of a hardened concrete. The students were supposed to write the following effect of improper curing include (i) Appearance of cracks,

(ii) Development of Internal cracks, (iii) Development of an even strength, (iv) Reduction in resistance to abrasion, (v) Increases in the permeability and (vi) Reduction in resistance to the action of frost and weathering, but also write (i) Impervious, (ii) Strength, (iii) Shrinkage (iv) Creep (v) Durability and (vi) Thermal expansion, as properties of hardened concrete. The students in this group showed lack of knowledge on concrete work and concrete technology. Some of them wrote irrelevant responses and other wrote the terms of bond which are used in masonry work. Extract 8.2 is a sample of response from the student who provided incorrect responses.

9. (a) What are the five indicators that show the improper curing of concrete?

(i) Mix the concrete clearly with all equipment

(ii) strength of the concrete

(iii) Modability of the concrete

(iv) leaving concrete to form more than one day before use.

(v) Unfrability of concrete

(b) With examples, give five properties of a hardened concrete.

(i) concrete it is used in the biggest building to support the building for the construction.

(ii) hardened concrete it is temporary support which is operated to the building for the construction work.

(iii) hardened concrete ductability

(iv) hardened concrete it is more expensive and strength also it is good in construction work.

(v) hardened concrete it is most used in building construction because it is hard it help the building to stay for a long time.

Extract 8.2: A sample of the incorrect responses to Question 9

2.3 Section C: Structured Question

This section consisted of one question, the students were required to attempt this question which carried 15 marks. The score ranges used for grading performance of the students for the question in this section is indicated in Table 4. The students with average to good performance were considered to have passed a particular question.

Table 4: Scores Range for Students' Performance in Question 10

Scores Range	General Performance	
	Remark	Grade
0 – 4	Weak	F
4.5 – 9.5	Average	C – D
10 – 15	Good	A - B

2.3.1 Question 10: Walls

The question had three parts: (a), (b) and (c). Students were required to: (a) differentiate rendering from stucco as used in finishing a blockwork partition wall; (b) give three importance of a wall for a house; and, (c) with the aid of well labelled sketches, differentiate the following types of load bearing walls: (i) Solid and cavity wall, and (ii) Faced and veneered wall. This question intended to measure students' practical skills in wall finishing materials, drawing techniques of load bearing wall and their importance.

This question was attempted by 545 students, whereby 319 (58.53%) students scored from 0 to 4.5 marks, 211 (38.72%) students scored from 4.5 to 9.5 marks, while 18 (2.75%) students scored from 10 to 15 marks.

The performance in this question was generally average as 226 (41.47%) students scored pass and above pass marks while 319 (58.53%) students scored below pass marks. Figure 11 shows the trend of students' performance in question 10.

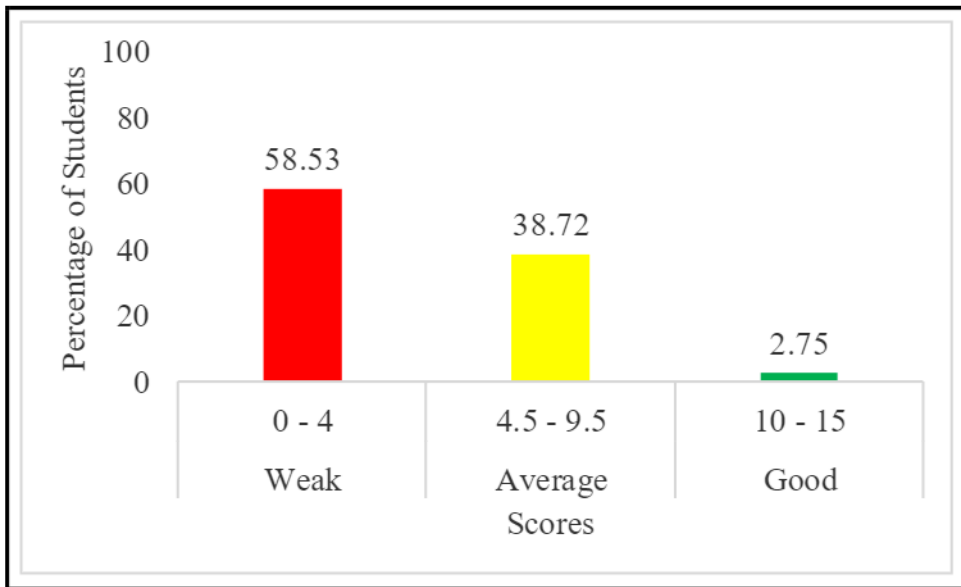


Figure 11: Students' Performance in Question 10

Figure 8 shows that, 58.53 per cent of the students failed to score pass marks. This group of students showed lack of knowledge in the terms asked in part (a) of the question. These terms actually refer to two distinct materials used in building construction, but sometimes they are used interchangeably. Stucco typically refers to a type of plaster made from cement, sand, and lime, while render is a similar material made from a mixture of cement, sand, and water. Both materials are applied to exterior walls to create a textured, weather-resistant finish. The stucco it seemed to be the decorative type of plaster, which gives an excellent finish and usually laid in three coats, but render looks like even a rough, durable surface applied to an external wall surface.

Most of the students failed to differentiate rendering from stucco as used in blockwork partition wall and they defined a wall instead of writing the difference between rendering and stucco. These students also failed to give any importance of wall like it provide a privacy between the two rooms or spaces instead the students defined some type of wall such as cavity wall. Likewise, in part (c) of this question, students failed to differentiate with the help of sketches; the difference between a solid wall with cavity wall and a faced wall with a veneered wall. Extract 9.1 illustrates a sample of responses from students who provided incorrect responses in all parts of the question.

10. (a) Differentiate rendering from stucco as used in finishing a block work partition wall.

(i) A wall is used to build the wall in the wall.

(ii) The brick wall is used to be in the block at the wall in the foundations and no underment.

(b) Give three importance of a wall for a house.

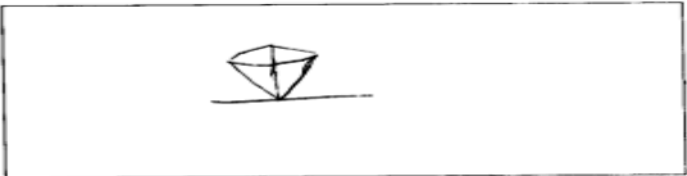
(i) block wall

(ii) brick wall is the wall that is broken.

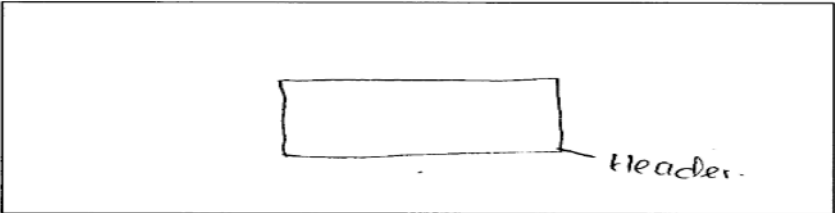
(iii) cavity wall.

(c) With aid of labeled sketches, differentiate the following types of load bearing walls:

(i) Solid and cavity wall
 is the solid some thing or manage of the solid and cavity wall is the wall that are be used in the main of the wall.



(ii) Faced and veneered wall
 is the faced wall that you can be faced in the faced that we used to make a wall of the power.



Extract 9.1: A sample of the student's incorrect response to Question 10

Despite this failure, some of the students scored pass marks and above but not 15 allotted marks. It seems these students had sufficient practical skills in internal and external wall plastering hence they managed to score from 4.5 to 11 marks out of 15 allotted marks. Few students who scored above average marks failed in part (c) of this question therefore they didn't scores allotted 15 marks. Extracts 9.2 portrays a sample response from a student who provided correct answer in the part (a), part (b) and some of part (c).

10. (a) Differentiate rendering from stucco as used in finishing a block work partition wall.

(i) Rendering

→ Is the block finishing which does not involve the introduction of a new surface.

(ii) Stucco

→ Is the finishing in which involves the application of ceramic materials on walls.

(b) Give three importance of a wall for a house.

(i) They are used to divide rooms and enclose spaces.

(ii) They are used to provide good appearance of a house.

(iii) They are used to provide privacy and security.

(c) With aid of labeled sketches, differentiate the following types of load bearing walls:

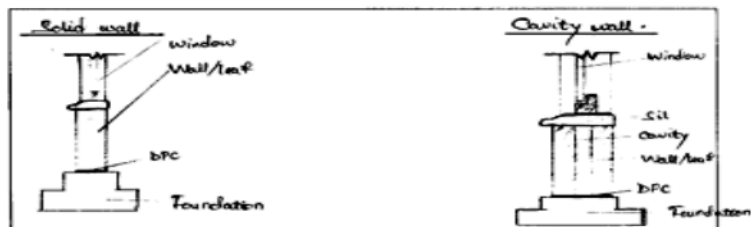
(i) Solid and cavity wall

Solid wall

→ Is the wall single and used materials wide

Cavity wall

→ Is the wall built for the purpose of insulation and it is built by using two leaf and leaving a space between them.



Extract 9.2: A sample of the student's correct response to Question 10

3.0 ANALYSIS OF THE STUDENTS' PERFORMANCE PER TOPIC

The topics covered in Building Construction subject for FTNA 2023 were: *Building Materials, Building Construction Science and Technology, Foundation Setting out, Walls, Workshop Orientation, Foundation, and Temporary Support.*

The analysis of the students' performance in different topics indicate that students had an average performance in seven out of eleven topics that were tested in the Building Construction subject. Six out of eleven topics were tested in question one, which consisted of multiple-choice items. About 93.90 percent of all students scored a pass mark and above.

The rest of the topics, the in performance was 55.41% in *Wall*, 50.13% in *Building Materials*, 44.40% in *Building Construction Science and Technology* and 39.43 in *Temporary Support*. The students' performance per question and per topic are summarized in **Appendices A** and **B** respectively.

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

A summary of the distribution of students' performance in Figure 1 shows that the general performance in the Building Construction subject was average, since 288 (57.98%) students scored pass marks and above.

The students' performance in questions 1 and 8 was good, questions 7, 5, 2, 9, 3 and 10 was average, while the performance in questions 6 and 4 was poor. The poorly performed questions were from the topics of *Building Materials* and *Temporary Supports* respectively.

The poor performance of the students in those questions was mostly attributed to the failure of the students to comprehend the demands of the questions, partial attempt of the questions and insufficient knowledge about the topics tested. Moreover, they had inadequate skills and practical experience, especially in the topics of *Building Materials* and *Temporary Support*.

4.2 Recommendations

Based on the performance observed in this analysis, the following recommendations are worth noting for both students and teachers:

(a) Recommendations for Students

- (i) Students should be encouraged to read carefully the instructions before attempting the questions so as to understand the demand of the questions.
- (ii) Students are encouraged to search and study relevant materials from different books or internet sources in order to widen their knowledge. This will help them to grasp relevant and modern concepts and theories applied in the building and construction industry.
- (iii) Students should be involved in practical works (activities) whenever they get any chance to participate. This will lead them to learn by doing.

(b) Recommendations for Teachers

- (i) In order to improve the students' performance, teachers should give enough exercises and tests to their students which will cover the whole syllabus before sitting for the National Assessment.
- (ii) Teachers should help students to develop practical skills so as to be able to integrate theories with practical experiences, hence acquiring the expected competencies.
- (iii) Participatory and cooperative learning (students centered learning) should be encouraged as it makes them independent learners.
- (iv) Teachers may use interactive projectors during teaching to make learning more active and productive. Through this method, students can see visual aids, like colorful charts, diagrams or videos which will help them to acquire the expected skills of the subject matter.
- (v) Teachers should be provided with enough learning resources that will be able to meet student's practical demands as articulated in text book and the syllabus.

Appendix A: Analysis of the Students' Performance Per Question

S/N	Topic	Question Number	Percentage of Students who Scored 30% or More	Remarks
1	Foundation, Building Construction (Site Analysis) Building Materials, Introduction to Building Construction, Building Construction, Science and Technology, Workshop Orientation and Walls.	1	93.90	Good
2	Building Materials	8	75.00	Good
3	Walls	7	62.39	Average
4	Walls	5	62.38	Average
5	Temporary Support	2	60.00	Average
6	Building Materials	9	56.70	Average
7	Building Construction (Site Analysis)	3	44.40	Average
8	Walls	10	41.47	Average
9	Building Materials	4	18.70	Weak
10	Temporary Support	6	14.86	Weak

Appendix B: The Students' Performance Per Topic

S/N	Topic	Question Number	Percentage of Students who Scored 30% or More	Remarks
1	Foundation, Building Construction (Site Analysis) Building Materials, Introduction to Building Construction, Building Construction Science and Technology, Workshop Orientation and Walls.	1(Multiple Choice Items)	93.90	Good
2	Temporary Support	2& 6	39.43	Average
3	Walls	5, 7 &10	55.41	Average
4	Building Materials	4,8 & 9	50.13	Average
5	Building Construction, Science and Technology	3	44.40	Average

