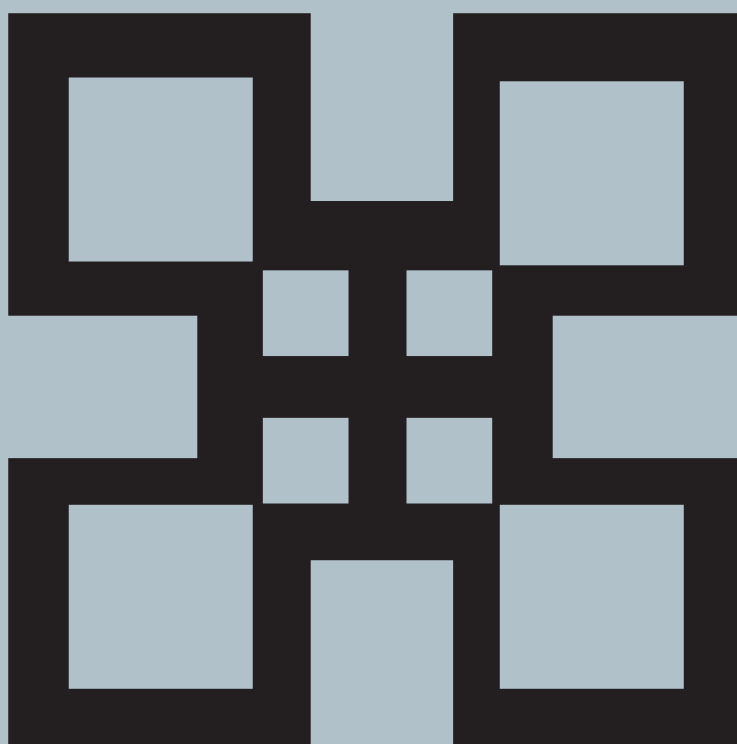


Professional Learning Community Handbook

Robotics

Year One



Ghana Education
Service (GES)



Professional Learning Community Handbook

Robotics

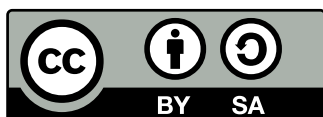
Year One



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Introduction

This Professional Learning Community (PLC) Handbook is designed to enable teachers to deliver effective lessons for Year One of the new Robotics Curriculum. 'Effective' is defined as meaning that each lesson:

- i. Has a weekly learning plan which is aligned with the content and pedagogy set out in the relevant Teacher Manual;
- ii. Incorporates the relevant Learner Materials which are available on the curriculum microsite;
- iii. Contains assessment strategies which are aligned with the Teacher Manual, Learner Materials and Transcript Assessment Guidance;
- iv. Is delivered by the teacher in close adherence (Fidelity of Implementation) with i.) to iii.) above.

The PLC Handbook has a strong focus on assessment, outlining structured approaches to assessment derived from the Teacher Assessment Manual and Toolkit (TAMT), emphasising the attainment of learning outcomes, timely feedback to learners and recording learning outcomes accurately.

Additionally, this Handbook prescribes nine (9) main assessment events which teachers should score and record to constitute each learner's academic transcript for the academic year as follows: Two (2) Class exercises or Homework, one (1) Individual Portfolio, one (1) Group Project, two (2) Mid-semester examinations (in first and second semesters), two (2) End of Semester examinations (in first and second semester) and one (1) Individual project. It also promotes continuous weekly assessment for learning across all DoK levels, supporting teachers to deliver an all-inclusive education by inculcating 21st century skills, ICT, national values and support to special needs learners.

The TAMT identifies six modes of assessment which cover the nine events described above. The modes are described below.

- a) **Class Exercise/Homework as assessment strategy:** This assessment strategy reinforces immediate practice and feedback on learning. This assessment should be recorded in the transcript system between weeks 1 and 5 in the first semester and weeks 13 and 17 of the second semester which contributes 10% of total internal summative assessment. Out of these class exercises and homework, 2 of the highest-scoring will be selected and recorded in the learner's academic transcript.
- b) **Individual Portfolio:** This assessment could span for the whole academic year. Portfolio assessment task should commence in the first week or second of the first semester to be submitted latest by week 22 of the second semester for scoring and recoding in learners' transcript system contributing 10% of internal summative assessment. Teachers should discuss with learners and decide on the artefacts/

pieces of work (what qualifies) to be included in the portfolio so that learners can prepare accordingly.

- c) **Group Project:** One group project work shall be given to learners by the second week of the first semester to be submitted latest by week 8. However, the group project work could be submitted earlier depending on its nature. Teachers should explain the context and scope of the project before the groups commence. The group project which contributes 10% of internal assessment should be scored and recoded in learner's academic transcript system. Refer to Appendix B of PLC session 2 for a sample group project work.
- d) **Mid-semester examination:** This assessment will be done in week 6 of first semester and week 18 of the second semester. PLC session 6 and 18 are dedicated as preparatory sessions for the mid-semester examinations. The questions for first semester should cover Week 1-5 of the Teacher Manual and second semester should cover week 13-17 of the TM. Note that mid-semester assessment scores are mandatory for learners' transcript. Refer to Appendix C and F of PLC Sessions 6 and 18 respectively for sample Table of Specification for mid-semester examination and how to conduct mid-semester examinations.
- e) **Individual Project:** It focuses on problem-solving skills of the learner, encouraging independent research skills, innovation and critical thinking. Project work should be given to learners in the 2nd semester latest by the second week. Explain the context and scope of the project before learners commence. This project should be submitted latest by week 20 of the second semester for scoring. The scores for the individual project also form part of the learner's transcript for the academic year. See Appendix E of PLC session 14 for sample Individual Project for learners.
- f) **End of Semester examination:** This summative assessment evaluates learning Outcome of each semester. First semester examination questions should cover week 1-12 of the Teacher Manual and second semester examination should cover week 13-24. PLC session 12 and 24 are dedicated as preparatory sessions for this assessment. The scores for these assessments are mandatory for the learner's academic transcript which contribute 40% of the internal assessment. Refer to Appendix D and G of PLC session 12 and 24 respectively for sample Table of specification for end of semester examination and how to conduct the end of semester examinations.

PLC SESSION 0: Internal Assessment Structure and Transcript System for SHS/SHTS and STEM Schools

1. Introduction (20 minutes)

This Professional Learning Community (PLC) session focuses on enhancing internal assessment and transcript system to ensure it aligns with the new Senior High School, Senior High Technical School and Science, Technology, Engineering and Mathematics curriculum and effectively supports student learning.

In this session, you will discuss the structure and frequency of assessments, strategies for involving learners in the assessment process, methods for providing constructive feedback and the implementation of a robust transcript system.

- 1.1 Share two ways in which you have used assessment in the past to support teaching and learning.
- 1.2 Share your observation on how a colleague used assessment in the past to support teaching and learning.

2. Internal assessment structure and frequency (60 minutes)

- 2.1 Read the purpose, learning outcome and learning indicators for the session.

Purpose

The purpose of the session is to strengthen teachers' understanding and competence in assessment techniques to effectively teach and assess the new SHS, SHTS and STEM Curriculum.

Learning Outcome

To ensure teachers understand the assessment structure and acquire the skill to design, administer and provide feedback of the assessments that accurately reflect the learning Outcome for each week.

Learning Indicators

1. Discuss the formative and summative assessment strategies recommended for the new curriculum.
 2. Discuss in detail, the relevance and structure of the assessment transcript system and its use/implementation.
- 2.2 Discuss formative assessment strategies which can be used in your subject area.

E.g.

Questioning, etc.

2.3 Discuss *summative assessment strategies* which can be used in your subject area.

E.g.

End of Semester Examinations, etc.

2.4 Discuss as a subject group how you would administer a given assessment strategy.

E.g.

Class Exercise:

- i. *Inform learners ahead of time*
- ii. *Write the questions on the board, etc.*

2.5 Discuss methods of providing constructive feedback to learners on their performance.

E.g.

Provide individual comments on learners' work, etc.

2.6 Discuss as a subject group some of the do's and don'ts of constructing assessment items/tasks.

E.g.

Do: Align the purpose of the assessment with the task, etc.

Don't: Do not give clues in the stem, etc.

2.7 Discuss as a subject group the main assessments that would be recorded in the transcript system in the academic year.

E.g.

Class exercise, etc.

2.8 Discuss how and where you would record and submit learners' assessments for the transcript system.

E.g.

Record learners scores immediately, etc.

3. Reflection (10 minutes)

3.1 Reflect and share your views on the session (NTS 1a, 1b).

3.2 Remember to:

- a) read PLC Session 1 and related Learner Material (NTS 2b, 2c and 3a).
- b) bring along your Teacher Manual, PLC Handbook and learning plan on *week 1* in preparation for the next session (NTS 3a).

PLC SESSION 1: Industrial Revolution and Organisational Performance Indicators

1. Introduction (20 minutes)

- 1.1** Share two things you did in the classroom based on your experience in the various PLC sessions you have attended (NTS 1a, 1b and 2e).
- 1.2** Share your observation on what a colleague did by way of application of lessons learned from previous PLC sessions attended (NTS 2e, 2f and 3d-3j).

2. Review of learning plans (60 minutes)

- 2.1** Read the purpose, learning outcome and learning indicators for the session.

Purpose

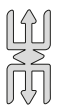
The purpose of the session is to review the learning plan for *week 1* by aligning the plan with the Learner Material and appropriate assessment strategies.

Learning Outcome

Review your learning plan for *week 1* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
 2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.
- 2.2** Review the pedagogical approaches proposed for teaching *week 1* in your learning plan, identify activities that align with those in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

The selected activities should be included in the teacher/learner activity section of the learning plan

- 2.3** Develop assessment tasks/items based on the learning indicator(s) for the week. This week's recommended mode of assessment is **group homework** (NTS 3k, 3p).

E.g.

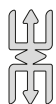
Compare the difference between the first and second industrial revolution and tabulate your answers. (Submit in 1 week)

Refer to Teacher Manual Section 1, week 1 pages 13–19 and Learner Material Section 1 for more task examples.



Hint

Give portfolio assessment for the academic year commences in week 1 and to be submitted in Week 22. See **Appendix A** for more information.



Note

- i. The assessment tasks may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.
- ii. The selected activities should be included in the ‘Assessment DoK aligned to Curriculum and TM’ section below teacher/learner activities in the learning plan

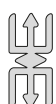
2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week’s recommended assessment (NTS 3n- 3p).

E.g.

Question 1: A table that correctly differentiates the first and second industrial revolutions earns **5 marks** per difference.

First Industrial Revolution	Second Industrial Revolution
Power source was steam engine	Power source was electricity
Key technologies were power loom and steam engine	Key technologies were assembly line, internal combustion engine
Materials produced were Iron and Steel	Materials produced were chemical and oil
Major industries were iron, textiles and coal, etc.	Major industries were steel, chemicals, automobiles and oil, etc.

Total: 20 marks



Note

- i. The marking scheme and rubrics for scoring the assessment tasks/items should be included in the ‘Assessment DoK aligned to Curriculum and TM’ section below teacher/ learner activities in the learning plan.
- ii. Take into consideration different modes of responses provided by learners.
- iii. Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring

- 2.5** Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

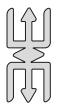
Group learners and give them homework to discuss and present their responses, etc.

Refer to Teacher Assessment Manual and Toolkit (pages 57–60) for more information on how to administer Group Homework

- 2.6** Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Discuss the homework in class with learners and address any misconceptions, etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

- 3.1** Reflect and share your views on the session (NTS 1a, 1b).
- 3.2** Identify a critical friend to observe your lesson in relation to PLC Session 1 to provide feedback on your lesson (NTS 1f, 3g).
- 3.3** Remember to:
- provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
 - read PLC Session 2 and related Learner Material (NTS 3a).
 - bring along your Teacher Manual, PLC Handbook and learning plan on *week 2* in preparation for the next session (NTS 3a).



Appendix A: Sample portfolio assessment

1. **Task:** Put together your works for the academic year i.e. from the beginning of the first semester and be submitted at the end of the academic year and submit for portfolio assessment. Pieces of work that must be put together includes assignments, projects, quizzes, tests, reflective pieces, and mid and end of semester papers.
2. **Artifacts to be included in the Portfolio Assessment**
 - a) Assignments
 - b) Projects
 - c) Quizzes and Tests
 - d) Reflective Pieces
 - e) Mid-semester and end of semester papers
3. **Sample Portfolio Assessment Marking scheme**

Learner's works	Score
Assignments/Exercises	10 marks
Projects/Experiments	10 marks
Quizzes and Simulations	10 marks
Reflective Pieces	5 marks
Mid-semester and End of semester Paper(s)	5 marks
Total marks	40 marks

4. Example of structure and organisation of the Portfolio Assessment

As part of the structure of the portfolio assessment, make sure the following information has been provided:

- a) Cover Page which entails the learner's name, class, subject and period/date.
- b) Table of Contents which has the list of items included with page numbers.
- c) Brief description/background of items such as short description of the robotics project, background information for each included artefact etc.

4. Sample mode of administration

- a) Explain the purpose and components of the portfolio to the learners and provide examples and templates for each section.
- b) Schedule periodic reviews (e.g. every 3-4 weeks) to ensure learners are keeping up with their portfolios and provide feedback and guidance during these checkpoints.

- c) Provide learners with the scoring rubrics and provide detailed explanation on the rubrics.
- d) Final portfolios are due in week 22 of the academic calendar. Allow a grace period for revisions based on final feedback.

5. Sample mode of submission/presentationA

- a. Communicate the final deadline for portfolio submission to all students to ensure timely and complete submissions.
- b. Learners will submit their completed portfolios either as a physical or through the school's online submission system.
- c. Ensure the portfolio includes all required elements: assignments, projects, quizzes, tests, reflective pieces, class participation records, and a final reflection.
- d. Learners should organise their portfolios clearly and logically, with each component clearly labeled and easy to access.
- e. For digital submissions, learners should upload their portfolios as a single file or in clearly marked folders within the online portal.

6. Sample feedback strategy

- a) Schedule periodic check-ins to discuss progress, set goals, and adjust strategies as needed.
- b) Utilise both formative and summative feedback to guide students' development and ensure they understand how to enhance their work continuously.

PLC SESSION 2: Economic and Social Benefits of Using Robots

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 1* delivered last week that:

- a) went well (NTS 1a, 1b and 2a–2e).
- b) you found challenging (NTS 1a, 1b and 2a–2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 1* that supported learning (NTS 2e, 2f and 3d–3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 2* by aligning the learning plan with Learner Material and appropriate assessment strategies.

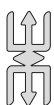
Learning Outcome

Review your learning plan for *week 2* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g–3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 2* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a–2f, 3a – 3j).



Note

The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **case study** (NTS 3k, 3p).

E.g.

Case:

Create a Public Service Announcement (PSA) about the benefits and potential ethical concerns about robots in society.

Case 1:

Many people are of the opinion that Robots will take away many jobs and destroy humanity. Questions: Do you agree that robots will take away many jobs?

Do you think robots can do all jobs?

Do you think robots will destroy humanity in the near future?

Do you think robots can work without human intervention?

Groups will present a report on the case study in the next lecture session.

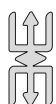
Refer to Teacher Manual Section 1, Week 2 pages 29 –30 and Learner Material Section 1 for more task examples.

Refer to Teacher Assessment Manual Toolkit (pages 31–34) on how to administer case study as an assessment.

Hint



Give learners group project task which will be submitted in week 9. See **Appendix B** on how to administer this project task.



Note

- i. The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.
- ii. The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

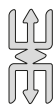
Some Rubrics That Teacher Can Use To Score Learners Include:

<i>Title Of Presentation (Descriptive, Concise)</i>	<i>5 Marks</i>
<i>Introductory Statements (Relevance, Context Of Presentation)</i>	<i>10 Marks</i>
<i>Content Delivery (Benefits And Concerns Explained Well)</i>	<i>10 Marks</i>
<i>Conclusion (Summary, Recommendations)</i>	<i>10 Marks</i>

Answer To Questions (Ability To Answer Questions Clearly)

5 Marks

Total: 40 Marks

**Note**

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

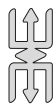
Give clear instructions and provide resources needed for learners to work, etc.

Refer to Teacher Assessment Manual and Toolkit pages 31–34 for more information on how to administer case study.

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class. (NTS 3l – 3n)

E.g.

Give constructive feedback to learners pointing out their strengths and areas for improvement, etc.

**Note**

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

3.1 Reflect and share your views on the session (NTS 1a, 1b).

3.2 Identify a critical friend to observe your lesson in relation to PLC Session 2 and provide feedback on your lesson (NTS 1f, 3g).

3.3 Remember to:

- a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
- b) read PLC Session 3 and related Learner Material (NTS 3a).
- c) bring along your Teacher Manual, PLC Handbook and learning plan on week 3 in preparation for the next session (NTS 3a)



Appendix B: Sample Project Assessment

1. **Task:** Design a line following robot to move on a path. See reference table below for links to find other project ideas.

2. Example of structure and organisation of the Project Assessment

As part of the structure of the project assessment, make sure the following information have been provided:

- a) Cover page which entails each group member's name, class, subject and period/ date.
- b) Brief description/background of project undertaken by group in the project paper.

3. Sample mode of administration

- a) Explain the purpose and components of the project to the learners and provide examples and templates.
- b) Schedule periodic reviews (e.g., every 3-4 weeks) to ensure learners are keeping up with their project and provide feedback and guidance during these checkpoints.
- c) Provide learners with the scoring rubrics and provide detailed explanation on the rubrics.

The final project presentation is due in week 23 of the academic calendar. Allow a grace period for revisions based on final feedback

4. Sample mode of submission/presentation

- a) Communicate the final deadline for project submission to all students to ensure timely and complete submissions.
- b) Learners will submit their completed project documents physically or virtually via a flash drive.
- c) Learners should organise their project documentation clearly and logically, with each aspect of the project clearly stated.

5. Sample Project Assessment Marking scheme

Assessment criteria	Score
Introduction	10 marks
Methodology	10 marks
Experiments	20 marks
Conclusion	5 marks
Recommendations	5 marks
Total marks	50 marks

6. Sample feedback strategy

- a) Schedule periodic check-ins to discuss progress, set goals, and adjust strategies as needed.
- b) Utilise both formative and summative feedback to guide students' development and ensure they understand how to enhance their work continuously.

Reference Link	QR Code
https://education.lego.com/en-us/teacher-resources/lego-education-spike-prime/lesson-planning/lego-education-spike-prime-lesson-planning-lessons-by-subject/	
https://www.youtube.com/watch?v=EvWXfimxzjE&list=PL7xpqKJ8hTJnbnHXCTEyevP1x4-16VwOy	
https://www.youtube.com/watch?v=AXpneDwHf0c	

PLC SESSION 3: Robotic and Non-robotic Systems

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 2* delivered last week that:

- a) went well (NTS 1a, 1b and 2a-2e)
- b) you found challenging (NTS 1a, 1b and 2a-2e)

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 2* that supported learning. (NTS 2e, 2f and 3d-3j)

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 3* by aligning the learning plan with Learner Material and appropriate assessment strategies.

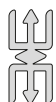
Learning Outcome

Review your learning plan for *week 3* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 3* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

The selected activities should be included in the teacher/learner activity section of the learning plan.

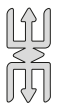
2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week’s recommended mode of assessment is **group class exercise** (NTS 3k, 3p).

E.g.

Classify the following systems as robotic or non-robotic and give a reason.

Bank ATM, factory assembly line, toy car, robotic vacuum cleaner, remote control, radio, mobile phone, drones, autonomous vehicles and humanoid robots.

Refer to Teacher Manual Section 2, Week 3 pages 80–83 and Learner Material Section 2 for more task examples.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the ‘Assessment DoK aligned to Curriculum and TM’ section below teacher/learner activities of the learning plan.*

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week’s recommended assessment (NTS 3n- 3p).

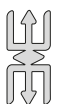
E.g.

<i>Robotic systems</i>	<i>Non-robotic systems</i>
<p><i>Factory assembly line:</i> This system often involves robotic arms and automated processes.</p>	<p><i>Bank ATM:</i> While automated, it does not possess the physical embodiment or autonomy typically associated with robots.</p>
<p><i>Robotic vacuum cleaner:</i> It is a robot designed for a specific task</p>	<p><i>Toy car:</i> A simple mechanical toy without autonomous capabilities</p>

Correct classification of each system as robotic or non-robotic = 1 mark

Correct reason for classification = 1 mark

Total Score: 10



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the ‘Assessment DoK aligned to Curriculum and TM’ section below teacher/ learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

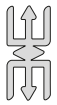
Inform learners about class exercise at the beginning of the lesson, etc.

Refer to Teacher Assessment Manual and Toolkit (pages 80–83) on assessment mode

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Address all misconceptions and ask learner reflect on their work using the rubrics, etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

3.1 Reflect and share your views on the session (NTS 1a, 1b).

3.2 Identify a critical friend to observe your lesson in relation to PLC Session 3 and provide feedback on your lesson (NTS 1f, 3g).

3.3 Remember to:

- a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
- b) read PLC Session 4 and related Learner Material (NTS 3a).
- c) bring along your Teacher Manual, PLC Handbook and learning plan on *week 4* in preparation for the next session (NTS 3a).

PLC SESSION 4: Non-Feedback Loop Systems and Feedback Loop Systems

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 3* delivered last week that:

- a) went well (NTS 1a, 1b and 2a-2e).
- b) you found challenging (NTS 1a, 1b and 2a-2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 3* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 4* by aligning the learning plan with Learner Material and appropriate assessment strategies.

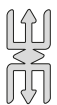
Learning Outcome

Review your learning plan for *week 4* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 4* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

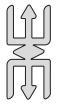
The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **research** (NTS 3k, 3p).

E.g.

Research and explain two features each of feedback loop systems and non-feedback loop systems with two examples of each system in your school.

Refer to Teacher Manual Section 2, Week 4 pages 48-49 and Learner Material Section 2 for more assessment task.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.*

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

Feedback loop systems

Self-Regulation: *Feedback loop systems are designed to regulate themselves automatically.*

Dynamic Adjustment: *Feedback loop systems continuously monitor their output and make real-time adjustments to their inputs based on the feedback received.*

Examples: Students give real examples of such system in their school

Non-feedback loop systems

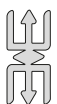
Fixed Operation: *Non-feedback loop systems operate based on predefined inputs without self-regulation or automatic adjustment based on outputs.*

Predictable Behaviour: *The behaviour of these systems is predictable and does not adapt based on changes in output or external conditions*

Examples: Students give real examples of such system in their school.

3 marks will be awarded for correct features. Extra 2 marks will be awarded for accurate examples and where these devices were found on campus.

Total marks: 20



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*

- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

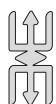
Give learners specific sources where they will find information regarding the research task, etc.

Refer to Teacher Assessment Manual and Toolkit pages 107–109 for tips on how to administer this assessment.

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Share the scoring rubric with the learners and provide immediate feedback during class discussion by highlighting good research strategies and accurate classification of systems etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

3.1 Reflect and share your views on the session (NTS 1a, 1b).

3.2 Identify a critical friend to observe your lesson in relation to PLC Session 4 and provide feedback on your lesson (NTS 1f, 3g).

3.3 Remember to:

- a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
- b) read PLC Session 5 and related Learner Material (NTS 3a).
- c) bring along your Teacher Manual, PLC Handbook and learning plan on week 5 in preparation for the next session (NTS 3a).

PLC SESSION 5: The Use of Logic and Loop Diagrams in Control Systems Design

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 4* delivered last week that:

- a) went well (NTS 1a, 1b and 2a-2e)
- b) you found challenging (NTS 1a, 1b and 2a-2e)

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 4* that supported learning. (NTS 2e, 2f and 3d-3j)

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 5* by aligning the learning plan with Learner Material and appropriate assessment strategies.

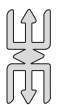
Learning Outcome

Review your learning plan for *week 5* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 5* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

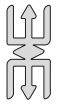
The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **gamification** (NTS 3k, 3p).

E.g.

Compete in pairs in the designing a traffic light system using a flow chart for the preliminary rounds.

Refer to Teacher Manual Section 2, Week 5 pages 52–54 and Learner Material Section 2 for more task examples.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.*

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n– 3p).

E.g.

A correct flowchart with processes and input and output will earn 5 marks.

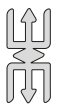
Groups that win preliminary round will earn 5 marks.

Groups that lose the preliminary round will earn 2 marks.

For the final rounds, correct loop diagram with signal flow representation and feedback connections will earn 5 marks.

Winners of final rounds earn 5 marks; losers earn 2 marks.

Total marks: 20



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

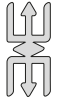
The teacher will specify learning outcome to be assessed. Rules of the game is established for all groups. Competing teams are determined by balloting.

Refer to Teacher Assessment Manual and Toolkit pages 105–106 for more information on to administer the assessment mode

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Collaborate with learners to rate the outcome of the gamified exercise etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

3.1 Reflect and share your views on the session (NTS 1a, 1b).

3.2 Identify a critical friend to observe your lesson in relation to PLC Session 5 and provide feedback on your lesson (NTS 1f, 3g).

3.3 Remember to:

- a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
- b) read PLC Session 6 and related Learner Material (NTS 3a).
- c) bring along your Teacher Manual, PLC Handbook and learning plan on week 6 in preparation for the next session (NTS 3a).

PLC SESSION 6: Preparing for Mid-Semester Examination

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 5* delivered last week that:

- a) went well (NTS 1a, 1b and 2a-2e)
- b) you found challenging (NTS 1a, 1b and 2a-2e)

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 5* that supported learning. (NTS 2e, 2f and 3d-3j)

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 6* lessons and end of semester examination by aligning the learning plan with Learner Material and appropriate assessment strategies.

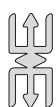
Learning Outcome

Review your learning plan for *week 6* and prepare for end of semester examination considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 6* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan. (NTS 2a-2f, 3a - 3j)



Note

The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **mid-semester examination** (NTS 3k, 3p)

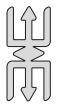
E.g.

Multiple Choice Questions

Which of the following is a robotic system?

- A. *ATM machine*
- B. *Autonomous vehicle*
- C. *Computer*
- D. *Radio*

Refer to the **Appendix C** below for the Table of Specification and details of the mid-semester examination



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.*

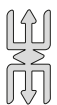
2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

The correct answer is B

Give 1 mark for every correct answer (20 questions)

Total Score: 20



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/ learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

- 2.5** Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

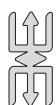
Give clear instructions, provide resources needed and conduct the mid semester examination in controlled environment to prevent cheating, etc.

Refer to Teacher Assessment Manual and Toolkit (pages 83–86) for more information on how to administer the assessment mode.

- 2.6** Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Score and give prompt feedback to learners on their strengths and areas for improvement, etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

- 3.1** Reflect and share your views on the session (NTS 1a, 1b).
- 3.2** Identify a critical friend to observe your lesson in relation to PLC Session 6 and provide feedback on your lesson (NTS 1f, 3g).
- 3.3** Remember to:
- provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate. (NTS 3l–3n)
 - read PLC Session 7 and related Learner Material. (NTS 3a)
 - bring along your Teacher Manual, PLC Handbook and learning plan on *week 7* in preparation for the next session. (NTS 3a)



Appendix C: Table of Specification for Mid-Semester Examination



Hint

- i. *Mid-semester examination will cover from weeks 1-5.*
- ii. *It will consist of level 1 and level 2 questions in the form on Multiple Choice Questions*
- iii. *The suggested number of questions per week is stated in table of specification.*

1. Sample of principles to consider when designing effective multiple-choice questions (MCQ's)

- a) Write clear and concise questions (stems) that are easy to understand.
- b) Ensure that each question aligns with the learning objectives and the material covered in the course.
- c) Include distractors (incorrect options) that are plausible and closely related to the correct answer.
- d) Ensure there is only one unambiguously correct answer for each question. Avoid “all of the above” or “none of the above” options, which can sometimes confuse or mislead students.
- e) Design questions with varying levels of difficulty to differentiate between different levels of students understanding.
- f) Ensure that questions are free from cultural, linguistic, or gender bias. Use language and contexts that are accessible and fair to all learners, regardless of their background.

2. Sample table of specification for developing Multiple-Choice Questions

Learning Indicators	Level 1	Level 2	Total
Distinguish between the industrial revolutions	2	1	3
Economic and social benefits of using robots.	1	1	2
Distinguish between robotic and non-robotic systems	2	2	4
Feedback and non-feedback loop systems.	3	1	4
Using logic and loop diagrams in control systems.	2	2	4
Coordination of sensors, processors and actuators in robots.	2	1	3
Total	12	8	20

PLC SESSION 7: Scientific Principles Underlying the Operation of Sensors

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 6* and mid-semester examination that:

- a) went well (NTS 1a, 1b and 2a-2e).
- b) you found challenging (NTS 1a, 1b and 2a-2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 6* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 7* by aligning the learning plan with Learner Material and appropriate assessment strategies.

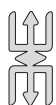
Learning Outcome

Review your learning plan for *week 7* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 7* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

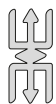
The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **group discussion** (NTS 3k, 3p).

E.g.

Discuss how light, ultrasonic and temperature sensors work. Talk about their use in robotics. Groups should present a write-up of their discussions.

Refer to Teacher Manual Section 3, Week 7 pages 70–72 and Learner Material Section 3 for more assessment task.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.*

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

Light Sensors

Ultrasonic Sensors

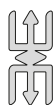
Temperature Sensors

(Consider the function of the sensor).

2 marks each for explanation with the function of sensor

1 mark each for explanation without the function of sensor.

Total – 6 marks



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

- 2.5** Discuss how you will administer the assessment task(s)/item(s) as a subject group. (NTS 3n - 3p).

E.g.

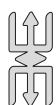
Teacher gives discussion question at the beginning of lesson and learners break out into groups during the second half of the lesson.

Refer to Teacher Assessment Manual and Toolkit (pages 66–68) for how to administer the assessment mode

- 2.6** Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l - 3n).

E.g.

Feedback about groups' comportment and write-ups to be given at the end of the lesson, etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

- 3.1** Reflect and share your views on the session (NTS 1a, 1b).
- 3.2** Identify a critical friend to observe your lesson in relation to PLC Session 7 and provide feedback on your lesson (NTS 1f, 3g).
- 3.3** Remember to:
- a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
 - b) read PLC Session 8 and related Learner Material (NTS 3a).
 - c) bring along your Teacher Manual, PLC Handbook and learning plan on *week 8* in preparation for the next session (NTS 3a).

PLC SESSION 8: Calibrating Linear Sensors and Scaling Sensor Readings

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 7* delivered last week that:

- a) went well (NTS 1a, 1b and 2a-2e).
- b) you found challenging (NTS 1a, 1b and 2a-2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 7* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 8* by aligning the learning plan with Learner Material and appropriate assessment strategies.

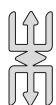
Learning Outcome

Review your learning plan for *week 8* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 8* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

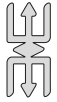
The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **pop quiz** (NTS 3k, 3p).

E.g.

- a) *Identify some pictures of sensors and list what they measure.*
- b) *What is sensor calibration?*

Refer to Teacher Manual Section 3, Week 8 page 79 and Learner Material Section 3 for more task examples.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.*

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

- a) *Ultrasonic sensor – measures distance*
Potentiometers – measures angular position
Touch sensor – measures touch
Light Sensor – measures light intensity
2 marks each for the above sensors and what they measure
1 mark each for mentioning only the sensor without the measurement
- b) *Sensor calibration (consider the mention of accuracy and reliability and adjusting the sensor value to match the true value).*
2 marks for presence key words and phrases in explanation
1 mark for absence of key words and phrases in explanation.

Total – 10 marks

Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/ learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

- 2.5** Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

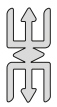
Create a set of questions that align with your objectives. Ensure they are clear, concise, and cover the material taught, etc.

Refer to Teacher Assessment Manual and Toolkit (pages 37–41) on how to administer

- 2.6** Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Learners can exchange scripts and mark based on answers provided from their discussion, etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

- 3.1** Reflect and share your views on the session (NTS 1a, 1b).
- 3.2** Identify a critical friend to observe your lesson in relation to PLC Session 8 and provide feedback on your lesson (NTS 1f, 3g).
- 3.3** Remember to:
- provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
 - read PLC Session 9 and related Learner Material (NTS 3a).
 - bring along your Teacher Manual, PLC Handbook and learning plan on *week 9* in preparation for the next session (NTS 3a).

PLC SESSION 9: Components of an Electronic Circuit and their Functions

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 8* delivered last week that:

- a) went well (NTS 1a, 1b and 2a-2e).
- b) you found challenging (NTS 1a, 1b and 2a-2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 8* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 9* by aligning the learning plan with Learner Material and appropriate assessment strategies.

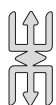
Learning Outcome

Review your learning plan for *week 9* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 9* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

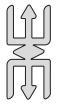
The selected activities should be included in the teacher/learner activity section of the learning plan.

2. Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **group homework** (NTS 3k, 3p).

E.g.

Find the circuits diagrams of any two common electronic devices (e.g. watch, remote control, radio), write down each component in the diagram.

Refer to Teacher Manual Section 4, Week 9 page 86 and Learner Material Section 4 for more task examples.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.*

- 2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

Resistor – Controls the flow of electric current in a circuit

Capacitor – Stores electrical energy as charge

Transistor – Amplifies electronic signals

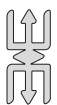
Diode – Allows electric current to flow in one direction only

Inductor – Opposes changes in electric current

2 Marks for each component

3 marks each for their corresponding functions

Total – 10 marks



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

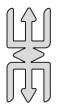
Give questions at the end of the lesson, etc.

Refer to Teacher Assessment Material and Toolkit (pages 57–60) for more information on how to administer the assessment mode.

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Teacher should take the class through the electronic components one more time, etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

3.1 Reflect and share your views on the session (NTS 1a, 1b).

3.2 Identify a critical friend to observe your lesson in relation to PLC Session 9 and provide feedback on your lesson (NTS 1f, 3g).

3.3 Remember to:

- a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate. (NTS 3l–3n)
- b) read PLC Session 10 and related Learner Material. (NTS 3a)
- c) bring along your Teacher Manual, PLC Handbook and learning plan on *week 10* in preparation for the next session. (NTS 3a)

PLC SESSION 10: Schematic Diagram Representation of Electronic Systems, System Inputs and Outputs

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 9* delivered last week that:

- a) went well (NTS 1a, 1b and 2a-2e).
- b) you found challenging (NTS 1a, 1b and 2a-2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 9* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 10* by aligning the learning plan with Learner Material and appropriate assessment strategies.

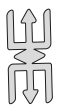
Learning Outcome

Review your learning plan for *week 10* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 10* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

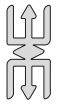
The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **test of practical knowledge (TPK)** (NTS 3k, 3p).

E.g.

Draw the circuits presented in the homework from week 9 on the board or project it onto the board and explain what the circuit does.

Refer to Teacher Manual Section 4, Week 10 pages 91–92 and Learner Material Section 4 for more task examples.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.*

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n– 3p).

E.g.

Circuit Description:

a) **Components:**

Power Source (e.g., Battery)

Resistor (R)

Light Emitting Diode (LED)

Connecting Wires

2 marks for each listing of the components

b) **Connection Layout:**

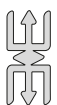
Connect the positive terminal of the battery to one terminal of the resistor.

Connect the other terminal of the resistor to the anode (longer lead) of the LED.

Connect the cathode (shorter lead) of the LED to the negative terminal of the battery.

2 marks each for the drawing the connections

Total – 14 marks



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*

iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

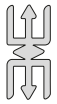
Keep track of time to ensure learner keep to the time allotted them. Aim to leave time for questions at the end, etc.

Refer to Teacher Assessment Manual and Toolkit pages 41–43 for more information.

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Provide detailed written feedback on each group's performance, highlighting strengths and areas for improvement.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

3.1 Reflect and share your views on the session (NTS 1a, 1b).

3.2 Identify a critical friend to observe your lesson in relation to PLC Session 10 and provide feedback on your lesson (NTS 1f, 3g).

3.3 Remember to:

- a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
- b) read PLC Session 11 and related Learner Material (NTS 3a).
- c) bring along your Teacher Manual, PLC Handbook and learning plan on *week 11* in preparation for the next session (NTS 3a).

PLC SESSION 11: Assembling and Testing Electronic Circuits on a Solderless Breadboard

1. Introduction (20 minutes)

- 1.1 Share one thing on the lesson for *week 10* delivered last week that
 - a) went well (NTS 1a, 1b and 2a-2e)
 - b) you found challenging (NTS 1a, 1b and 2a-2e).
- 1.2 Share your experience in conducting and/or recording the assessment for the previous week.
- 1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 10* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

- 2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

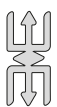
The purpose of the session is to review the learning plan for *week 11* by aligning the learning plan with Learner Material and appropriate assessment strategies.

Learning Outcome

Review your learning plan for *week 11* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
 2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.
- 2.2 Review the pedagogical approaches proposed for teaching *week 11* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note



The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **demonstration** (NTS 3k, 3p).

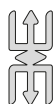
E.g.

Perform experiments of the LED Flasher Circuit Assembly or Light-sensitive LED Circuit Assembly.

Refer to links and QR codes below for tips on how to execute the experiment.

Activity Link	QR Code
https://www.jameco.com/Jameco/workshop/JamecoBuilds/jumbo-led-flasher.html https://startingelectronics.org/beginners/start-electronics-now/tut8-dual-LED-flasher/	
https://blog.learningbix.com/how-to-make-led-circuit-on-breadboard/	

Refer to Teacher Manual Section 4, Week 11 pages 96–97 and Learner Material Section 4 for more task examples.



Note

- i. The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.
- ii. The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

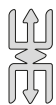
Some rubrics that teacher can use to score learners include:

- a. *Circuit Design and Assembly (5 Marks):*
 - i. *Excellent (5 marks): The circuit is assembled correctly with all components (e.g., resistors, capacitors, LEDs, transistors) properly connected according to the circuit diagram. The assembly is neat, with no loose connections or visible mistakes.*

- ii. *Good (4 marks): The circuit is mostly correct, with minor errors that do not affect the overall functionality (e.g., slightly misplaced components). The assembly is fairly neat with most connections secure.*
 - iii. *Fair (3 marks): The circuit has several mistakes in component placement or connections, which affects functionality. The assembly lacks organisation and has multiple loose or improper connections.*
 - iv. *Poor (2 marks): The circuit is incorrectly assembled with major errors in connections or component placement, resulting in a non-functional circuit. The assembly is disorganised and shows a lack of attention to detail.*
- b. *Experimentation and Testing (5 Marks):*
- i. *Excellent (5 marks): The student conducts the experiment systematically, follows all safety protocols, and tests the circuit thoroughly to ensure proper operation (e.g., adjusting resistances or observing LED flashing rates). Accurately records observations and results.*
 - ii. *Good (4 marks): The student conducts the experiment with minor deviations from the procedure but maintains safety protocols. Tests the circuit adequately and records most observations correctly.*
 - iii. *Fair (3 marks): The student shows some understanding of the experiment but deviates from the procedure significantly, impacting the outcome. Records are incomplete or lack accuracy.*
 - iv. *Poor (2 marks): The student does not follow the experimental procedure properly, disregards safety protocols, and fails to test the circuit effectively. No or minimal observations are recorded.*
- c. *Understanding of Circuit Functionality (5 Marks):*
- i. *Excellent (5 marks): The student demonstrates a deep understanding of the circuit's functionality, including how components like resistors, capacitors, and transistors contribute to the LED flashing or light sensitivity. Clearly explains the principles behind the circuit's operation.*
 - ii. *Good (4 marks): The student shows a good understanding of the circuit's basic functionality and can explain the role of most components, though some details or principles may be unclear.*
 - iii. *Fair (3 marks): The student has a partial understanding of the circuit's operation but struggles to explain component roles or underlying principles.*
 - iv. *Poor (2 marks): The student shows little to no understanding of how the circuit works or the purpose of its components.*
- d. *Problem-Solving and Troubleshooting (5 Marks):*
- i. *Excellent (5 marks): The student effectively identifies and diagnoses issues in the circuit (e.g., non-functioning LEDs, incorrect connections) and successfully resolves them using appropriate troubleshooting techniques.*

- ii. *Good (4 marks): The student identifies most issues in the circuit and attempts to resolve them with some success but may require guidance or miss less obvious problems.*
- iii. *Fair (3 marks): The student struggles to identify and solve circuit problems independently, resolving only some issues with significant guidance.*
- iv. *Poor (2 marks): The student fails to identify or address problems in the circuit, demonstrating limited problem-solving skills.*

Total – 20 marks



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

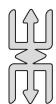
Develop a clear, step-by-step procedure for the experiment. Include safety precautions and any specific techniques students need to know, etc.

Refer to Teachers Assessment Manual and Toolkit pages 62–65 for how to administer this task.

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Learners should report to the teacher any challenges they faced for teacher to explain, give support and dispel any misconceptions, etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

3.1 Reflect and share your views on the session (NTS 1a, 1b).

3.2 Identify a critical friend to observe your lesson in relation to PLC Session 11 and provide feedback on your lesson (NTS 1f, 3g).

3.3 Remember to:

- a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
- b) read PLC Session 12 and related Learner Material (NTS 3a).
- c) bring along your Teacher Manual, PLC Handbook and learning plan on *week 12* in preparation for the next session (NTS 3a).

PLC SESSION 12: Preparing for End of Semester Examination

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 11* delivered last week that:

- a) went well (NTS 1a, 1b and 2a–2e).
- b) you found challenging (NTS 1a, 1b and 2a–2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 11* that supported learning (NTS 2e, 2f and 3d–3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 12 lessons and end of semester examination* by aligning the learning plan with Learner Material and appropriate assessment strategies.

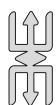
Learning Outcome

Review your learning plan for *week 12 and prepare for end of semester examination* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g–3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 12* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan. (NTS 2a–2f, 3a – 3j)



Note

The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **end of semester examination** (NTS 3k, 3p).

E.g.

Multiple Choice Question

A capacitor

- A. Controls voltage
- B. Stores charges
- C. Is a power source
- D. Is also an inductor

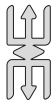
Short Answer Question

What are the three main parts of a robotic system?

Essay Type Question

Explain two similarities between humans and a robot.

Refer to **Appendix D** for the table of specification and details of the end of semester examination



Note

- i. The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.
- ii. The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

MCQ

Correct answer is B

1 mark each for a correct answer (40 question)

Total - 40 marks

Short Answer Question

Sensors, Processors and Actuators [3 marks]

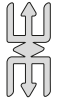
Essay Type Question

Sensory perception: Both humans and robots are able to perceive their environment around them. Humans use their eyes to sense obstacles; robots use cameras and ultrasonic sensors to sense obstacles.

Learning and adaptation: Humans and robots are able to learn from what they are trained with and make decisions accordingly. Humans learn through education whilst robots learn through machine learning.

6 marks each for correct answers for 10 items

Total – 60 marks



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

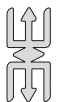
Provide a detailed syllabus outlining the topics to be covered in the test etc.

Refer to Teacher Assessment Manual and Toolkit pages 83–85 for more information.

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Give learners constructive feedback after scripts are marked by pointing out areas of strength and improvement, etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

3.1 Reflect and share your views on the session (NTS 1a, 1b).

3.2 Identify a critical friend to observe your lesson in relation to PLC Session 12 and provide feedback on your lesson (NTS 1f, 3g).

3.3 Remember to:

- a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
- b) read PLC Session 13 and related Learner Material (NTS 3a).
- c) bring along your Teacher Manual, PLC Handbook and learning plan on *week 13* in preparation for the next session (NTS 3a).



Appendix D: End of Semester Examination

1. **Sample principles to consider when designing effective multiple-choice questions (MCQ's)**
 - a) Write clear and concise questions (stems) that are easy to understand.
 - b) Ensure that each question aligns with the learning objectives and the material covered in the course.
 - c) Include distractors (incorrect options) that are plausible and closely related to the correct answer.
 - d) Ensure there is only one unambiguously correct answer for each question. Avoid “all of the above” or “none of the above” options, which can sometimes confuse or mislead students.
 - e) Design questions with varying levels of difficulty to differentiate between different levels of students understanding.
 - f) Ensure that questions are free from cultural, linguistic, or gender bias. Use language and contexts that are accessible and fair to all learners, regardless of their background.
2. **Sample principles to consider in developing essay-type questions**
 - a) Avoid vague or complex wording that might confuse learners.
 - b) The question should be relevant to the learning objectives and the material covered in the course.
 - c) Design questions that allow for a comprehensive exploration of the topic.
 - d) Formulate questions that require analysis, synthesis, and evaluation rather than mere recall of facts.
 - e) Ensure the question is fair to all learners, considering their diverse backgrounds and abilities.
 - f) Clearly define and communicate the criteria for grading the essay.
3. **Sample Table of Specifications for developing End of Semester Examination Questions**

Learning Indicators		Level 1	Level 2	Level 3	Total
Coordination of sensors, processors and actuators in robots.	<i>Multiple-choice</i>	2	1	–	4
	<i>Essay</i>			1	
Discuss the principles underlying the operation of sensors.	<i>Multiple – choice</i>	1	2	1	8
	<i>Essay</i>			1	
Calibrating and scaling sensors in robotics.	<i>Multiple-choice</i>	4	1	1	6

Learning Indicators		Level 1	Level 2	Level 3	Total
Identifying electronic circuits and their components.	<i>Multiple-choice</i>	2	1	1	4
Explain block and schematic diagram representation of electronic systems.	<i>Multiple-choice</i>	2	1		3
Assemble and test electronic circuits on a breadboard.	<i>Multiple-choice</i>	1	1		2
Understanding the Principles Underlying the Operation of Robotic Sensors	<i>Multiple-choice</i>	1	1		2
Apply knowledge from linear equations to calibrate linear sensors and to scale sensor readings to fit within a desired max-min range	<i>Multiple-choice</i>	1	1		2
Assemble electronic circuits from schematic diagrams and analyse their application in discrete and continuous time machine design	<i>Multiple-choice</i>	1	1		2
Identify the components of an electronic circuit and their functions.	<i>Multiple-choice</i>	1	1		2
Properly label and explain block and schematic diagram representation of electronic systems, system inputs and outputs.	<i>Multiple-choice</i>	1	1	1	6
	<i>Essay</i>			1	
Assemble and test electronic circuits on a solderless breadboard using predesigned schematic diagrams	<i>Multiple-choice</i>	2	1	1	7
	<i>Essay</i>	1	1		
Total		13	14	8	40

Level 1 questions can be MCQs, level 2 questions can be fill-ins or short answer questions and level 3 questions can be short essay questions.

PLC SESSION 13: Modelling, Programming and Simulation Tools in Robotics

1. Introduction (20 minutes)

- 1.1** Share one thing on the lesson for *week 12* and end of semester examination that:
- went well (NTS 1a, 1b and 2a-2e).
 - you found challenging (NTS 1a, 1b and 2a-2e).
- 1.2** Share your experience in conducting and/or recording the assessment for the previous week.
- 1.3** Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 12* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

- 2.1** Read the purpose, learning outcome and learning indicators for the session:

Purpose

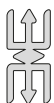
The purpose of the session is to review the learning plan for *week 13* by aligning the learning plan with Learner Material and appropriate assessment strategies.

Learning Outcome

Review your learning plan for *week 13* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

- Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
 - Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.
- 2.2** Review the pedagogical approaches proposed for teaching *week 13* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **poster** (NTS 3k, 3p).

E.g.

Develop a poster for the following:

- a) *Name two software and what they are used for.*
- b) *Present your response on the cardboard for poster presentation.*

Refer to Teacher Manual Section 5, Week 13 and Learner Material Section 5 for more task examples.

Hint

Give learners individual project task this week to be submitted in week 20.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.*

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

1. **Title Section (Top Center)**

Large, bold font for the title.

Consider adding a relevant image or icon (like a computer or software logo) beside the title. 3 marks

a. **Description:**

A spreadsheet program widely used for data analysis and visualisation. 2 marks

Uses

Organising data in tabular form.

Analysing data with formulas and functions.

Creating charts and graphs to visualise information.

Building financial models and budgets.

5 marks

2. Conclusion Section (Bottom Center)

Text: Both Microsoft Excel and Adobe Photoshop play essential roles in enhancing productivity and fostering creativity across various fields, including business, design, and education.”

Call to Action: Explore these applications to unlock their full potential in your personal and professional projects!”

5 marks

Design Elements

Colors: Use a balanced color scheme that is visually appealing (e.g., blue for Excel and light orange for Photoshop).

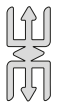
Fonts: Use clear, legible fonts for the text. Consider using different font sizes for headings and body text.

Bullet Points: Use bullet points to organise the information clearly for easy reading.

Borders: Consider adding borders or sections to visually separate different parts of the poster.

5 marks

Total – 20 marks



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the ‘Assessment DoK aligned to Curriculum and TM’ section below teacher/ learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

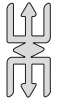
Learners will design a poster about software used in the robotics class.

Refer to Teacher Assessment Manual and Toolkit (pages 97–99) for more information on how to administer the assessment mode.

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

The teacher will give feedback to learners based on content, visual appeal and presentation skills.

**Note**

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

- 3.1** Reflect and share your views on the session (NTS 1a, 1b).
- 3.2** Identify a critical friend to observe your lesson in relation to PLC Session 13 and provide feedback on your lesson (NTS 1f, 3g).
- 3.3** Remember to:
 - a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
 - b) read PLC Session 14 and related Learner Material (NTS 3a).
 - c) bring along your Teacher Manual, PLC Handbook and learning plan on *week 14* in preparation for the next session (NTS 3a).



Appendix E: Individual Project

Project task

Research a real-world application of robotics that utilises more complex algorithms. Explain how the specific algorithms contribute to the robot's functionality.

Example of structure and organisation of the Project Assessment

As part of the structure of the project assessment, make sure the following information have been provided:

- a) Cover Page which entails each group member's name, class, subject and period/ date.
- b) Brief description/background of project undertaken by group in the project paper.

Sample mode of administration

- a) Explain the purpose and components of the project to the learners and provide examples and templates.
- b) Schedule periodic reviews (e.g. every 2 weeks) to ensure learners are keeping up with their project and provide feedback and guidance during these checkpoints.
- c) Provide learners with the scoring rubrics and provide detailed explanation on the rubrics.

The final project presentation is due in week 23 of the academic calendar. Allow a grace period for revisions based on final feedback

1. Sample mode of submission/presentation

- a) Communicate the final deadline for project submission to all students to ensure timely and complete submissions.
- b) Learners will submit their completed project documents physically or virtually via a flash drive.
- c) Learners should organise their project documentation clearly and logically, with each aspect of the project clearly stated.

2. Sample Project Assessment Marking scheme

Assessment criteria	Score
Introduction	10 marks
Methodology	10 marks
Experiments	20 marks
Conclusion	5 marks
Recommendations	5 marks
Total marks	50 marks

3. **Sample feedback strategy**

- a) Schedule periodic check-ins to discuss progress, set goals, and adjust strategies as needed.
- b) Make use targeted feedback to guide students' development and ensure they understand how to enhance their work continuously.

PLC SESSION 14: Designing Robots Using Virtual Platforms

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 13* delivered last week that:

- a) went well (NTS 1a, 1b and 2a-2e).
- b) you found challenging (NTS 1a, 1b and 2a-2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 13* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 14* by aligning the learning plan with Learner Material and appropriate assessment strategies.

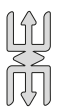
Learning Outcome

Review your learning plan for *week 14* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 14* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

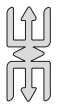
The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **e-assessment** (NTS 3k, 3p).

E.g.

Use the Tinker cad Circuits section to create a circuit with a DC motor. Connect the motor to a power source and a control switch. You can then simulate turning the motor on and off and adjusting its speed using a potentiometer.

Refer to Teacher Manual Section 5, Week 14 and Learner Material Section 5 for more assessment task.



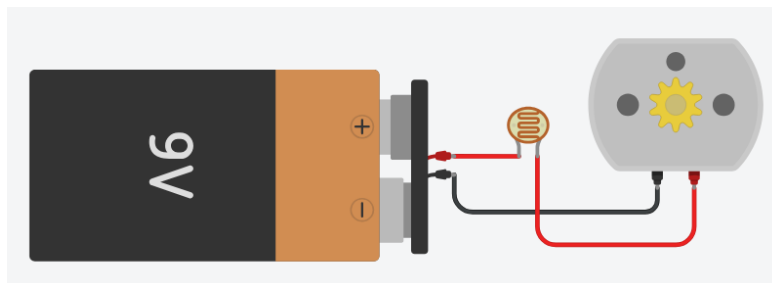
Note

- i. The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.
- ii. The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

a)



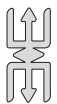
- i. Log in to your Tinkercad account and select the "Circuits" option from the dashboard.
- ii. Click on "Create new Circuit" to start a blank circuit design.
- iii. **DC Motor:** Drag a DC motor from the components panel onto the workspace.
- iv. **Power Source:** Drag a battery (typically, a 9V battery works well) onto the workspace.
- v. **Switch:** Include a simple switch. You can find this in the components panel (usually labeled as "SPST Switch").
- vi. **Potentiometer:** Find a potentiometer (10kΩ is typical) and place it in the workspace.
- vii. **Wires:** You will need wires to make connections.
- viii. Connect the positive terminal of the battery to one terminal of the switch.

- ix. *Connect the other terminal of the switch to one of the terminals on the DC motor.*
- x. *Connect the other terminal of the DC motor to the negative terminal of the battery.*
- xi. *Connect the middle pin (wiper) of the potentiometer to the terminal of the DC motor that is connected to the switch.*
- xii. *Connect one of the side pins of the potentiometer to the positive terminal of the battery.*
- xiii. *Connect the other side pin of the potentiometer to the terminal connected to the switch.*
- xiv. *Double-check your connections to ensure that everything is wired correctly as per the above instructions.*
- xv. *Click on the “Start Simulation” button on the upper right.*
- xvi. *Use the switch to turn the motor on and off. When the switch is in the ON position, the current flows, and the motor should spin.*
- xvii. *Use the potentiometer to adjust the resistance. By turning the knob of the potentiometer, you should be able to vary the speed of the DC motor. Turning it clockwise typically increases the resistance, reducing the speed, while turning it counterclockwise decreases resistance, increasing speed.*

2 marks for each correct step listed

6 marks for the setup of the experiment

Total – 40 marks



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the ‘Assessment DoK aligned to Curriculum and TM’ section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

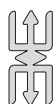
Laboratory sessions should be arranged to allow learners to explore with the robot software. Teacher will assist students create Google accounts to submit e-assessments

Refer to Teacher Assessment Manual and Toolkit pages 86–88 for more information on how to administer the assessment mode

- 2.6** Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Teacher gives feedback on the use of the technology used in the e-assessment. Teacher identifies learners with special needs and addresses them.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

- 3.1** Reflect and share your views on the session (NTS 1a, 1b).
- 3.2** Identify a critical friend to observe your lesson in relation to PLC Session 14 and provide feedback on your lesson (NTS 1f, 3g).
- 3.3** Remember to:
- provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
 - read PLC Session 15 and related Learner Material (NTS 3a).
 - bring along your Teacher Manual, PLC Handbook and learning plan on *week 15* in preparation for the next session (NTS 3a).

PLC SESSION 15: Using a CAD tool to model parts of robotic systems

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 14* delivered last week that:

- a) went well (NTS 1a, 1b and 2a–2e).
- b) you found challenging (NTS 1a, 1b and 2a–2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 14* that supported learning (NTS 2e, 2f and 3d–3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 15* by aligning the learning plan with Learner Material and appropriate assessment strategies.

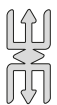
Learning Outcome

Review your learning plan for *week 15* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g–3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 15* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a–2f, 3a – 3j).



Note

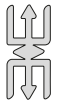
The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **essay** (NTS 3k, 3p).

E.g.

Write what you know about the 3D printing. Your writeup include the role of 3D printing in robotics, 3D printing software, the process of 3D printing.

Refer to Teacher Manual Section 5, Week 15 and Learner Material Section 5 for more task examples.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.*

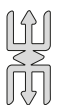
2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

Some rubrics for scoring include

- a) *Organisation (logical presentation of information) – 5 marks*
- b) *Content (demonstration of knowledge) – 10 marks*
- c) *Delivery (good language skills, clear visual aids and text) – 10 marks*
- d) *Response to questions – 5 marks*

Total marks – 30 marks



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/ learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

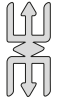
Clearly explain the learning outcome of this assessment mode and encourage learners to plan, draft, revise and finalise their essay.

Refer to Teacher Assessment Manual and Toolkit pages 94–97 for more information on how to administer e-assessment

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Give oral and written comments to the learner etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

3.1 Reflect and share your views on the session. (NTS 1a, 1b)

3.2 Identify a critical friend to observe your lesson in relation to PLC Session 15 and provide feedback on your lesson. (NTS 1f, 3g)

3.3 Remember to:

- a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate. (NTS 3l–3n)
- b) read PLC Session 16 and related Learner Material. (NTS 3a)
- c) bring along your Teacher Manual, PLC Handbook and learning plan on *week 16* in preparation for the next session. (NTS 3a)

PLC SESSION 16: Modelling Files into G-Codes for 3D Printers

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 15* delivered last week that:

- a) went well (NTS 1a, 1b and 2a-2e).
- b) you found challenging (NTS 1a, 1b and 2a-2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 15* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 16* by aligning the learning plan with Learner Material and appropriate assessment strategies.

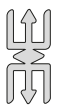
Learning Outcome

Review your learning plan for *week 16* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 16* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week’s recommended mode of assessment is **report writing** (NTS 3k, 3p).

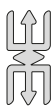
E.g.

Watch videos about the stages of 3D printing. They are to make notes and submit a 2-page report about 3D printing.

Refer to video links below

Link	QR-Code
<p>3D PRINTING 101: The ULTIMATE Beginner’s Guide https://www.youtube.com/watch?v=2vFdwz4U1VQ</p>	
<p>Complete beginner’s guide to 3D printing – Assembly, tour, slicing, levelling and first prints https://www.youtube.com/watch?v=T-Z3GmM20JM</p>	
<p>Beginner’s Guide to 3D Printing! https://www.youtube.com/watch?v=705L35B9YWc</p>	

Refer to Teacher Manual Section 5, Week 16 and Learner Material Section 5 for more task examples.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the ‘Assessment DoK aligned to Curriculum and TM’ section below teacher/learner activities of the learning plan.*

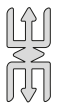
2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

The Report should include the following parts

- a) *Introduction (5 marks): Should include what 3D printing is and its importance*
- b) *Design Stage (5 marks): Model design using a CAD software and file preparation*
- c) *Preparation Stage (5 marks): Slicing, printer setup and material selection*
- d) *Printing Stage (5 marks): Layer-by-layer printing and monitoring*

Total: 20 marks



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/ learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n - 3p).

E.g.

Learners are told to observe the stages and make notes whilst watching the video

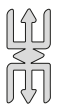
Videos will be shown in class, etc.

Refer to Teacher Assessment Manual and Toolkit pages 72-74 for information on how to administer report writing.

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l - 3n).

E.g.

Provide personalised feedback on errors, right answers and address any other questions etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

- 3.1** Reflect and share your views on the session. (NTS 1a, 1b)
- 3.2** Identify a critical friend to observe your lesson in relation to PLC Session 16 and provide feedback on your lesson. (NTS 1f, 3g)
- 3.3** Remember to:
 - a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n)
 - b) read PLC Session 17 and related Learner Material (NTS 3a)
 - c) bring along your Teacher Manual, PLC Handbook and learning plan on *week 17* in preparation for the next session (NTS 3a)

PLC SESSION 17: Using Algorithms, Pseudocodes and Flowchart Diagrams in Robotics

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 16* delivered last week that:

- a) went well (NTS 1a, 1b and 2a-2e).
- b) you found challenging (NTS 1a, 1b and 2a-2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 16* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 17* by aligning the learning plan with Learner Material and appropriate assessment strategies.

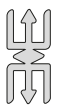
Learning Outcome

Review your learning plan for *week 17* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 17* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan. (NTS 2a-2f, 3a - 3j)



Note

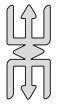
The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week’s recommended mode of assessment is **critiquing** (NTS 3k, 3p).

E.g.

Write a pseudocode and draw the flowchart for brushing teeth.

Refer to Teacher Manual Section 6, Week 17 and Learner Material Section 6 for more task examples.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the ‘Assessment DoK aligned to Curriculum and TM’ section below teacher/learner activities of the learning plan.*

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week’s recommended assessment (NTS 3n- 3p).

E.g.

a)

START

Wet toothbrush

Apply toothpaste to toothbrush

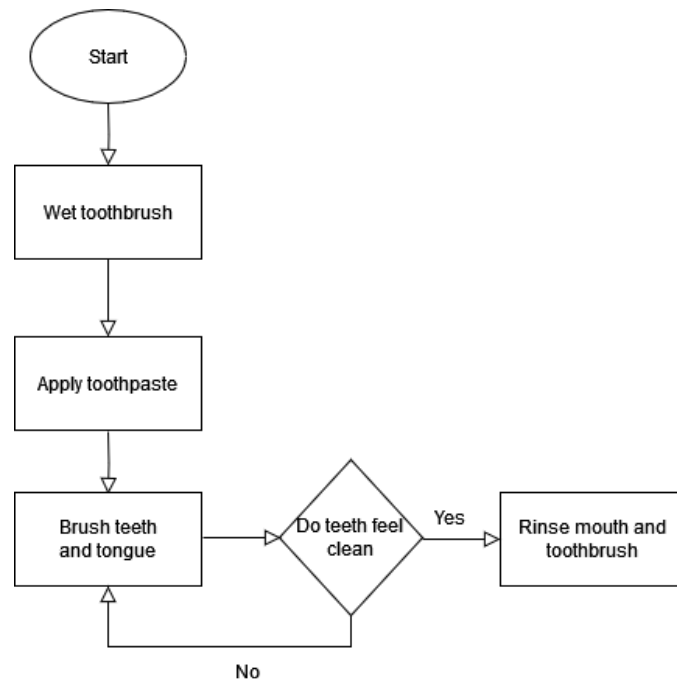
Brush teeth and tongue

Check for clean teeth

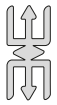
Rinse mouth and toothbrush

END

b)



Total: 20 marks



Note

- i. The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.
- ii. Take into consideration different modes of responses provided by learners.
- iii. Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

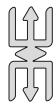
The teacher will allow each group to make a presentation of their pseudocode and flowcharts in front of the class. Other groups critique their presentation respectfully.

Refer to Teacher Assessment Manual and Toolkit pages 74–77 for more information on critiquing.

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

The teacher will offer feedback to each group after comments from other groups by suggesting areas for improvement etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

- 3.1** Reflect and share your views on the session (NTS 1a, 1b).
- 3.2** Identify a critical friend to observe your lesson in relation to PLC Session 17 and provide feedback on your lesson (NTS 1f, 3g).
- 3.3** Remember to:
 - a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
 - b) read PLC Session 18 and related Learner Material (NTS 3a).
 - c) bring along your Teacher Manual, PLC Handbook and learning plan on *week 18* in preparation for the next session (NTS 3a).

PLC SESSION 18: Preparing for Mid-Semester Examination

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 17* delivered last week that:

- a) went well (NTS 1a, 1b and 2a-2e).
- b) you found challenging (NTS 1a, 1b and 2a-2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 17* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 18* lessons and mid-semester examination by aligning the learning plan with Learner Material and appropriate assessment strategies.

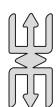
Learning Outcome

Review your learning plan for *week 18* and prepare for mid-semester examination considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marketing scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 18* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **mid-semester examination** (NTS 3k, 3p).

E.g.

Multiple choice question

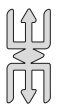
What will be the weight of a 1kg block on Mars?

- A. 9.81kg
- B. 3.72kg
- C. 1g
- D. 1kg

Essay type question

Explain why a pyramid is more stable than a narrow, tall tower

*Refer to **Appendix E** of this session for the details of the Second semester mid semester examination and the Table of Specification*



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.*

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

Multiple Choice Question

Correct answer is D

1 mark each (20 Questions)

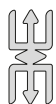
Total – 20 marks

Essay type question

A pyramid's design lowers its center of gravity and therefore gives it more stability. A narrow tall tower has a higher center of gravity and therefore less stable. (5 Questions)

2 marks each, consider the function of the pyramid design in the explanation.

Total – 30 marks

**Note**

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

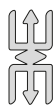
Conduct the mid semester in a controlled environment and monitor to prevent cheating etc.

Refer to Teacher Assessment Manual and Toolkit pages 83–85 for more information.

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Provide comprehensive written feedback on each learner's performance, noting their strengths and areas needing improvement by sharing and discussing the marking scheme etc.

**Note**

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

3.1 Reflect and share your views on the session (NTS 1a, 1b).

3.2 Identify a critical friend to observe your lesson in relation to PLC Session 18 and provide feedback on your lesson (NTS 1f, 3g).

3.3 Remember to:

- a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
- b) read PLC Session 19 and related Learner Material (NTS 3a).
- c) bring along your Teacher Manual, PLC Handbook and learning plan on *week 19* in preparation for the next session (NTS 3a).



Appendix E: Table of Specification for Mid-Semester Examination

Hint



- i. *Mid-semester examination will cover from weeks 13–18.*
- ii. *It will consist of level 1 and level 2 questions in the form on Multiple Choice Questions*
- iii. *The suggested number of questions per week is stated in table of specification.*

1. Sample of principles to consider when designing effective multiple-choice questions (MCQ's)

- a) Write clear and concise questions (stems) that are easy to understand.
- b) Ensure that each question aligns with the learning objectives and the material covered in the course.
- c) Include distractors (incorrect options) that are plausible and closely related to the correct answer.
- d) Ensure there is only one unambiguously correct answer for each question. Avoid “all of the above” or “none of the above” options, which can sometimes confuse or mislead students.
- e) Design questions with varying levels of difficulty to differentiate between different levels of students understanding.
- f) Ensure that questions are free from cultural, linguistic, or gender bias. Use language and contexts that are accessible and fair to all learners, regardless of their background.

3. Sample table of specification for developing Multiple-Choice Questions

Learning Indicators	Level 1	Level 2	Total
Explore features of selected modelling, programming and simulation tools useful for the design of robots.	2	1	3
Design robots using virtual platforms and use simulation tools and programming IDEs to test the mechanics of the designed robots.	1	1	2
Use a CAD tool to model parts of robotic systems.	2	2	4
Use relevant intermediate tools to prepare modelled files into g-codes and print the designs using a 3D Printer.	3	1	4
Determine the Inputs, Processes and Outputs required to solve a particular problem.	2	2	4
Define solutions to basic automated and robotic problems using algorithms, pseudocodes and flowchart diagrams.	2	2	4

Learning Indicators	Level 1	Level 2	Total
Describe the effect of mass and centre of gravity on the stability of a structure or robot and strategies for designing systems that can withstand forces.	2	1	3
Total	12	8	20

PLC SESSION 19: Creating Robots with Robotic Kits or Local Materials

1. Introduction (20 minutes)

- 1.1** Share one thing on the lesson for *week 18* and mid-semester examination that:
- went well (NTS 1a, 1b and 2a-2e).
 - you found challenging (NTS 1a, 1b and 2a-2e).
- 1.2** Share your experience in conducting and/or recording the assessment for the previous week.
- 1.3** Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 18* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

- 2.1** Read the purpose, learning outcome and learning indicators for the session:

Purpose

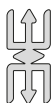
The purpose of the session is to review the learning plan for *week 19* by aligning the learning plan with Learner Material and appropriate assessment strategies.

Learning Outcome

Review your learning plan for *week 19* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

- Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
 - Discuss and develop assessment tasks and rubrics/markingscheme for the learning indicators for the week.
- 2.2** Review the pedagogical approaches proposed for teaching *week 19* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

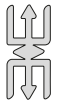
The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **computational task** (NTS 3k, 3p).

E.g.

Calculate the gear ratio for Gear 1(driving gear) with 20 teeth and Gear 2 (driven gear) with 40 teeth.

Refer to Teacher Manual Section 7, Week 19 and Learner Material Section 7 for more task examples.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.*

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

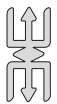
Gear Ratio = Number of teeth on Gear 2 / Number of teeth on Gear 1 – 2 marks

Gear Ratio = 40 / 20 – 2 marks

This gives a figure of 2 – 2 marks

The Gear Ratio = 2:1 – 4 marks

Total – 10 marks



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

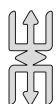
Distribute the task to learners, closely monitor their progress and ensure a fair and cheating-free assessment environment (both teacher and learner roles).

Refer to Teacher Assessment Manual and Toolkit pages 49–51 for more information on this assessment type.

- 2.6** Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Review the answers with the entire class by displaying them on the board or projector, discussing the correct solutions and methods etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

- 3.1** Reflect and share your views on the session (NTS 1a, 1b).
- 3.2** Identify a critical friend to observe your lesson in relation to PLC Session 19 and provide feedback on your lesson (NTS 1f, 3g).
- 3.3** Remember to:
- provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
 - read PLC Session 20 and related Learner Material (NTS 3a).
 - bring along your Teacher Manual, PLC Handbook and learning plan on *week 20* in preparation for the next session (NTS 3a).

PLC SESSION 20: Creating Robots with Robotic Kits or Local Materials

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 19* delivered last week that:

- a) went well (NTS 1a, 1b and 2a-2e).
- b) you found challenging (NTS 1a, 1b and 2a-2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 19* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 20* by aligning the learning plan with Learner Material and appropriate assessment strategies.

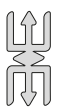
Learning Outcome

Review your learning plan for *week 20* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 20* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

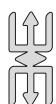
The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week’s recommended mode of assessment is **presentation (project)** (NTS 3k, 3p).

E.g.

Make a 10-minute presentation of the individual project.

Refer to Teacher Manual Section 7, Week 20 and Learner Material Section 7 for more task examples.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the ‘Assessment DoK aligned to Curriculum and TM’ section below teacher/learner activities of the learning plan.*

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week’s recommended assessment (NTS 3n- 3p).

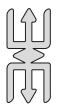
E.g.

Rubrics for Presentation

Criteria	Excellent – 5	Very good – 4	Good – 3	Satisfactory – 2
Content knowledge	Ability to indicate components such as; perception logarithms, localised logarithms, Path planning logarithm, control logarithm, machine learning and AI with examples and functions	Ability to indicate components such as; perception logarithms, localised logarithms, Path planning logarithm, control logarithm, machine learning and AI with examples but not functions	Ability to indicate components such as; perception logarithms, localised logarithms, Path planning logarithm, control logarithm, machine learning and AI without examples and functions	Ability to indicate less than 3 components such as; perception logarithms, localised logarithms, Path planning logarithm, control logarithm, machine learning and AI without examples and functions
Visual aids	Title, outline, content, supporting pictures, transition, appendix, colour	Title, outline, content, supporting pictures, transition, appendix without colour	Title, outline, content, supporting pictures, transition, without appendix and colour	Title, outline, content, without supporting pictures, transition, appendix and colour

Criteria	Excellent – 5	Very good – 4	Good – 3	Satisfactory – 2
Engagement	Adjust tone and style, capture attention, ask questions, use visual aids and keep eye contact	Adjust tone and style, capture attention, ask questions, use visual aids without keeping eye contact	Adjust tone and style, capture attention, ask questions, without using visual aids and keeping eye contact	Adjust tone and style, capture attention, without asking questions, use visual aids without keeping eye contact
Timing	Vary pace, allocate time, pause effectively, set alert and rehearse	Vary pace, allocate time, pause effectively, set alert without rehearsal	Vary pace, allocate time, pause effectively without, setting alert and rehearsing	Vary pace, allocate time, without pausing effectively, setting alert and rehearsing

Total – 20 marks



Note

- i. The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.
- ii. Take into consideration different modes of responses provided by learners.
- iii. Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

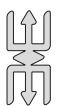
Guide learners to create good assessment posters. Emphasise the use of graphics, images, and concise text.

Refer to pages 97 – 99 of the Teacher Assessment Manual and Toolkit for information on how to administer presentation

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Provide feedback to groups on changes to make to their project work etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

- 3.1 Reflect and share your views on the session (NTS 1a, 1b).
- 3.2 Identify a critical friend to observe your lesson in relation to PLC Session 20 and provide feedback on your lesson (NTS 1f, 3g).
- 3.3 Remember to:
 - a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
 - b) read PLC Session 21 and related Learner Material (NTS 3a).
 - c) bring along your Teacher Manual, PLC Handbook and learning plan on *week 21* in preparation for the next session (NTS 3a).

PLC SESSION 21: Creating Computer Programs from Pre-Designed Flowcharts

1. Introduction (20 minutes)

1.1 Share one thing on the lesson for *week 20* delivered last week that:

- a) went well (NTS 1a, 1b and 2a-2e).
- b) you found challenging (NTS 1a, 1b and 2a-2e).

1.2 Share your experience in conducting and/or recording the assessment for the previous week.

1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 20* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

The purpose of the session is to review the learning plan for *week 21* by aligning the learning plan with Learner Material and appropriate assessment strategies.

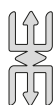
Learning Outcome

Review your learning plan for *week 21* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.

2.2 Review the pedagogical approaches proposed for teaching *week 21* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

The selected activities should be included in the teacher/learner activity section of the learning plan.

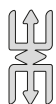
2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **group experiment** (NTS 3k, 3p).

E.g.

Translate a given flowchart into Block Code in Lego Spike Prime

A robot which moves in the forward direction needs to stop only if it detects an object in front of it using an ultrasonic sensor. The object should not be more than 10cm close to it.

Refer to Teacher Manual Section 8, Week 21 and Learner Material Section 8 for more task examples.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.*

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

Some rubrics that teacher can use to score learners include:

a. Accuracy of Code Translation (5 marks):

- i. *Excellent (5 marks): The block code accurately translates the flowchart into LEGO Spike Prime with no errors. All control structures (loops, conditionals) and sensor inputs (ultrasonic sensor) are correctly implemented to match the flowchart's logic.*
- ii. *Good (4 marks): The block code mostly matches the flowchart, with minor errors that do not significantly affect the robot's operation (e.g., a slight delay in stopping the robot).*
- iii. *Fair (3 marks): The block code shows several inaccuracies in translating the flowchart (e.g., incorrect use of conditionals or sensor blocks), which affects the robot's ability to perform the desired task correctly.*

b. Effective Use of Sensors and Blocks (5 marks):

- i. *Excellent (5 marks): The code effectively uses the ultrasonic sensor to detect objects within 10 cm. The logic for sensing and stopping the robot is implemented correctly, and all sensor parameters are appropriately configured.*
- ii. *Good (4 marks): The sensor is used correctly, but there are minor issues, such as slight misconfigurations or incorrect thresholds, that do not significantly affect functionality.*

- iii. *Fair (3 marks): The sensor is used with several issues, such as incorrect placement of sensor blocks or improper parameters, affecting the robot's ability to stop at the correct distance.*

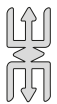
c. Logic and Flow Control (5 Marks):

- i. *Excellent (5 marks): The code demonstrates a clear and logical flow, with correct use of loops and conditionals to ensure the robot moves forward and stops when an object is detected within 10 cm.*
- ii. *Good (4 marks): The code mostly demonstrates a logical flow, with minor mistakes in flow control (e.g., incorrect loop placement or unnecessary blocks) that do not significantly impact the overall functionality.*
- iii. *Fair (3 marks): The code has several logical errors, such as misplaced or missing control blocks, which cause the robot to behave unpredictably or not meet the task requirements.*

d. Code Optimisation and Efficiency (5 Marks):

- i. *Excellent (5 marks): The code is well-optimised, using the minimum necessary blocks and avoiding redundancy while maintaining clarity and functionality. The program runs smoothly without unnecessary delays.*
- ii. *Good (4 marks): The code is fairly optimised but contains some redundant or unnecessary blocks that do not significantly affect its performance.*
- iii. *Fair (3 marks): The code shows minimal optimisation, with multiple redundant or unnecessary blocks that make it less efficient but still functional.*

Total – 20 marks



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

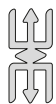
Groups will run experiments in the robotics laboratory, etc.

Refer to Teacher Assessment Material and Toolkit pages 69–72 for more information on this assessment mode.

- 2.6** Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Give feedback to groups about codes that worked well and those that did not, etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

- 3.1** Reflect and share your views on the session (NTS 1a, 1b).
- 3.2** Identify a critical friend to observe your lesson in relation to PLC Session 21 and provide feedback on your lesson (NTS 1f, 3g).
- 3.3** Remember to:
- provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
 - read PLC Session 22 and related Learner Material (NTS 3a).
 - bring along your Teacher Manual, PLC Handbook and learning plan on *week 22* in preparation for the next session (NTS 3a).

PLC SESSION 22: Creating Computer Programs from Pre-Designed Flowcharts

Introduction (20 Minutes)

- 1.1 Share one thing on the lesson for *week 21* delivered last week that:
 - a) went well (NTS 1a, 1b and 2a-2e).
 - b) you found challenging (NTS 1a, 1b and 2a-2e).
- 1.2 Share your experience in conducting and/or recording the assessment for the previous week.
- 1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 21* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

- 2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

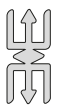
The purpose of the session is to review the learning plan for *week 22* by aligning the learning plan with Learner Material and appropriate assessment strategies.

Learning Outcome

Review your learning plan for *week 22* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
 2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.
- 2.2 Review the pedagogical approaches proposed for teaching *week 22* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

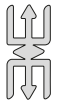
The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **peer assessment** (NTS 3k, 3p).

E.g.

Identify the appropriate block type (start/stop, process, decision) based on the given flowchart

Refer to Teacher Manual Section 8, Week 22 and Learner Material Section 8 for more task examples.



Note

- i. The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.
- ii. The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3k, 3p)

E.g.

Some rubrics that teacher can use to score learners include:

a) Accuracy in Identifying Block Types (10 Marks):

- i. *Excellent (10 marks):*

The student correctly identifies all flowchart symbols, such as:

- **Start/Stop Block:** *Correctly identifies the oval symbol at the beginning and end of the flowchart as "Start" or "Stop."*
- **Process Block:** *Correctly identifies the rectangle symbol indicating actions like "Move Forward" or "Turn Left" as a "Process."*
- **Decision Block:** *Correctly identifies the diamond symbol representing decision points such as "Is Object Detected?" or "Is Distance Less Than 10 cm?" as a "Decision."*

- ii. *Good (6 marks):*

The student correctly identifies most symbols, such as all "Process" blocks and "Start/Stop" blocks but makes 1-2 minor errors, such as misidentifying a decision symbol ("Is Distance Less Than 10 cm?") as a process block.

- iii. *Fair (4 marks):*

The student identifies some block types correctly (e.g., "Start/Stop" and one "Process" block) but makes 3-4 errors, such as identifying a "Process" block ("Turn Left") as a decision or confusing a "Decision" block ("Is Object Detected?") with a process block.

iv. *Poor (3 marks):*

The student incorrectly identifies most symbols, such as labeling all symbols as “Process” blocks or failing to distinguish between “Decision” and “Process” blocks.

b) **Clarity of Explanation (5 Marks):**i. *Excellent (5 marks):*

Provides clear and detailed explanations, such as:

- *“The oval symbol is labeled ‘Start’ because it represents the beginning of the flowchart.”*
- *“The rectangle labeled ‘Move Forward’ is a ‘Process’ block because it describes an action that the robot must perform.”*
- *“The diamond symbol labeled ‘Is Object Detected?’ is a ‘Decision’ block because it represents a point where the robot must choose between two paths based on sensor input.”*

ii. *Good (4 marks):*

Provides explanations that are generally clear, but with minor omissions or unclear points. For example, correctly explains the “Start” block but gives a less detailed explanation for the “Decision” block (“It checks something, so it must be a decision”).

iii. *Fair (3 marks):*

Provides limited explanations with several unclear points. For example, “The ‘Move Forward’ block is a process because it does something” but fails to specify what action is taken. Explanations for decision points may lack clarity or be partially incorrect.

iv. *Poor (1 marks)*

Provides inadequate or incorrect explanations, such as “The diamond symbol is a ‘Start’ block,” showing confusion about flowchart conventions.

c) **Correct Use of Flowchart Conventions (3 Marks):**i. *Excellent (3 marks):*

The student demonstrates complete knowledge of flowchart conventions by correctly using:

- *Start/Stop symbols (ovals) at the beginning and end.*
- *Process symbols (rectangles) for actions like “Move Forward” and “Turn Left.”*
- *Decision symbols (diamonds) for questions like “Is Object Detected?” or “Is Distance Less Than 10 cm?”*

ii. *Good (2 marks):*

The student uses most conventions correctly but may have minor errors, such as using a rectangle instead of an oval for the “Stop” symbol or placing a decision symbol incorrectly.

iii. *Fair (1 mark):*

The student uses some conventions correctly, but with noticeable errors, such as using circles instead of ovals for start/stop or mixing up decision and process symbols.

iv. *Poor (0 marks):*

The student demonstrates little to no knowledge of flowchart conventions, such as using rectangles for all symbols or placing the “Stop” symbol in the middle of the flowchart.

d. **Presentation and Organisation (2 Marks):**

i. *Excellent (2 marks):*

The work is well-organised and neat, with all block types clearly labeled (e.g., “Start,” “Process,” “Decision”). Symbols are accurately drawn or represented, and the flow of the chart is logical and easy to follow.

ii. *Good (1.5 marks):*

The work is mostly organised and neat, with minor issues, such as one or two symbols not labeled correctly (e.g., missing the “Stop” label) but still understandable.

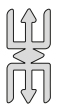
iii. *Fair (1 mark):*

The work is somewhat disorganised, with multiple unclear labels (e.g., incorrect labels like “Decision” for a process block) or poorly drawn symbols that make understanding the flow challenging.

iv. *Poor (0 marks):*

The work is disorganised, messy, or incomplete, with missing labels or symbols that make it difficult to assess the student’s understanding of flowchart conventions.

Total – 20 marks



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the ‘Assessment DoK aligned to Curriculum and TM’ section below teacher/ learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n, 3p)

E.g.

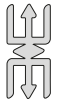
Model peer/self-assessment by letting learners assess or review what was taught to open them up to the assessment to be conducted

Refer to pages 91–94 of the *Teacher Assessment Manual and Toolkits* for more information on how to administer peer assessment.

- 2.6** Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l, 3n).

E.g.

Offer immediate feedback based on each rubric criterion, highlighting strengths (e.g., accurate identification, clear explanations) and areas needing improvement (e.g., better understanding of flowchart conventions). etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

- 3.1** Reflect and share your views on the session (NTS 1a, 1b).
- 3.2** Identify a critical friend to observe your lesson in relation to PLC Session 22 and provide feedback on your lesson (NTS 1f, 3g).
- 3.3** Remember to:
- provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).
 - read PLC Session 23 and related Learner Material (NTS 3a).
 - bring along your Teacher Manual, PLC Handbook and learning plan on *week 23* in preparation for the next session (NTS 3a).

PLC SESSION 23: Creating Computer Programs from Pre-Designed Flowcharts

Introduction (20 minutes)

- 1.1 Share one thing on the lesson for *week 22* delivered last week that:
 - a) went well (NTS 1a, 1b and 2a-2e).
 - b) you found challenging (NTS 1a, 1b and 2a-2e).
- 1.2 Share your experience in conducting and/or recording the assessment for the previous week.
- 1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 22* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

- 2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

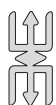
The purpose of the session is to review the learning plan for *week 23* by aligning the learning plan with Learner Material and appropriate assessment strategies.

Learning Outcome

Review your learning plan for *week 23* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
 2. Discuss and develop assessment tasks and rubrics/marking scheme for the learning indicators for the week.
- 2.2 Review the pedagogical approaches proposed for teaching *week 23* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

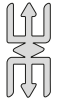
The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week's recommended mode of assessment is **report (reflective essay)** (NTS 3k, 3p).

E.g.

Learners will write a reflective essay or report on the project experience of their First Year Project given in Session 2 of this PLC Handbook.

Refer to Teacher Manual Section 8, Week 23 and Learner Material Section 8 for more task examples.



Note

- i. *The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.*
- ii. *The selected activities should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities of the learning plan.*

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/rubrics for scoring the assessment task(s)/item(s) for the week's recommended assessment (NTS 3n- 3p).

E.g.

Some rubrics that teacher can use to score learners include:

a) Depth of Reflection (5 marks):

- i. *Excellent (5 marks): Provides a comprehensive and thoughtful reflection on the project experience, demonstrating deep insight into personal growth, learning, and challenges encountered. Clearly articulates how the experience has impacted their understanding and future actions.*
- ii. *Good (4 marks): Offers a good level of reflection, highlighting significant learning and challenges, with some insight into personal growth and future actions. Some areas may lack depth or detail.*
- iii. *Fair (3 marks): Provides a basic reflection that identifies general learning and challenges, but lacks depth, specificity, or a personal connection to the experience. Reflection is superficial or generalised.*
- iv. *Poor (2 marks): Minimal or no reflection on the project experience. The essay lacks insight, detail, or personal connection, demonstrating little understanding of the learning process.*

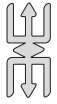
b) Analysis of Learning (5 marks):

- i. *Excellent (5 marks): Clearly analyses specific skills, knowledge, or concepts learned during the project. Provides concrete examples and connects learning to the project goals and objectives. Demonstrates an ability to critically evaluate their own work and the outcomes.*

- ii. *Good (4 marks): Analyses learning with some specific examples, but may not fully connect all points to the project goals or outcomes. Demonstrates some critical thinking, but lacks depth in parts of the analysis.*
 - iii. *Fair (3 marks): Provides limited analysis of what was learned, with few or vague examples. There is minimal connection to project goals or outcomes, and critical evaluation is lacking.*
 - iv. *Poor (2 marks): Fails to analyse learning from the project or provide examples. Little to no connection to project goals or outcomes and lacks critical evaluation.*
- c) Description of Challenges and Problem-Solving (5 marks):**
- i. *Excellent (5 marks): Clearly describes the challenges faced during the project, including technical, personal, or team-related issues. Explains the strategies used to overcome these challenges, demonstrating creative problem-solving and adaptability.*
 - ii. *Good (4 marks): Describes most challenges faced with some explanation of problem-solving strategies, though the description may lack detail or specific examples.*
 - iii. *Fair (3 marks): Mentions challenges but provides little detail on what they were or how they were addressed. The description is vague or lacks specific problem-solving strategies.*
 - iv. *Poor (2 marks): Does not describe any challenges faced or fails to discuss strategies for overcoming them. Shows little understanding of the problem-solving process.*
- d) Organisation and Clarity (3 marks):**
- i. *Excellent (3 marks): The essay is well-organised with a clear introduction, body, and conclusion. Ideas flow logically, and transitions are smooth. The writing is concise, clear, and free of grammar and spelling errors.*
 - ii. *Good (2 marks): The essay is mostly organised, with a clear structure and logical flow, but may have minor issues with transitions or clarity. Contains a few grammar or spelling errors that do not hinder understanding.*
 - iii. *Fair (1 mark): The essay is somewhat organised but lacks a clear structure or logical flow. Contains multiple grammar or spelling errors that make understanding difficult.*
 - iv. *Poor (0 marks): The essay is disorganised, lacks a clear structure, and is difficult to follow. Contains numerous grammar or spelling errors that hinder understanding.*
- e) Use of Evidence and Examples (2 marks):**
- i. *Excellent (2 marks): Uses specific and relevant examples from the project experience to support reflections and analysis. Examples are well-integrated into the essay and enhance the overall argument.*
 - ii. *Good (1.5 marks): Uses examples to support reflections, but some may be vague or less relevant. Examples generally support the essay's points but are not consistently well-integrated.*

- iii. *Fair (1 mark): Provides limited or overly general examples that do not clearly support the reflections or analysis. The use of examples is sporadic or lacks relevance.*
- iv. *Poor (0 marks): Does not use examples to support reflections or analysis, or the examples provided are irrelevant or incorrect.*

Total – 20 marks



Note

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

E.g.

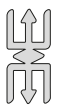
Provide clear and detailed criteria including criterion/pass mark for interpreting the assessment results, etc.

Refer to page 120 of the Teacher Assessment Manual and Toolkits for information on how to administer reporting

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Provide written/oral feedback on each group's work. Highlight specific strengths, such as completeness and organisation of the project report, quality of the work included and identify areas for improvement to guide their learning process etc.



Note

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

3.1 Reflect and share your views on the session (NTS 1a, 1b).

3.2 Identify a critical friend to observe your lesson in relation to PLC Session 23 and provide feedback on your lesson (NTS 1f, 3g).

3.3 Remember to:

- a) provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).

- b) read PLC Session 24 and related Learner Material (NTS 3a).
- c) bring along your Teacher Manual, PLC Handbook and learning plan on *week 24* in preparation for the next session (NTS 3a).

PLC SESSION 24: Preparing for End of Semester Examination

Introduction (20 minutes)

- 1.1 Share one thing on the lesson for *week 23* delivered last week that:
 - a) went well (NTS 1a, 1b and 2a-2e).
 - b) you found challenging (NTS 1a, 1b and 2a-2e).
- 1.2 Share your experience in conducting and/or recording the assessment for the previous week.
- 1.3 Share your observation on what a colleague did by way of application of lessons learned from the previous session for *week 23* that supported learning (NTS 2e, 2f and 3d-3j).

2. Review of Learning Plans (60 minutes)

- 2.1 Read the purpose, learning outcome and learning indicators for the session:

Purpose

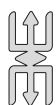
The purpose of the session is to review the learning plan for *week 24 lessons and end of semester examination* by aligning the learning plan with Learner Material and appropriate assessment strategies.

Learning Outcome

Review your learning plan for *week 24 and prepare for end of semester examination* considering the cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o).

Learning Indicators

1. Review the activities in the Learner Material and identify appropriate activities based on the pedagogical approaches in the Teacher Manual that can support your lesson for the week.
 2. Discuss and develop assessment tasks and rubrics/marketing scheme for the learning indicators for the week.
- 2.2 Review the pedagogical approaches proposed for teaching *week 24* in your learning plan, identify activities that align with these in the Learner Material. Indicate the activity(ies) in your learning plan (NTS 2a-2f, 3a - 3j).



Note

The selected activities should be included in the teacher/learner activity section of the learning plan.

2.3 Develop assessment tasks/items based on the learning indicator(s) on assessment for the week. This week’s recommended mode of assessment is **end of semester examination** (NTS 3k, 3p).

E.g.

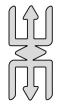
Multiple Choice Question

A finite state machine operates within

- A. One defined set of state
- B. No defined set of states
- C. A defined set of states
- D. An undefined set of states

Essay Type Question

Tabulate two differences between a finite state machine and a controlled feedback loop and give two examples of each.



Note

- i. The assessment tasks/items may cover levels 1 to 4 where appropriate to ensure that assessment is differentiated for all.
- ii. The selected activities should be included in the ‘Assessment DoK aligned to Curriculum and TM’ section below teacher/learner activities of the learning plan.

2.4 Discuss (and agree as a subject group) how you will develop the marking scheme/ rubrics for scoring the assessment task(s)/item(s) for the week’s recommended assessment (NTS 3n- 3p).

E.g.

Multiple Choice Question

Correct answer is C,

1 mark for each for (40 Questions)

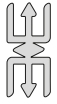
Total – 40 marks

Essay Type Question

Feature	Finite State Machine (FSM)	Controlled Feedback Loop
Structure	Defined states and transitions	Continuous loop with checks inside
Decision-making	Based on the current state and triggering event	Based on the most recent sensor reading
Examples	Traffic light controller, robot performing a sequence of tasks	Line follower, temperature control system

60 marks for Essay Questions

Total: 100 marks

**Note**

- i. *The marking scheme and rubrics for scoring the assessment tasks/items should be included in the 'Assessment DoK aligned to Curriculum and TM' section below teacher/learner activities in the learning plan.*
- ii. *Take into consideration different modes of responses provided by learners.*
- iii. *Discuss how you will observe and integrate character qualities, national values and 21st century skills that align with the lesson for the week and include these in your scoring.*

2.5 Discuss how you will administer the assessment task(s)/item(s) as a subject group (NTS 3n – 3p).

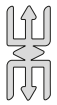
E.g.

Conduct the examination in a controlled environment to prevent cheating etc.

2.6 Discuss how to provide feedback, and where appropriate, record and submit the assessment scores for each learner in the class (NTS 3l – 3n).

E.g.

Schedule and hold a review session the next semester to address learner's strengths and areas needing improvement that emerged during the test etc.

**Note**

In giving feedback on assessment tasks/items, guide learners to make the necessary corrections that will improve learning.

3. Reflection (10 minutes)

3.1 Reflect and share your views on the session (NTS 1a, 1b).

3.2 Identify a critical friend to observe your lesson in relation to PLC Session 24 and provide feedback on your lesson (NTS 1f, 3g).

3.3 Remember to provide constructive feedback to learners and record their assessment scores in the required format and document where appropriate (NTS 3l–3n).



Appendix F: Table of Specification for End of Semester Examination

Learning Indicators	Level 1	Level 2	Level 3	Total
Explore features of selected modelling, programming and simulation tools useful for the design of robots.	2	2		4
Design robots using virtual platforms and use simulation tools and programming IDEs to test the mechanics of the designed robots.	2	2		4
Use a CAD tool to model parts of robotic systems.	2	2		4
Use relevant intermediate tools to prepare modelled files into g-codes and print the designs using a 3D Printer.	3	2		5
Determine the Inputs, Processes and Outputs required to solve a particular problem.				
Define solutions to basic automated and robotic problems using algorithms, pseudocodes and flowchart diagrams.	2	2		4
Describe the effect of mass and centre of gravity on the stability of a structure or robot and strategies for designing systems that can withstand forces.	2	2		4
Build structures for a specified use case and test them for stability and ability to withstand forces.	2	2		4
GEARS (Gear Ratios, Compound Gear Systems, changing angle of rotation using gears, Using worm gears)	2	2		4
VEHICLES (Driving robots with single motors, Driving robots with two motors)	2	2		4
Select one of the three robot types (flapping wing, gripping figure, or lifting mechanism) to build. Plan the robot's components and dimensions based on the intended use and task requirements.	2	2		4
Create programmes that make use of decision structures and loop conditions to control robots.	2	2		4
Create computer programmes from pre-designed flowcharts that have single-decision conditions.	2	3		5
Total	25	25		50

Hint

- i. End of semester examination will cover from weeks 13–24.
- ii. It will consist of level 1 and level 2 questions in the form of Multiple Choice Questions
- iii. The suggested number of questions per week is stated in table of specification.

2. Sample of principles to consider when designing effective multiple-choice questions (MCQ's)

- a) Write clear and concise questions (stems) that are easy to understand.
- b) Ensure that each question aligns with the learning objectives and the material covered in the course.
- c) Include distractors (incorrect options) that are plausible and closely related to the correct answer.
- d) Ensure there is only one unambiguously correct answer for each question. Avoid “all of the above” or “none of the above” options, which can sometimes confuse or mislead students.
- e) Design questions with varying levels of difficulty to differentiate between different levels of students understanding.
- f) Ensure that questions are free from cultural, linguistic, or gender bias. Use language and contexts that are accessible and fair to all learners, regardless of their background.

4. Sample table of specification for developing Multiple-Choice Questions

A finite state machine operates within.....

- A. *One defined set of state*
- B. *No defined set of states*
- C. *A defined set of states*
- D. *An undefined set of states*

Appendix 1: Structure of The Senior High School Internal Assessment and Transcript System

Introduction

This document provides details on the structure of the internal assessment and transcript system for effective implementation of the standards-based curriculum at the SHS level. The structure of the internal assessment involves a comprehensive and systematic approach to evaluating learners' performance and learning progress. The frequency of assessment is carefully planned to ensure regular and consistent monitoring, typically occurring at multiple points throughout the academic term. It is crucial to capture learner assessment scores promptly and accurately for the transcript. Therefore, guidance has been provided to ensure that each assessment is recorded in a timely manner. Effective management of the transcript system requires meticulous organisation and updated technology to handle and store data efficiently. Capacity building and training on effective internal assessment are essential for teachers, heads, assessments officers, providing them with the skills and knowledge to conduct assessments that are fair, ethical and align with learning outcomes for valid results. Engaging learners in internal school assessments fosters a sense of responsibility and self-awareness, encouraging them to take an active role in their educational journey through prompt and effective feedback.

A. Structure

Formative Assessment

This assessment may be conducted during a class period, after completing or during a practical activity, or after a teacher completes a sub-strand, strand, or a learning indicator(s). Distinct types of assessment tools can be used for Formative Assessment. These include:

- Observation during in-class activities
- Standard homework exercise for class discussion
- Question and answer sessions (formal and informal)
- Quizzes (e.g. class pop-ups)
- In-class activities and presentations (individuals and groups)
- Project work (individuals and groups)
- Practical assessments
- Field trips/Presentation of Reports

- Class assignments/Self/Peer Assessments
- Class tests
- Portfolios
- Performance assessments (roleplay, demonstration oral/aural)

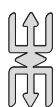
Summative Assessment

Summative Assessment is conducted at the end of the learning sequence (end of semester). It records the learners' overall achievement/performance at the end of the learning sequence. The type of tools used may include:

- Mid-semester examination
- End of semester examination
- Project work/Portfolio/Research/Practical assessments

TABLE 1: Proposed Structure, assessment activities and marks distribution

	Mode of Assessment	Contribution/ Weight	Submission per Year
1	Class Assessments (e.g., Classwork, Quizzes, Homework, Debate, Presentation, Drama & Roleplay, Case Study)	10 %	2
2	Mid-Semester Examination (Assessment/Project/Research)	10%	2
3	Practical or Portfolio or Performance Assessment (Individual)	10 %	1
4	Group Projects, Research, or Case Studies, Practical/Lab work, Workshops, Performances, Presentations (Out of Class)	10 %	1
5	Individual Projects, Research, or Case Studies, Practical/Lab work, Workshops, Performances, Presentations (Out of Class)	20%	1
6	Supervised Individual Semester Assessment/Project/Research/ End of Semester Examination	40 %	2
	Total	100 %	9



Note

Character Qualities/National, Values, 21st Century Skills: Teachers should make a conscious effort to observe these soft skills as learners go about their activities in the class, take notes, and award marks appropriately. Assessment of these skills should be deliberately embedded in the various modes of assessment outlined in the table above.

B. Frequency of Assessment

Table 2 provides a suggested schedule of internal assessment for SHS. It is important to note that whilst assessments should comply with the specific learning outcomes of the subject area, they should cover the 21st century skills and competencies, GESI, SEL and National values as espoused in the TAMT using diversity in assessment modes as suggested in Table 1. Teachers may increase the frequency of assessments using other assessment strategies. The schedules presented should serve as **milestones** for schools to comply with.

Table 2: Suggested schedules of internal assessment for SHS

Semester One															
SN	Modes of Assessment	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Individual Class Assessment(s)				→										
2	Practical or Portfolio** or Performance Assessments (Individual)					→	→	→	→	→	→				
3	Group Projects, Research or Case Studies (out of class)	→	→	→	→	→	→	→	→	→	→				
4	Supervised Individual Semester Assessment													→	→
Semester Two															
SN	Modes of Assessment	15	16	17	18	19	20	21	22	23	24	25	26	27	28
5	Individual Class Assessment(s)				→										
6	Group work or Exercises						→	→	→	→					
7	Practical or Portfolio or Performance Assessments (Individual)	→	→	→	→	→	→	→	→	→					
8	Individual Project work or Research or Case Study		→	→	→	→	→	→	→	→	→				
9	Supervised Individual Semester Assessment													→	→

Note: How and when to capture learner assessment scores for the Transcript.

1. **Individual Class Assessment:** This can include individual classwork. This assessment can begin before week 4, but the evaluation scores should be ready by weeks 4 and 18.
2. **Individual Practical/Performance Assessment:** This form of assessment should include orientation of learners at the beginning to provide enough information

concerning the deliverables, progress review, and feedback processes. The assessment score should be ready by the end of weeks 5 through 10, and 15 through 22.

3. **Group Projects/ Research/Case Studies:** Learners should be grouped to work on a common project, case study or research-based problem. The learners should be given orientation concerning the rubrics and ethical or professional conduct concerning the assessment. The problems, projects, research assignments, or case studies should be related to the learners’ environment. The assessment score should be ready by week 10.
4. **Supervised Individual Semester Assessment:** This may be a written examination or project work. It must be noted that regardless of the mode of assessment, there should be supervision throughout. This assessment should be completed by weeks 13/14 and 27/28.
5. **Individual Project Work/Research/Case Study:** This can include mini-design assignments, investigative or case studies or research-based assignments. The assessment score should be ready by week 24.

Assessments should cover the scope of the 21st century skills and competencies, GESI, SEL and national values espoused in the TAMT. Table 3 gives examples of the scope. Refer to the TAMT for a comprehensive list of the scope.

Table 3: Examples of 21st Century skills and competencies, GESI, SEL and National Values to be covered by scope of assessment

21 st Century Skills & Competencies	GESI & SEL	National Values
<ul style="list-style-type: none"> • Critical Thinking and Problem Solving • Creativity • Innovation • Collaboration • Communication • Global and Local Citizenship • Learning for life • Leadership • Analytic skills • Digital Literacy 	<ul style="list-style-type: none"> • Gender Equality and Social Inclusion • Self-Awareness • Self-Management • Social Awareness • Relationship Skills • Responsible Decision Making • Tolerance 	<ul style="list-style-type: none"> • Respect • Truth and Integrity • Tolerance • Respect • Equity • Communalism • Appreciation • Stewardship • Time Management

Table 4 shows the recommended assessment strategies for the scope in Table 3.

Table 4: Recommended assessment strategies for 21st century skills and competencies

21 st Century Skills & Competencies	Assessment Strategies
Critical Thinking, Problem Solving, Analytical skills	<ul style="list-style-type: none"> • Debates • Analysis of Case Studies based on learners' environment. • Research & Project work. • Objective and Essay type questions/items
Creativity and Innovation	<ul style="list-style-type: none"> • Individual and group projects • Analysis of Case Studies based on learners' environment. • Design & product creation to solve societal problems
Communication and Collaboration	<ul style="list-style-type: none"> • Debates • Group projects. • Presentations • Drama & Role play
Global and Local Citizenship	<ul style="list-style-type: none"> • Research & Project work. • Analysis of Case Studies based on cultural and global issues
Leadership and learning for life	<ul style="list-style-type: none"> • Individual and Group projects • Presentations
Digital Literacy	<ul style="list-style-type: none"> • Research & Project work. • Presentations using ICT tools. • Individual and group projects

The TAMT details the rubrics for the assessment strategies suggested in Table 3. A combination of the assessment strategies could provide diversity and ensure that the assessment scope is effectively covered during formative and summative assessments. It is important to note that the GESI, SEL and National values espoused in the TAMT should be incorporated into the assessment strategies.

C. Learner Involvement

What should learners contribute?

Learners' involvement in the internal assessment processes in schools offers valuable insights into how the learner perceives and experiences of the assessment process. This engagement process grants learners the opportunity to explain areas of confusion, frustration, or unfairness, and these help teachers refine their assessment approaches.

Again, learner involvement fosters communication between teachers and students. This can help clarify expectations, address concerns, and create a more positive learning environment.

When to involve learners

As part of the initial needs assessment for teacher training, gather learner input on areas needing improvement in the Internal Assessment Score (IAS) process. This helps to incorporate learner feedback in developing appropriate teacher training materials.

How should learners be involved?

Teachers should organise focus group sessions, to gather learner feedback on past assessments. This feedback can be used to inform future training sessions for teachers. e.g., Mock assessments and Co-creation of rubric.

Guide learners on the learning outcome expected. Involve them in the development of the assessment rubrics, and checklists to evaluate their progress and identify areas for improvement. Learners would demonstrate respect for diverse perspectives and the ability to work cooperatively with others.

Reflection

Integrate reflective activities such as journaling or discussions where students can analyse their learning experiences and identify areas for growth.

By actively involving teachers and learners in the SBA process, we create a dynamic learning environment. This empowers students to take ownership of their learning journey while equipping teachers with the tools to effectively guide and assess student progress.

Transparency and Setting Goals

At the beginning of a lesson, communicate clearly, the assessment criteria to the learners using appropriate language and structure. Present the information in an organised and coherent manner.

Self-assessment

Incorporate opportunities for self-assessment throughout the learning process. Learners can use rubrics or checklists to evaluate their progress and identify areas for improvement. Learners would demonstrate respect for diverse perspectives and the ability to work cooperatively with others.

Goal Setting

Encourage learners to set achievable learning goals aligned with the assessment criteria. This empowers them to take ownership of their learning journey.

Peer Assessment

Strategically incorporate peer assessment activities where students evaluate each other's work based on established criteria. This fosters critical thinking and collaboration skills.

Student-led presentations or projects

Provide opportunities for students to display their learning through presentations or projects. This allows them to develop communication and presentation skills.

By actively involving teachers and learners in the SBA process, we create a dynamic learning environment. This empowers students to take ownership of their learning journey while equipping teachers with the tools to effectively guide and assess student progress.

D. Feedback Mechanism

A feedback mechanism is a systematic approach for providing learners with information about their performance. This information helps them understand their strengths, identify areas for improvement, and achieve their learning goals. In the multi-subject environment of senior high school, timely and constructive feedback is crucial.

Timely means that feedback is provided soon enough for learners to act upon it after each assessment. Here are suggested general timelines to consider for the following types of assessments:

Type of Assessment	Expected Timeline for Feedback
Individual class assessments (mostly written)	1-3 days
Group assignments	1 week, with interim check-ins for assignments over extended periods of time.
Project work/Semester paper/End of Semester examinations	after key milestones and a final comprehensive review upon completion

For feedback to be constructive, it should focus on the task and not the learner's personality. It should be specific, actionable, and delivered in a way that motivates improvement.

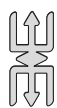
In providing feedback, use the sandwich method (CCC), which starts with a positive aspect of the work (*compliment*), followed by constructive criticism (*correction*), and concludes with another positive note (*compliment*). To set the stage for effective feedback, clearly communicate the learning objectives, expectations, and scoring rubrics before any assessment.

Learners must maintain an “assessment portfolio” where they compile all their assignments, reports, and feedback. Parents and other stakeholders review this portfolio during open days, parent-teacher meetings, or monitoring activities.

Feedback can be delivered using different methods after the assessment is done and marked. The choice of delivery should be guided by best practices and constraints that may exist, such as available time and class sizes. The following are some delivery methods to consider:

- Whole Class Feedback:** The teacher facilitates a discussion about the assessment with all the learners. During the discussion, the teacher should highlight common strengths and weaknesses, provide clarifications, and share best practices.

- **Individual Feedback:** The teacher gives learners personalised (one-on-one) guidance or written comments. Provide *prompts to guide learners* to self-correct their wrong responses.



Note

Provide checklists or rubrics that learners can use to assess their own work before submitting it. This helps them independently identify errors and make the necessary adjustments.

- **Group Feedback:** The teacher groups learners facing similar challenges for targeted instruction and provides them with feedback.
- **Peer Review Feedback:** The teacher allows learners to learn from one another by giving constructive feedback to peers.
- **Self-Reflection:** After receiving feedback, the teacher should encourage learners to analyse their work, identify areas for improvement, and set goals using rubrics as a guide.
- **External Feedback:** In specific cases, the teacher should consider feedback from subject experts, teachers from other institutions, parents, and other stakeholders.

Regardless of the chosen feedback mechanism, note that self-reflection is essential. This allows learners to internalise feedback, set personal targets for improvement, and develop a growth mindset. Following the feedback, teachers are to provide opportunities for learners to correct mistakes through targeted exercises and reassessments.

By implementing these feedback strategies, teachers can empower senior high school learners to become active participants in their learning journey.

E. Transcript System

Effective data management is crucial for informed decision-making in today's dynamic educational landscape. The computerised transcript system achieves this purpose by offering second-cycle institutions with a comprehensive record of learner performance. The transcript system is a centralised repository for learner information. It gathers key details such as learner profiles, semester information, subjects taken with their respective scores (including continuous assessments and end of semester examination), credits, grades, semester, and overall Grade Point Averages (GPAs). Additionally, a dedicated section captures brief descriptions of learners' character qualities at the end of each semester.

There should be at least three individual class assessments, at least one group work and at least one project work.

Appendix 2: Excerpts from The Teacher Assessment Manual and Toolkit

A. Principles of Effective Assessment

As a process of determining the nature and extent of learning and development among learners, it is important to ensure that the assessment process meets the following principles:

1. Validity
2. Reliability
3. Fairness and ethics
4. Transparency
5. Inclusivity
6. Practicability
7. Assessment utility

Developing a valid assessment (Validity of Assessment Results)

To ensure that assessment scores or results are useful and interpreted appropriately, the teacher should:

- i. Clearly state the purpose of the assessment (e.g., what the test will be used for).
- ii. Create a learning and assessment plan (i.e., table of test specification tots)
- iii. Write assessment items or tasks that measure important learning outcomes of the curriculum (e.g., Skills, competencies, collaborative efforts, and lifelong learning).
- iv. Clearly define the performance criteria or standards/schemes/rubrics (i.e., define the specific knowledge, skill or behaviour that learners should demonstrate)
- v. Score or grade assessment task based on the performance criteria to avoid biases, stereotyping, among others.
- vi. Ensure that the content of the assessment aligns closely with the defined criteria (thus, the assessment questions, tasks, or activities should directly measure what they want to assess).
- vii. Interpret the assessment results based on the purpose and the performance criteria.

Reliability (Consistency of Assessment Results)

In assessment, consistent standards of teacher assessment and fairness are important goals to aim for. The ‘connoisseur’ approach to assessment; that is, ‘I know it when I see it, but I can’t put it into words’ is not acceptable. Reliable results must be dependable for decision making.

For an Assessment result to be reliable, the teacher should:

- i. Clearly identify the learning outcomes to be assessed.
- ii. Give learners work or completed assessment tasks and activities to other teacher(s) to review.
- iii. Use multiple assessment strategies to measure the same or similar learning outcomes (e.g., giving the tasks or items of a class exercise as another class exercise or homework or group project) or using different item formats to assess learning outcomes.
- iv. Prepare scoring rubrics or marking schemes with specific weighting (marks) allocated to the items and use it consistently.
- v. Give rubrics of tasks/activities in the case of performance or practical assessment ahead of time.
- vii. Ensure that the load or the length of the tasks are appropriate to the level of the learner (e.g., 25 minutes for 20 items; a project for a week or the term/ semester).
- viii. Administer assessment in a conducive environment that minimise disruption (e.g., noise, lightening, ventilation, among others) and devoid of any cheating.

Fairness and Ethics

Assessment strategies should give learners equitable opportunity to demonstrate what they know and can do taking into consideration their ability, learning styles, gender, special educational needs (SEN), among others. The teacher should:

- i. Ensure that the assessment tasks/activities align with the learning outcomes and content covered in class.
- ii. Use different forms of assessment tasks to assess learning outcomes (e.g., oral assessment, class exercises, class tests, homework, assignments, written tests, projects, and practical demonstrations as well as the end-of-term/ semester assessment).
- iii. Provide clear and detailed instructions to learners about the assessment's format, expectations, and criteria for evaluation.
- iv. Identify learners with SEN and make the necessary adaptation by providing extra time, alternative formats and other necessary accommodations.
- v. Avoid using culturally biased or discriminatory content, unfamiliar words, questioning, or examples in assessments.
- vi. Communicate the assessment plan in advance. For example, date, time, location, and any other relevant logistics.

Transparency

Transparency in assessment refers to making the assessment process and criteria clear and understandable to learners. The teacher should:

- i. Make learners aware of the demand of the assessment tasks.
- ii. Share performance criteria and indicate what will constitute the pass mark.
- iii. Readily share assessment results with the appropriate stakeholders (learners, parents/guidance, teachers).
- iv. Provide opportunity for learners to seek review and redress.
- v. Share the learning outcomes the assessment is designed to measure with learners.
- vi. be ready to share assessment criteria or rubrics when the need arises.

Inclusivity

Inclusivity in assessment will allow teachers to create assessment practices that are fair and accessible to ALL learners (GESI, SEL and SEN).

The teacher should:

- i. Familiarise with the section of inclusivity on the national pre-tertiary learning and assessment framework (NPLAF, page 32).
- ii. Select assessment strategies that are appropriate for different learning needs.
- iii. Assign workload in connection with the developmental and learning needs of learners.
- iv. Work with special education experts in the school system to adapt and accommodate assessment to the needs of all learners (i.e., extra time, alternative formats, or other necessary accommodations should be available).
- v. Make use of different formats (braille, oral translation, text-to-speech, ai, sign language interpretation and other assistive technology forms).
- vi. Develop rubrics that are inclusive (taking into consideration grammar, vocabulary, handwriting, presentation of ideas).

Practicability

For assessment strategies or processes to be feasible, convenient, efficient and successful.

The teacher should:

- i. Ensure that appropriate and adequate assessment materials, resources and security are available.
- ii. Consider appropriate assessment format to match the learning outcome(s), class size, age and ability levels.
- iii. Consider the time available to develop, administer, score and give constructive feedback.

Assessment Utility (utilisation and benefits)

To enhance the usefulness and practical value of assessment tasks/activities, the teacher should:

- i. Clearly state the intended use of the assessment results.
- ii. Identify the essential learning outcome(s) to be covered in the assessment.
- iii. Construct assessment tasks/activities that are well aligned to real-life situations.
- iv. Select and allocate the appropriate resources for the assessment activities.
- v. Provide constructive feedback to learners on their performances.
- vi. Provide credible information that are useful to learners and other stakeholders (teachers, parent/guardians).
- vii. Weigh and indicate the benefits and the cost of the assessment strategies
- viii. to be used.
- ix. Justify the selection of a particular assessment format over the others (objective-type, essay, project, portfolio, demonstration, etc.).

B. Ethical considerations in Assessment

1. Designing and Developing the Assessment

- i. Identify the specific learning outcome(s) to be assessed.
- ii. State clearly the purpose of the assessment(s).
- iii. Specify the content area (i.e. Content Standards and/or Indicators) to be assessed and align them to the learning outcome(s).
- iv. Select appropriate format or strategy that should be in line with the learner's characteristics, learning outcome(s) and resources.
- v. Design different versions (differentiated assessment) of the assessment including the use of alternative strategies of assessment.
- vi. Avoid biased assessment tasks (e.g., task favouring a group of learners such as males among others).
- vii. Avoid using unfamiliar language and materials in writing the assessment tasks.
- viii. Adapt different versions to suit the needs of all learners. For example, make provision for learners with visual impairment by enlarging the font sizes of the assessment instrument and providing braille versions.
- ix. Develop the marking scheme/ scoring rubrics when developing the assessment task.
- x. Include mark allocation on the individual questions that are given when necessary.
- xi. Ensure that the assessment task is stored securely.
- xii. Provide clear direction for administration of the assessments.
- xiii. Consider logistics.

2. Administering the Assessment

- i. Communicate the assessment nature/structure/format, time, content coverage and location of the assessment tasks clearly to learners.
- ii. Ensure the setting is suitable and conducive for the assessment (e.g., lighting, ventilation, less noise among others).
- iii. For learners with SEN establish rapport and communicate in simple and clear language. Provide alternative settings for learners with SEN to meet their specific needs. (e.g., providing individualised accommodations such as writing the assessment in a separate room).
- iv. Provide needed logistics (e.g., answer booklets, first aid, pens and pencils among others) for the assessment task.
- v. For learners with SEN make room for the use of translators, assistive devices such as hearing aids, braille, computers, recorders, and other technologies that are relevant to their needs.
- vi. Administer assessments within appropriate time limits to enhance validity and to minimise the chance for cheating. Provide additional time for learners with SEN.
- vii. For learners with SEN, make room for varied modes such as oral, written, the use of a computer (text-to-speech and speech-to-text) among others.
- viii. Avoid anxiety, intimidating language, and unnecessary announcements.
- ix. Provide learners with anonymous identifiers and codes instead of names to enhance reliability and validity.
- x. In the case of practical/performance assessments, share rubrics and marking schemes with learners.
- xi. Ensure controlled and supervised distribution of assessment materials to avoid leaks or unauthorised sharing.

3. Scoring the Assessment

- i. Consistently make use of the marking scheme/ scoring rubrics.
- ii. Ensure multiple ratings or scoring/grading are done where necessary (e.g., for essay-type questions, practical/performance assessment).
- iii. Focus on the content (i.e., what is being assessed) instead of handwriting, spelling, punctuations, concord, and vocabulary when scoring.
- iv. For learners with SEN considerations should be made for vocabulary, spelling, and grammar especially in the English language.
- v. Provide opportunity for remarking, review, or redress where necessary.
- vi. Record the actual scores/grades of learners as a reflection of their performance. Do not add or subtract marks based on personal influences.
- vii. Keep assessment results of the learners safe (either manually or digitally).

- viii. Consider the use of professional scorers, judges, or raters in the case of External Assessments.

4. Reporting and Feedback in Assessment

- i. Ensure that the learner is aware of those who will be receiving the report.
- ii. Communicate results to authorised persons such as parents/guardians and other teachers.
- iii. Seek permission (informed consent) from the learner or parent/guardian if a third party may be involved.
- iv. Ensure that the true performance of the learner is reported (do not manipulate or distort the results).
- v. Present assessment results without stereotyping or biases.
- vi. Use language and terminology that is respectful and GESI responsive when reporting reports.
- vii. Provide clear and meaningful interpretation of the assessment results.
- viii. Adhere to legal requirements, ethical guidelines and institutional policies governing the reporting of assessment results.

5. Feedback

- i. Provide constructive feedback timely and promptly.
- ii. Emphasise the learner's strengths and opportunities for improvement rather than focusing solely on weaknesses.
- iii. Ensure that the feedback given to the learner, parents/guardians and other teachers reflects the performance of the learner.
- iv. Consider and adjust the mode of providing feedback to suit the needs of learners (consider GESI and SEN issues).
- v. Provide feedback based on the assessment criteria and not on personal influence.
- vi. Avoid displaying and announcing learners' performance unofficially.
- vii. Create opportunities for learners to readily access their results through creation of portals, portfolios and files for individual learners and other stakeholders.
- viii. Ensure collaborative assessment by sharing and taking the learner's information.
- ix. Create opportunities for learners to reflect on their own assessment results and learning.
- x. Give written comments to learners in formative assessment to help the learner track their errors and make the necessary corrections.

6. Interpreting and Using the Assessment Results

- i. Provide clear and detailed criteria including criterion/pass mark for interpreting the assessment results.
- ii. Avoid biases in interpreting the assessment results. Ensure result interpretation is not influenced by gender, religion, ethnicity, personal liking among others.
- iii. Use simple and clear language in the interpretation of the assessment results.
- iv. Interpret assessment results based on evidence and sound assessment practices.
- v. Ensure that the interpretation of the results accurately reflects the learner's ability, skills, competencies and knowledge.
- vi. Ensure the learner is aware of the assessment process and the consequence of the results.
- vii. Ensure assessment results are used for their INTENDED PURPOSE, aligning with the learning outcomes.
- viii. Seek the consent of the learner and parents/guardians before using the assessment results for any purpose.
- ix. Ensure that assessment informs the teaching and learning process in a fair and unbiased manner and provide remediation where necessary.
- x. Ensure that assessment results are confidentially kept and only shared with relevant stakeholders, such as the learner, parents/guardians, and school administrators.
- xi. Avoid using assessment results to label (name-calling), stereotype and discriminate among learners.
- xii. Ensure that results are stored and used in a secured manner.
- xiii. Avoid discussing the learner's results and performance unofficially with others (e.g., with other teachers, staff, learners and among others).

C. Differentiated Assessment

Differentiated assessment adapts strategies to diverse learning needs, strengths, and interests of all learners. Teachers tailor assessments to accommodate varying levels of readiness, learning styles, and preferences that ensure that all learners have equitable opportunities to demonstrate their understanding and skills.

To implement differentiated assessment, teachers should consider the following:

- i. *Varied assessment formats*: provide a range of assessment options, such as written assignments, oral presentations, projects, or multimedia presentations. This allows learners to exhibit their knowledge and skills using formats that align with their abilities and strengths.
- ii. *Flexible deadlines*: give learners the opportunity to complete assessments within a flexible timeframe. This considers different learning paces and allows learners to manage their time appropriately.

- iii. *Varying tasks*: Vary levels of difficulty for assessment tasks, allowing learners to choose the one that best suits their needs and challenges them appropriately.
- iv. *Accommodations*: Provide necessary accommodations for learners with unique learning needs, such as extended time, modified formats, or additional resources to support their assessment process.
- v. *Individualised feedback*: Provide individualised and constructive feedback that addresses the learner-specific needs and areas for improvement. Tailoring feedback to specific standards and learning outcomes can help learners understand their strengths and areas for improvement.
- vi. *Learner involvement*: Involve learners in the assessment process by encouraging self-reflection, self-assessment, and goal setting. Engaging learners in dialogue about their learning and assessment promotes

D. Guidelines on how to Construct Multiple Choice Questions (attachment)

1. Clearly define the purpose of the test/assessment
2. Define the learning outcome (i.e. knowledge, comprehension, skills, or competencies) you want learners to demonstrate through MCQs.
3. Prepare a table of test specifications or blueprints.
 - i. List topics and subtopics covered during the instructional period
 - ii. Distribute the number of test items among course content and instructional objectives or behaviours.
4. Write the test items (note: it should match the content and DoK levels stated in the table of test specification).
 - i. The central issue of the items should be in the question statement (stem).
 - ii. The options should be plausible and homogeneous in content.
 - iii. All options must follow syntax and punctuation rules.
 - iv. Repetition of words in the options should be avoided.
 - v. Vary the placement of the correct option (appropriately, arrange options in alphabetical order, ascending or descending or in order of magnitude if using numbers or dates).
 - vi. Stems and options should be stated positively. However, a negative stem could be used sparingly, and the word should be emphasized either by underlining it or writing it in capital form (e.g. **not**, **NOT**, not; **except**, **EXCEPT**, except).
5. Write clear directions/instructions. (e.g. Answer All Questions. All questions carry equal marks, Select/Choose from the alternative lettered A-D the correct answer).
6. Review the test items (go through items again after construction i.e. after a few days to week).

7. Prepare scoring key (scoring keys should be prepared concurrently with item construction).

E. Common Assessment Used in the Classroom

Class Exercise As An Assessment Strategy

Description: Class exercise as an assessment strategy are tasks designed to evaluate learner's understanding, knowledge, and skills related to a particular subject to gauge how well learners are grasping a content being taught.

Teachers should mainly use class exercises for formative purposes to assess learners across all subject areas, which can take various forms, such as quizzes, problem-solving tasks, group discussions, reflective questions, case studies, question and answer and practical activities, performance, observation, checklist/rubrics and demonstration providing valuable insights into the learning process.

Purpose: Class exercises can be used to:

- i. Help identify learning gaps in comprehension, retention, application of knowledge, values and attitudes.
- ii. Allow for immediate feedback and clarification of concepts.
- iii. Encourage active participation of learners for deeper understanding.
- iv. Modify teaching and learning techniques, strategies, and resources based on learning outcomes.
- v. Gradually build learners performance in a lesson over time to reduce summative test anxiety.
- vi. Help identify learners who may require special educational support.
- vii. Accommodate different learning styles and abilities, including group work and multiple representations for learners with special educational needs.

Settings

- i. Classroom
- ii. Laboratory/Workshops/Resource Centres/Libraries
- iii. Studios
- iv. Field (school park/garden or community spaces)
- v. Online learning platforms/Virtual classrooms e.g. Zoom, Class WhatsApp pages, Google classrooms.

Time frame: Class exercises often take place in a lesson and may be conducted before, during and after a lesson depending on the learning outcome and the duration of the lesson.

Class size: Class exercises may be conducted for learners either individually, as a group or whole class.

Steps

Before

The teacher should:

- i. Define the learning outcomes.
- ii. Design exercises using simple and clear language.
- iii. Select relevant exercises based on nature of the class exercise and desired skills/knowledge to be attained. E.g. quizzes, case studies etc.
- iv. Develop and discuss assessment criteria with learners.
- v. Set a reasonable time frame for completion of exercises to maintain focus and efficiency.
- vi. Clearly communicate instructions, including format, length, and resources.

The learner should:

- i. Read and understand instructions to ensure a thorough understanding of the exercise provided.
- ii. Collect all available required resources and tools for the task/exercise.

During

The teacher should:

- i. Assign task/exercise based on the learning outcome as well as learners with special needs.
- ii. Walk around the classroom and observe learners as they work on the exercise.

The learner should:

- i. Organise and set up their work area to facilitate a smooth workflow.
- ii. Plan how to approach the exercise, considering instructions and steps or techniques to employ.
- iii. Commence class exercise timely and promptly to work within the given time for completion of the task.

After

The teacher should:

- i. Evaluate the assessment outcome based on the assessment criteria with the learners.
- ii. Provide constructive feedback for learners' performance for discussions.

NB: Teachers should pay attention to learners with special educational needs.

Reflect and modify teaching and learning strategies and resources based on feedback received.

The learner should:

- i. Reflect, self and peer assess their exercises and provide constructive feedback.
- ii. Use the feedback to improve on their work/exercises.

Homework As An Assessment Strategy

Description: Homework or assignments as an assessment strategy involve the use of structured tasks or projects that learners complete outside of regular class time to evaluate their understanding, knowledge and skills gained in a specific learning outcome. This assessment strategy can take various forms, such as written assignments, projects, research papers, problem sets, essays, or creative tasks.

Some concepts that can be assessed using homework/ assignments include menu planning and recipe development, problem solving exercises in mathematics, hands-on experiments and observations, creative writing assignments and art projects, map development and application of GIS in locating places.

Purpose: The key purposes of using homework/assignment as an assessment strategy by the teacher include:

- i. Assessment of Understanding
- ii. Application of Knowledge
- iii. Reinforcement of Learning
- iv. Independent Study
- v. Provision of valuable feedback
- vi. Skill Development
- vii. Assessment of Diverse Abilities

Settings

- i. Classroom
- ii. Field work
- iii. Online platforms
- iv. Home

Class Size: Depending on the intended learning outcomes, assignments/ homework can be structured for either:

- i. Small class sizes
- ii. Large class sizes

Time Frame: The time frame for conducting assignments can be adjusted based on the desired learning outcomes and the complexity of the task.

- i. Short-term Assignments (Daily or nightly homework and weekly assignments)
- ii. Medium-term Assignments (Bi-weekly or monthly assignments)

- iii. Long-term Assignments (Semester/ term-long assignments)

Steps

Before

The teachers should:

- i. Clearly define the learning outcomes intended to be achieved
- ii. Design/ Create a well-structured assignment with clear instructions and expectations.
- iii. Adapt to the needs of diverse learners especially those with special needs
- iv. Provide Resources such as textbooks, online materials, or reference materials, to support learners in completing the assignment successfully.

During

The teachers should:

- i. Keep track of learners' progress on the assignment.
- ii. Be available to answer questions and provide clarification during the assignment phase.
- iii. Provide formative feedback and guidance to help students improve their work.
- iv. Teach learners how to properly cite sources and use information ethically/ avoid plagiarism.

The learner should:

- i. Seek clarification about the task from teachers or peers where necessary
- ii. Actively work on the homework, focusing on comprehension
- iii. Manage their time effectively
- iv. Learners can reach out to their parents/guardians, peers, or online resources for guidance and clarification in responding to the tasks

After

The teacher should:

- i. Evaluate the completed assignments using clear and consistent grading criteria
- ii. Analyse student performance to identify common strengths and areas for improvement.
- iii. Discuss feedback with learners
- iv. Reflect on the outcomes of the assignment.
- v. Share the results of the assignment with learners
- vi. Acknowledge and celebrate learners' achievements to boost motivation and self-esteem.

The learner should:

- i. Review their work to identify errors or areas for improvement.
- ii. Reflect on what they have learned
- iii. Bring up questions that were confusing for class discussion.
- iv. Use feedback to learn from their mistakes and improve performance.

Discussion As An Assessment Strategy

Description: Discussion is a formative assessment strategy that involves using verbal communication and group interaction to assess learners' understanding, knowledge, and skills. The teacher is to observe and assess learners' contributions, ability to analyse and synthesise information, and provide feedback based on their performance. It can be used for both formative and summative assessments.

Discussion can be used in all subject areas of the secondary education curriculum depending on the purpose of the assessment and learning outcomes under consideration.

Purpose: The following are the purposes of discussion as an assessment strategy:

- i. Build knowledge and develop a learner's critical and creative thinking.
- ii. Develop learners' communication skills.
- iii. Increase the depth of the learner's understanding and eliminate misconceptions.
- iv. Engage learners in active participation in the lesson.

Setting

- i. A classroom
- ii. Small groups
- iii. Seminars
- iv. Online learning platforms (virtual classroom and discussion forum)
- v. Fieldwork

Time frame: Appropriately, discussion as an assessment strategy can last for a lesson depending on the learning outcomes and learning indicator.

Class size: The class sizes appropriate for discussion as an assessment strategy can vary from small class to large/whole class.

Steps

Before

The teacher should:

- i. Determine the learning outcomes to be assessed.
- ii. Specify the content to be learnt that aligns with the learning outcome.
- iii. Give prepared questions to guide the discussion (i.e., make use of open-ended questions, adaptive to the diverse/abilities of learners)

- iv. Establish discussion guidelines or rules (let learners know what is expected of them, the content of the discussion and the format of the discussion i.e., individual, small or whole class)

The learner should:

- i. Read any assigned readings, watch videos, or engage with other course materials related to the discussion topic.
- ii. Take notes while reviewing the materials on important concepts, arguments, or evidence.
- iii. Reflect on their own experiences, prior knowledge, or relevant examples that relate to the discussion topic.
- iv. Seek clarification if needed.

During

The teacher should:

- i. Start and facilitate the discussion (ensure that all learners could participate and encourage learners to engage in critical thinking and reflective thinking).
- ii. Monitor and assess learner's participation (encourage self and peer assessment).
- iii. Provide constructive feedback on learners' responses and contributions. NB. Teachers are advised to manage all learners' responses and accommodate them but must be fair and ethical.

The learner should:

- i. Pay attention, maintain eye contact, and be open to different viewpoints and contributions from mates.
- ii. Share their own unique perspectives, insights, and experiences related to the discussion topic.
- iii. Take notes during the discussion to capture key points, new understanding, or questions that arise.
- iv. Ask follow-up questions, seek clarification, or offer alternatives or suggestions respectfully.

After

The teacher and the learners reflect on the discussion in relationship to the expected learning outcomes to check whether the learning outcomes have been achieved.

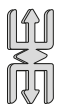
Case Study As An Assessment Strategy

Description: A case study can be used as an assessment and or pedagogical strategy. Usually, it is used as an assessment strategy to examine a learner's ability to apply acquired knowledge, skills and experiences by carefully investigating a particular circumstance or scenario to provide solutions to real-life situations. Usually, it will have the following components:

1. Theme
2. Case description
3. Study of the case
4. Class Discussions
5. Conclusion and reflection

Types of case studies

- i. Descriptive case studies: The teacher should ask learners to analyse and explain the key features and characteristics of the case.
- ii. Explanatory case studies: The teacher should ask learners to give detailed information on the case by identifying and explaining the factors that contributed to the situation.
- iii. Exploratory case reports: The teacher should ask learners to gather information, analyse data, and draw conclusions about a topic where limited information is available
- iv. Cumulative case studies: The teacher should encourage learners to synthesise and integrate their learning across different subjects



Note

Any of these can be done individually or as a group depending on the class size. For large class sizes, a group of 3 to 5 members should be used.

Purpose: The purpose of a case study is for learners to apply acquired knowledge, concepts and theories to solve real-life situations. What should the teacher consider before using a case study as an assessment strategy?

- i. The complexity of the content standard
- ii. The availability of resources
- iii. Ability level of learners
- iv. Time
- v. Class size

Steps: To ensure a well-structured and quality case study, it is important for the teacher to consider the following:

Before

The teacher should:

- i. Clearly define the learning outcomes to be assessed.
- ii. Identify appropriate issues or cases to be investigated.
- iii. Determine the format of the case study (e.g., written document, a multimedia presentation, a video, or a combination of these), depending on the resources available.

- iv. Inform the learner on what to do, time frame, and expectations.
- v. Provide materials (i.e., text, videos, pictures etc.) for the case study discussion.
- vi. Develop and provide a clear scoring rubric that outlines or defines quality
- vii. work to learners.

During

The teacher should:

- i. Create and maintain a sound environment for the case study discussion.
- ii. Bring the whole class together and invite each group to share their findings, solutions, or recommendations.
- iii. Ask open-ended questions on the issue of discussion to clarify any misconception.
- iv. Incorporate peer assessment or peer grading as part of the process.

After

The teacher should:

- i. Provide constructive feedback on learners' responses.
- ii. Ask the learners to reflect on their learning process, such as what they learned, what they found difficult, or what they would do differently.
- iii. Summarise the main points and lessons learned from the case study and link them to the learning outcomes and content.

Ethical Considerations: In the use of case study as an assessment strategy, the teacher should:

- i. Discuss ethical considerations with learners, especially in cases that involve sensitive or potentially controversial topics (e.g., gender, cultural, social, emotional, political and religious issues) when selecting and discussing a case.

Documentation and Record-Keeping: The teacher should keep records of assessments and learners' submissions to maintain transparency and fairness (e.g., portfolio)

Portfolio Assessment- General

Description: A portfolio assessment is an evaluative tool to measure learners' understanding in a comprehensive manner, looking at the overall progress instead of individual marks from tests and quizzes.

Purpose: Portfolio assessment is used to establish various cognitive achievements as well as practical competencies. Portfolio assessment could be used for the different levels of Depth of Knowledge (Levels 1 – 4). It helps teachers identify areas where the learner may need additional support or resources to improve learning and provide a wide variety of learners' mastery of a particular standard and growth over a defined time.

Types of Portfolio Assessments: A portfolio is a systematic collection of learners' work that represents learner's activities, actions, and achievements over a specific period in one or more areas of the curriculum. There are three main types of portfolios:

1. Assessment Portfolios
2. Teaching and Learning or Working portfolios
3. Showcase portfolios

Assessment Portfolios

Assessment portfolios, also known as evaluative portfolios, contain work that has been evaluated according to set standards or criteria. These portfolios demonstrate a learner's ability to meet specific learning standards. They often contain rubrics, test results, learner reflections, teacher's notes, and graded assignments. For instance, in a science class, an assessment portfolio may contain lab reports, results from class tests, assessed projects, and the learner's reflection on their learning throughout the term/semester/year.

Teaching and Learning or Working Portfolios

Teaching and learning or working portfolios are formative in nature. They allow a learner to demonstrate his or her ability to perform a particular skill. For example, a working portfolio may include a collection of lab reports during a semester (term) that highlight a learner's improving ability to create hypotheses.

Showcase Portfolios

Showcase portfolios are summative in nature. They include samples of a learner's best work to demonstrate mastery at the end of a unit of study, semester or school year. The showcase portfolio allows the learner to select their most outstanding work, hence demonstrating their highest level of learning and achievement. It can contain final drafts of assignments, projects, or any piece of work that the learner is particularly proud of, demonstrating the learner's mastery of the relevant skills.

What is in a Portfolio?

A portfolio contains the following:

1. Completed assignments and evaluations (e.g., Self-Assessment, Peer- Assessment)
2. Journal writings (daily report – Date, Time and Activities)
3. Reflections on discussions
4. Photos, sketches, and other visuals
5. A summary statement made at different points regarding what has been learned/ achieved.

Setting: The portfolio assessment strategy can be used in the following settings:

1. Project-Based Learning
2. Independent Study and Research Projects
3. Classroom-based assessment
4. Field Work

5. Exhibitions/ Fairs
6. Problem-based Learning
7. Laboratory environment
8. Studio
9. Resource Centres

For all approaches, the portfolio must demonstrate clear and close adherence to specific learning outcomes in the curriculum.

Steps

Before

The Teacher should:

- i. Determine the purpose of the portfolio. Decide how the results of a portfolio evaluation will be used to inform the subject.
- ii. Identify the learning outcomes the portfolio will address.
- iii. Decide what learners will include in their portfolio. Portfolios can contain a range of items—plans, reports, essays, resumes, checklists, self-assessments, references from employers or supervisors, and audio and video clips. Limit the portfolio to 3-4 pieces of learner’s work and one reflective essay/memo.
- iv. Identify or develop the scoring criteria (e.g., a rubric) to judge the quality of the portfolio.
- v. Establish standards of performance and examples (e.g., examples of a high, medium, and low-scoring portfolio).
- vi. Create learner instructions that specify how learners collect, select, reflect, format, and submit.
- vii. It is the teacher’s responsibility to help learners by explicitly tying subject assignments to portfolio requirements.

During

The learner should:

- i. Collect evidence related to the outcomes being assessed.
- ii. Select the best and appropriate evidence and label each piece of evidence according to the learning outcome being demonstrated.
- iii. Be guided on how to write a one or two-page reflective essay/memo that explains why they selected the particular examples, how the pieces demonstrate their achievement of the program outcomes, and/or how their knowledge/ability/attitude changed.
- iv. Be guided on how to format requirements (e.g., type of binder, font and style guide requirements, online submission requirements).
- v. Be given submission (and pickup) dates and instructions.

After

The teacher should:

- i. Clearly establish the criteria for evaluating/scoring in a consistent manner
- ii. Mark and record learners' performances
- iii. Reflect on the activity and learner performances
- iv. Provide constructive feedback to the learner
- v. Identify learners with SEN who may need extra support

The learner should:

- i. Reflect on the feedback received
- ii. Revise their work for final submission

Time Frame: Deciding on a time frame for Portfolio assessment depends on and includes the following:

- i. Nature of project/problem or assignment
- ii. Class size
- iii. Resources

However, based on the learning outcome(s) the appropriate time frame for this portfolio is a week for minor activity and a term for extended projects, especially in Art and Design or Performing Arts.

Form

- i. Individual learner's portfolios when the class size is relatively small.
- ii. Group portfolio when the size is relatively large.
- iii. Whole class/ school

Research As An Assessment Strategy

Description: Research as an assessment strategy is a systematic process of inquiry and investigation that aligns with a particular learning outcome to develop knowledge and understand a phenomenon. It involves identifying an issue in need of investigation, collecting and analysing data, conducting experiments, and drawing conclusions based on the findings. Once learners have completed their research work, they will write a report and do a presentation on their findings.

Purpose: Research as an assessment strategy is used to assess learner's ability to:

- i. Identify a problem and gather information (data) from a variety of sources.
- ii. Evaluate the credibility and accuracy of information.
- iii. Analyse and synthesise information from multiple sources.
- iv. Communicate their findings clearly and concisely.

Setting

- i. Classrooms
- ii. Factories/ Industries
- iii. School farms
- iv. School communities
- v. Libraries
- vi. Homes.
- vii. Fieldwork
- viii. Workshops

Class Size: As a teacher, depending on the number of learners in your class, individual or group research-based assessment can be used. However, teachers can create large groups for complex research, where different members can focus on specific aspects of the research.

Time Frame: The time frame for conducting a research-based assessment can vary depending on the complexity of the learning outcomes (skill to be achieved) may be:

- i. Short-term
- ii. Medium-term
- iii. Long term

Steps

Before

The teacher should:

- i. Define the learning outcomes.
- ii. Develop a theme in line with learning outcomes.
- iii. Design the research work and provide a description that is in line with learning outcomes.
- iv. Define specific tasks to be undertaken in developing the research.
- v. create a timeline.
- vi. Select resources and materials needed.
- vii. Provide guidance and support for learners.
- viii. Develop clear assessment rubrics.
- ix. Provide feedback and revisions.

During

The teacher should:

- i. Provide clear guidelines for developing the research and how to assess it.
- ii. Design and plan the research work to align with the learning outcomes.

- iii. Provide necessary resources, materials, and support to help learners succeed in their research work.
- iv. Guide learners in reflecting on their research-based assessments and help them develop metacognitive skills.

After

The teacher should:

- i. *Alignment with learning outcomes:* The research work should be aligned with the learning outcomes of the content standards. This means that the research work should allow learners to demonstrate their understanding of the course material and to develop the skills that are being taught.
- ii. *Originality:* The research work should be original and not simply a rehash of existing information. Learners should be encouraged to develop their ideas and to come up with their conclusions.
- iii. *Critical thinking:* The research work should demonstrate that learners can conceptualise, apply, analyse, synthesise and evaluate the information they have gathered and come out with an action plan.
- iv. *Communication skills:* The research work should be well-written and well-organised. Learners should be able to communicate their findings clearly and concisely.

Practical Assessments

Description: Practical assessment gauges a student's capacity to use their knowledge and abilities in practical and hands-on settings. It involves evaluating learners' ability to perform specific tasks and demonstrate practical skills. It includes laboratory experiments, simulations, demonstrations or projects.

The exact nature of the assessment will depend on the subject or area a teacher is interested in.

Purpose: The purpose of conducting a practical assessment is to:

- i. Evaluate learners' proficiency, problem-solving capacity, and aptitude for carrying out tasks.
- ii. Create and deliver tests that ask learners to complete real-world assignments, experiments, or demonstrations.

Setting: Teachers can use practical assessment in the following settings:

- i. Classroom
- ii. Laboratory
- iii. Field
- iv. School farms/gardens/community
- v. Technical workshops
- vi. Science fair

- vii. Virtual/Digital/Remote
- viii. Co-curricular activities and clubs
- ix. Outdoor spaces
- x. Workplace
- xi. Team project

Time Frame: Based on the learning outcome and the skills to be acquired, a Practical assessment can be done in a week, at the end of a term or year depending on the project.

Class size: Class size suitable for practical assessment can be individual, group or whole class

Steps

Before

Learners can understand the content and theory being used by;

- i. Reviewing the theoretical concept
- ii. Familiarising themselves with the concept under assessment

Choosing experimental design, learners are required to;

- i. Design an experiment using the theoretical concept.
- ii. Outline the stages/process for the experiment and formulate hypotheses.

Gathering materials

- i. Make a list of the tools and supplies you will need.
- ii. Ensure that the necessary materials are available

During

Choosing experimental procedure:

- i. Learners are required describe the step-by-step process in detail including how to control extraneous factors, along with any safety precautions.

Gathering and analysing data

With support from teachers, learners are required to:

- i. Measure the dependent variable appropriately at various factor values to collect data.
- ii. Analyse the data meaningfully.
- iii. Sort, examine, and derive conclusions from the data analysis

After

Display of findings

- i. Give a concise visual summary of the results.

- ii. Address any restrictions or mistakes.

Reflection and improvement

- i. Consider your advantages and disadvantages.
- ii. Improve the design of upcoming experiments.
- iii. Throughout the process, place a strong emphasis on ethics, integrity, and seeking advice as appropriate.
- iv. Encourage a critical and inquisitive outlook on learning.

Debate As An Assessment Strategy

Description: Debate as an assessment strategy involves structured arguments and discussions to evaluate learners' knowledge and understanding of issues/ideas. It encourages research and articulation of views; it can be used for formative or summative assessments. Types of debates include formal debates with rules and roles and informal debates, which are more flexible.

Purpose: Using debate as an assessment strategy offers a comprehensive evaluation of learners' ability to generate ideas based on their knowledge and understanding of concepts and confidence in supporting their own ideas.

Settings

- i. Classroom
- ii. Performance spaces (e.g. dining hall, assembly hall, laboratory)
- iii. Electronic platforms
- iv. Music and drama theatre

Class Size: Depending on the learning outcomes to be achieved debates can be organised in:

- i. Small classes
- ii. Large classes

Time frame: The teacher can conduct a debate within a single class session, it can also span over several class sessions or weeks.

Steps

Before

The teacher should:

- i. Select appropriate motion/ topic, ensuring it is relevant to the learning outcome
- ii. Offer resources and materials to support learners
- iii. Assign roles /create teams or pairings
- iv. Establish rules and procedures

The learner should:

- i. Undertake research regarding the debate's topic or motion
- ii. Play an active role as a team member (in team-based debates)

During

The teacher should:

- i. Host the debate
- ii. Ensure effective time management
- iii. Monitor and take notes

The learner should:

- i. Participate in the debate
- ii. Listen and take notes
- iii. Counter argue when necessary

After

The teacher should:

- i. Facilitate a debriefing session (Teachers should utilise the debriefing sessions to address any misunderstandings or questions that come up from the debate. They should also highlight the key concepts and important lessons based on the learning outcome)
- ii. Implement peer assessments.
- iii. Organise follow-up activities as necessary.

The learners should:

- i. Reflect on their performance and the debate as a whole.
- ii. Assess their peers' performances based on established criteria.

The Test of Practical Knowledge (TPK) Assessment Strategy

Description: This assessment is tailored to evaluate a learner's capacity to apply acquired knowledge in real-life situations by engaging in hands-on tasks or simulations that mirror real-world scenarios, assessing practical skills, problem-solving abilities, and the application of practical knowledge theoretically. It aims to gauge how effectively learners can employ their knowledge to solve problems or accomplish tasks.

Purposes: The general purpose of the test of practical knowledge is to assess learners' ability to apply practical knowledge in theory to:

- i. Evaluate their application-based understanding.
- ii. Assess their problem-solving skills.
- iii. Measure the learner's practical knowledge and its use in real-life situations.
- iv. Provide insights into a learner's ability to transfer practical knowledge into theoretical actions.

Setting: The Test of Practical Knowledge is conducted in environments that simulate real-life situations relevant to the learning outcome and the context being assessed. This could be a

- i. Classroom
- ii. Laboratory
- iii. Field
- iv. School farms/gardens/community
- v. Technical workshops
- vi. Science fair
- vii. Virtual/Digital/Remote
- viii. Outdoor spaces
- ix. Workplace
- x. Team Project

Class Size: The size of the class can vary based on resources and the nature of the practical tasks. It could be individual, smaller groups, or whole class.

Time Frame: The timing for assessing the Test of Practical Knowledge can range from a single session to multiple sessions, depending on the complexity of tasks and skills being assessed.

Steps

Before

The teacher should:

Provide clear instructions and resources needed for the tasks.

Clarify any doubts about the assessment task.

The learner should:

- i. Seek clarification from the teacher or other relevant persons before starting the assessment.
- ii. Familiarise themselves with theoretical concepts beforehand.

During

The teacher should encourage teamwork and effective communication if tasks involve group work.

The learner should

- i. Focus on applying learned concepts to solve problems or complete tasks accurately within the given context.
- ii. Manage time efficiently to complete tasks within allocated timeframes.

After

The teacher should encourage learners to reflect on their performance, review their work, and identify areas for improvement.

Performance Assessment Strategy

Description: In its simplest terms, a performance assessment is one which requires learners to demonstrate that they have mastered specific skills and competencies by performing or producing something. It is important that the task be meaningful and engaging to learners. When learners perform tasks that are meaningful and engaging to them, they can take ownership of their learning and effectively work, either independently or in collaboration, depending on the requirement of the task. Performance assessment can be used as either formative or summative tool.

Purpose: The main purpose of this assessment strategy is to provide learners with the opportunity to demonstrate their knowledge and understanding about a concept and communicate that understanding through a performance task.

Setting: Performance assessment can be used in the following settings:

- i. Classroom
- ii. Laboratory/workshops
- iii. Field
- iv. Theatre

Time Frame: Teachers should note that the learning outcome and learners' achievement expectations may inform the appropriate time frame for the use of performance assessment. However, the designated time of completion of the assessment task should not be too short or too long.

Class Size: Performance assessment works best for all forms of class size. Teachers should, however, be strategic in making learners work individually or in moderate/large groups depending on the unique situation.

Steps: To develop and implement performance assessment, teachers should:

Before

The teacher should:

- i. State the purpose of the assessment.
- ii. Specify the learning outcome to be assessed using the performance assessment strategy.
- iii. Make learners aware whether they will work individually or as groups (e.g., group of 2-5).
- iv. Design a performance task which requires the learners to demonstrate the intended skills and knowledge required of them.
- v. Discuss with learners the rules of engagement which includes the performance criteria that specifies the extent to which learners have mastered the skills and knowledge.

- vi. Discuss with learners the available resources to be used.

The learner should:

- i. Make ready the available resources that will help them perform the assessment task.
- ii. Seek for clarification on the performance task to be performed when necessary.

During:

The teacher should:

- i. Monitor and ensure serenity of the environment for learners to work effectively as individuals or groups as in the case of a laboratory/field/workshop exercise.
- ii. Guide learners to complete the assigned task(s) within the stipulated time.

The learner should:

- i. Design the artifact or the idea using the available resources.
- ii. Should submit the performance product to class at the stimulated time for evaluation.

After:

The teacher should:

- i. Collaborate with learners to evaluate the performance task(s) outcome.
- ii. Communicate constructive feedback of the assessment to the learners.
- iii. Provide information on how the assessment feedback would be used.

The learner(s) should:

- i. Offer constructive feedback on their colleague's work.
- ii. Self-reflect and make use of constructive feedback to shape his/her work.

Demonstration As An Assessment Strategy

Description: Demonstration as an assessment strategy offers a practical and effective way to evaluate learners' knowledge, skills, and abilities by observing their performance in a real or simulated context. This may include a presentation, a practical experiment, a role-play, a performance, or a project.

Purpose: The main purpose of using demonstration as an assessment strategy is to allow learners to showcase their skills and competencies through practical application. Some of the areas in which learners can demonstrate their proficiencies are:

- i. Problem-solving skills
- ii. Critical thinking abilities
- iii. Communication

Settings

- i. Classroom
- ii. Laboratory/ Workshop /Studio
- iii. Simulation studio/environment
- iv. Field or real-world settings (e.g., field trips, community projects, or internships)
- v. Performance spaces (e.g., theatre, music room, or sports field/studio/rooms)
- vi. Online/remote/virtual platform

Time Frame: The time frame for conducting demonstration as an assessment strategy depends on the following:

- i. Learning outcome(s)
- ii. Complexity of the task to be performed
- iii. Resources

NB: The teacher should provide the learner enough time to demonstrate their abilities and ensure the assessment process is managed within the constraints of the learning environment.

Class size: Demonstration can be used for individuals or groups (large or small groups) for the reasons of attention, support, and prompt feedback on factors such as assessors, resources and equipment, learning outcome and the assessment environment.

Steps

Before

The teacher should

- i. Set clear expectations of the learning outcomes, specific skills, knowledge and competencies.
- ii. Provide instructions for the demonstration to include safety precautions, criteria for assessment and time.
- iii. Provide learners the opportunity to rehearse the task or the activity to be demonstrated.
- iv. Provide the needed materials and resources to be used for the demonstration.
- v. Address the concerns of the learners raised after the rehearsals.
- vi. Distribute the task to the learner(s) considering Special Education Needs - SEN)

The learner should:

- i. Understand the learning outcomes, specific skills, knowledge, and competencies expected of them.
- ii. Take the necessary steps to prepare for the demonstration by reviewing the instructions and rehearsing the expected knowledge, skills, and competencies.

- iii. Seek clarification about the instructions and materials to be used for the demonstration.
- iv. Take the opportunity to practice and refine their skills or knowledge before the demonstration.
- v. Reflect on their previous learning and experiences related to the skills or knowledge being assessed.

During

The teacher should:

- i. Observe the learner's performance of the task demonstrated.
- ii. Provide continuous guidance to learner(s) on the task especially when they are working with or in hazardous situations.
- iii. Monitor the progress of the learner(s) on the task.
- iv. Pace the timing of the demonstration such that differentiation is considered.
- v. Assess the performance of the learners on the task.
- vi. Take notes of critical issues such as learners' strengths and areas for improvement

The learner should:

- i. Focus on the demonstration and actively listen to the instructions and explanations provided.
- ii. Carefully watch the demonstration, noting the steps, techniques, and key details being shown.
- iii. Take notes of important points, steps, or tips during the demonstration to refer to later.
- iv. Request feedback from the demonstrator or peers to ensure they are on the right track and identify areas for improvement.

After

The teacher should:

- i. Provide constructive feedback to the learners based on observations highlighting areas of improvement, reinforcing correct techniques, and encouraging further practice.
- ii. Review notes to consider where learners have performed well and areas that need improvement
- iii. Provide support to learners who may be struggling with the demonstrated skills. This can involve additional explanations, demonstrations, or one-on-one assistance.

The learner should:

- i. Reflect on their own performance during the demonstration and assess their understanding and execution of the demonstrated skills or techniques.

- ii. Share their performance and ask for feedback to improve their learning.
- iii. Identify specific areas where they need further assistance or practice; they can seek out additional resources such as tutorials, online courses, or books to support their learning and assessment.

Questioning As An Assessment Strategy

Description: Questioning as an assessment strategy is the practice of engaging learners in an interactive dialogue or a series of carefully crafted questions to evaluate their understanding, knowledge, skills, and critical thinking abilities. Teachers can use questioning as an assessment strategy in all learning areas or subjects.

Purpose: Questioning as an assessment strategy can be used by the teacher to:

1. Identify learning gaps through the assessment of the level of comprehension, retention and application of knowledge, and skills gained by learners in achieving a learning outcome of a given content.
2. Actively engage learners in the teaching and learning process.
3. Assess if a concept taught has been well grasped as learners' feedback provides valuable feedback to them and the teacher.
4. Clarify concepts leading to deeper understanding or seek additional information in solving real-world or imaginary issues.
5. Promote the acquisition of critical thinking and problem-solving skills.
6. Encourage immediate or real-time feedback from learners leading to deeper thinking.
7. Investigate misconceptions for clarification.
8. Accommodate diverse learning styles to achieve a specific learning outcome.

Types: The following are various types of questioning techniques based on the Depth of Knowledge (DoK) levels that the teacher can use in assessment:

- i. Closed-ended questions – DoK 1: have a limited number of predetermined answers and are designed to gather specific information requiring “yes” or “no”, “True or False”
- ii. Open-ended Questions - DoK 2 and 3: allow for a more detailed and
- iii. Comprehensive response, which begins with words like “what,” “why,” or “how.”
- iv. Funnel Questions- DoK 2 and 3: used to gradually narrow down a topic, starting with broader questions and proceeding to more specific ones. This technique helps gather information in a logical and structured manner.
- v. Probing Questions - DoK 2 and 3: used to explore a topic in more detail or to gain deeper insights. They are often used to dig deeper into a previous response or to uncover hidden information,
- vi. Leading Questions - DoK 2 and 3: used to steer learners towards a particular answer or viewpoint. They may imply an expected or desired response.

- vii. Hypothetical Questions- DoK 3 and 4: These questions often involve speculative or creative thinking. They require learners to make connections, apply knowledge, and think beyond the immediate context.

Settings

- i. Classroom
- ii. Co-curricular activities, e.g. School Clubs and Games
- iii. Field trips/work, e.g., Factories/industries, school farms/gardens/ pantries(kitchen)
- iv. Laboratory/Resource Centre
- v. Workshops/studios/theatres

Time Frame: Teachers can use questioning in their daily teaching and learning activities. However, it should be used based on the learning outcome of the subject matter under consideration. It can specifically be used:

- i. Throughout the teaching and learning process (Formative Assessment): before, during and after the teaching of a lesson.
- ii. In summative assessment, questioning can be used together with other forms of assessment such as oral/aural(listening) assessment at the end of a unit or content and programme.

Class size: Individual, small group or whole class

Steps: In using questioning as an assessment strategy, the teacher and learner can employ the following steps:

Before

The teacher should:

- i. Define the Learning Outcomes to be achieved and develop key questions before class based on the outcomes.
- ii. Select appropriate question type(s) that align with the content standard/ indicators to be taught and the DoK levels to be achieved. The questions to be asked should be clear, relevant, concise, and free from ambiguity and biases.
- iii. Design valid questions that will suit the type of questioning strategy to be used to achieve the learning outcomes.

NB: Avoid or minimise the use of questions that will yield Yes/No or True/False responses but make more use of questions that allow for explanatory responses.

Plan question sequence and adapt questioning techniques to meet the diverse learning needs and abilities of their learners to promote active participation.

During

The Teacher should:

- i. Select the context and provide relevant information to give learners the basis for the questions.

- ii. Vary the form of questions: those that gauge knowledge, require diagnosis, or challenge conclusions considering the learner's background characteristics to promote inclusivity.
- iii. Ask one question at a time and wait for responses from learners to allow time to think through responses critically.
- iv. Encourage active engagement of all learners.
- v. Monitor learners' performance and learning process to identify areas where learners may need additional support or clarification or to plan appropriate remediation where appropriate.
- vi. Acknowledge all responses/answers- repeat so the class can hear and/or write them on the board.
- vii. Provide constructive and timely feedback; teachers are advised to accommodate learners' varied responses as well as be fair and ethical.
- viii. Use assessment data to modify their teaching techniques, strategies and resources.
- ix. Move around the classroom or learning centre

The learner should:

- i. Ensure they gain an understanding of the learning outcomes and work towards achieving them through self and peer assessment.
- ii. Actively participate in the questioning process by listening carefully to the questions, thinking critically about their responses, and providing thoughtful answers.
- iii. Self and peer assess themselves using a questioning assessment strategy when learning to enable them to reflect on their learning.
- iv. Own their learning by adapting strategies to improve their learning outcomes, skills and competencies.

After

The teacher should:

- i. Analyse responses
- ii. Provide constructive feedback
- iii. Modify teaching and learning processes
- iv. Document assessment data
- v. Reflect and adapt questioning techniques, strategies and resources to check if expected learning outcomes have been achieved.
- vi. Teachers and learners reflect on responses to check if expected learning outcomes have been achieved.

Peer/Self Assessment Strategy

Description: Peer/self-assessment is a type of performance monitoring and evaluation related to a learning outcome done by or among learners under the supervision of a teacher to track their learning progress. It can be used as both formative and summative assessment. However, it is predominately used for formative assessment purposes.

Purpose: Peer/self-assessment provides an opportunity for learners to reflect and provides insight, leading to meaningful feedback on their or other learners' work (behaviours, competencies and experiences). Peer/self-assessment enhances deep learning and understanding among learners and trains learners to track their progress and areas for improvement.

Setting

- i. Classroom-based environment
- ii. Fieldwork
- iii. Laboratory i.e., Science Resources Centres
- iv. Studio
- v. Workshop

Class size: Peer assessment strategy can be done in small groups or whole class.

Time Frame: The time frame depends on the complexity of the assignment, the estimated period of the lesson stated in the curriculum and how learners have been adequately prepared. However, the time should neither be too short nor too long.

Steps

Before

The teacher should:

- i. Set clear expectations of the learning outcome, skills and competencies
- ii. Decide the structure and format of the assessment e.g.: written or oral
- iii. Introduce the learners to the assignment to be assessed
- iv. Develop the assessment criteria and scoring rubrics with learners.

During

The teacher should

- i. Model peer/self-assessment by letting learners assess or review what he has taught to open them up to the assessment to be conducted.
- ii. For peer assessment, lead the pairing or grouping for the assessment. In doing this, the teacher should consider mixed groupings, and avoid inter- pairing and pairing amongst friends. (fairness and transparency)
- iii. In self-assessment, the teacher should guide learners with special educational needs in their assessment through questioning
- iv. Provide constructive feedback to learners after the assessment

The learner should:

- i. Work and submit assignments
- ii. Assess their assignments or that of other learners and give constructive feedback
- iii. Reflect on the feedback received and revise the work for final submission

After

The teacher should:

- i. Grade the assignments (summative)
- ii. Reflect on the activity with learners
- iii. Offer help or intervention in areas learners need help
- iv. Work on areas that need improvement

NB: The teacher should be a mediator between arguing learners and should also consider and guide learners in their approach to providing feedback. (Be conscious of gender, cultural, social and religious sensitive comments and issues)

Teacher should also provide multiple opportunities or formats for learners to assess to accommodate all learn.

Appendix 3: Teacher Lesson Observation Form

Name of School:

Subject being observed:

Class

Year 1

Year 2

Year 3

Sex of the teacher

Male

Female

1. Is the purpose of the lesson clearly stated in the lesson plan and focused on learners achieving the lesson learning outcomes?

Yes

In Part

No

NA

1b. Please provide an explanation to your answer in Q1 above

.....

2. Are the unique needs of female learners, male learners, and learners with special education needs adequately catered for in the lesson plan? For example, the choice of teaching methods and learning activities reflects/does not reflect the learning needs of all learners.

For example, the choice of teaching methods, and learning activities.

Yes

In Part

No

NA

2b. Please provide an explanation to your answer in Q2 above

.....

3. Does the teacher manage behaviour well, maintaining a positive and non-threatening learning environment throughout the lesson?

Yes

In Part

No

NA

3b. Please provide an explanation to your answer in Q3 above

.....

4. Are appropriate teaching and learning materials and other resources (including ICT, books, desks) available, accessible and being used to support learning of all females, males and learners with special education needs?

Yes

In Part

No

NA

4b. Please provide an explanation to your answer in Q4 above

.....

5. Are learners engaged on tasks that challenge them in line with the content standards?
Does the teacher take into consideration the uniqueness of learners?

Yes In Part No NA

5b. Please provide an explanation to your answer in Q5 above

6. Is there evidence that students are learning?

Yes In Part No NA

6b. Please provide an explanation to your answer in Q6 above

7. Is teaching differentiated to cater for the varied needs of all learners (i.e., male learners, female learners, learners with special education needs) and those with poor literacy and/ or numeracy proficiency?

Yes In Part No NA

7b. Please provide an explanation to your answer in Q7 above

.....

8. Does the teacher use real life examples which are familiar to learners to explain concepts?

Yes In Part No NA

8b. Please provide an explanation to your answer in Q8 above

.....

9. Does the teacher point out or question traditional gender roles when they come up during the lessons as appropriate?

Yes In Part No NA

9b. Please provide an explanation to your answer in Q9 above

.....

10. Does the lesson include appropriate interactive and creative approaches e.g., group work, role play, storytelling to support learners achieving the learning outcomes?

If yes, give examples of the issues and skills that have been so integrated.

Yes In Part No NA

10b. Please provide an explanation to your answer in Q10 above

.....

11. Have cross-cutting issues and /or 21st century skills been integrated into the lesson to support learners in achieving the learning outcomes e.g., problem-solving, critical thinking, communication? If yes, give examples of the issues and skills that have been so integrated.

Yes In Part No NA

11b. If yes, give examples of the issues and skills that have been so integrated.

.....

12. Does the teacher incorporate ICT into their practice to support learning?

Yes In Part No NA

12b. Please provide an explanation to your answer in Q12 above

.....

13. Does the teacher encourage all female male and male learners (including those who may be shy or afraid to speak) to ask questions, answer questions, participate in group work, etc. during the lesson?

Yes In Part No NA

13b. Please provide an explanation to your answer in Q13 above

.....

14. Is assessment evident in the lesson? If yes, does it include assessment as, for or of learning and go beyond recall?

If yes, did it include assessment of, for or as learning and go beyond recall?

Yes In Part No NA

14b. Please provide an explanation to your answer in Q14 above

.....

15. Do learners make use of feedback from teacher and peers?

Yes In Part No NA

15b. Please provide an explanation to your answer in Q15 above

.....

16. Does the teacher sum up the lesson and evaluate the lesson against the learning outcomes with the learners?

Yes In Part No NA

16b. Please provide an explanation to your answer in Q16 above

.....

17. Does the teachers' planning of lessons taught before the one observed show how they plan for learning over time, considering individual and group needs?

Yes In Part No NA

17b. Please provide an explanation to your answer in Q17 above

.....

18. Does the teacher pay attention to the composition of females and males during group work and assigns females leadership roles.

Yes In Part No NA

18b. Please provide an explanation to your answer in Q18 above

.....

19. Does the teacher provide constructive verbal feedback to both females and males and learners with special education needs?

Yes In Part No NA

19b. Please provide an explanation to your answer in Q19 above

.....

20. Does the teacher provide constructive written feedback to both females and males and learners with special education needs in their exercise book?

Yes In Part No NA

20b. Please provide an explanation to your answer in Q20 above

.....

21. Key strengths in the lesson

.....

22. Areas for development

.....

23. Next steps for teacher

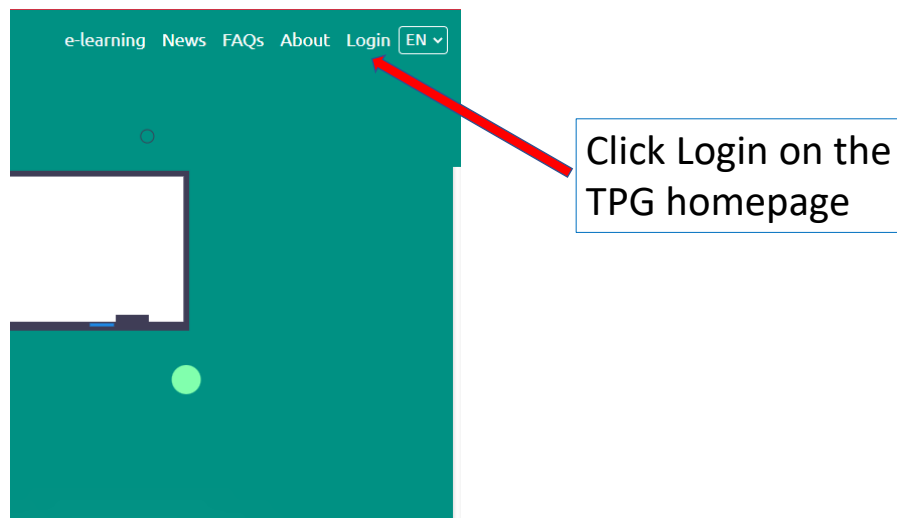
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24. Additional Notes (on teacher's actions, the flow of activities, etc.)

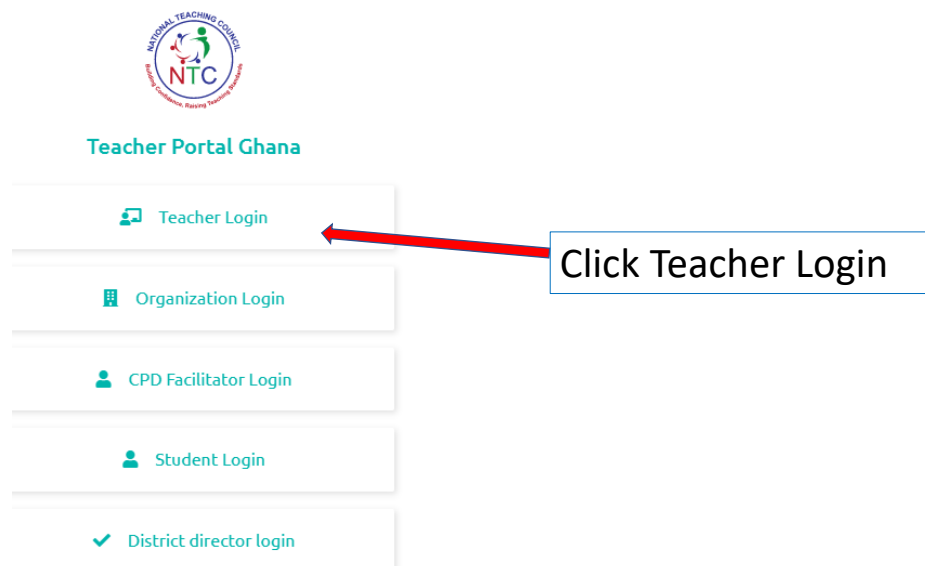
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Appendix 4: How to Check CPD Points and Training Records on Teacher Portal Ghana

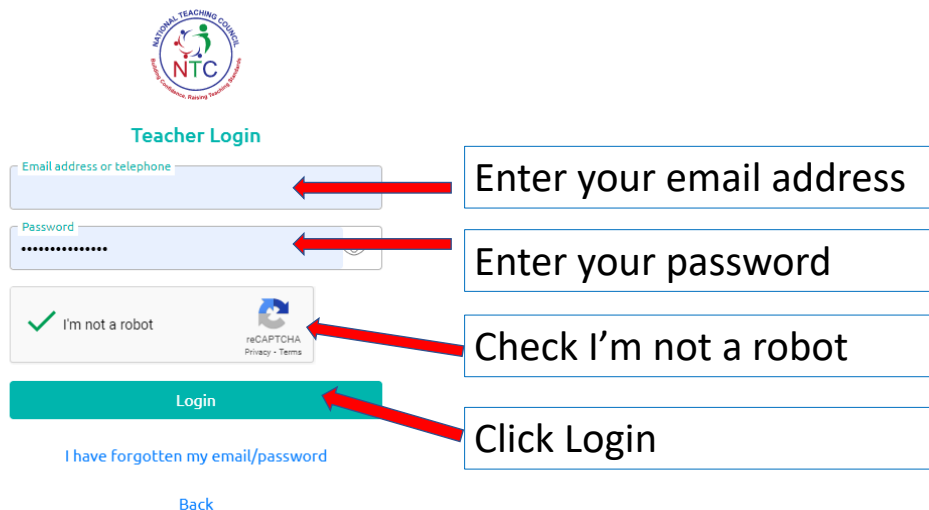
1. Visit tpg.ntc.gov.gh and click Login



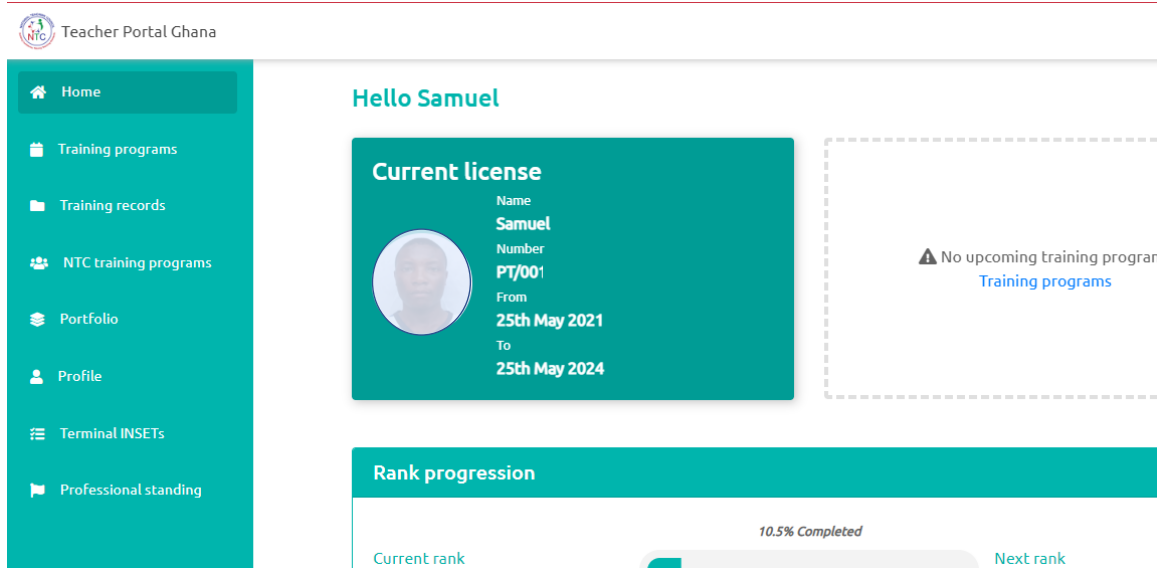
2. On the Login page, click Teacher Login



3. On the Teacher Login page enter your email address and password and then click Login



4. After a successful login you will get access to your TPG account (Check image below)



5. To check CPD points, scroll down to **Rank progression**. You will see the CPD points progress bar and actual points accrued (Check image below)



6. To view training records, from the side menu tap on **Training records** (Check image below)

Teacher Portal Ghana

- Home
- Training programs
- Training records**
- NTC training programs
- Portfolio
- Profile
- Terminal INSETs
- Professional standing

Training records
Records for training programs registered and/or attended

Total points: 1.8988

Sensitization on Education Policies	⚠ Marked as absent
Differentiated Learning	✓ Processed Credits: 1.32
Advanced Mobile Learning with Multimedia (AMLM)	✓ Processed Credits: 0.5788

List of training programs

Click to view training records

List of Contributors

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