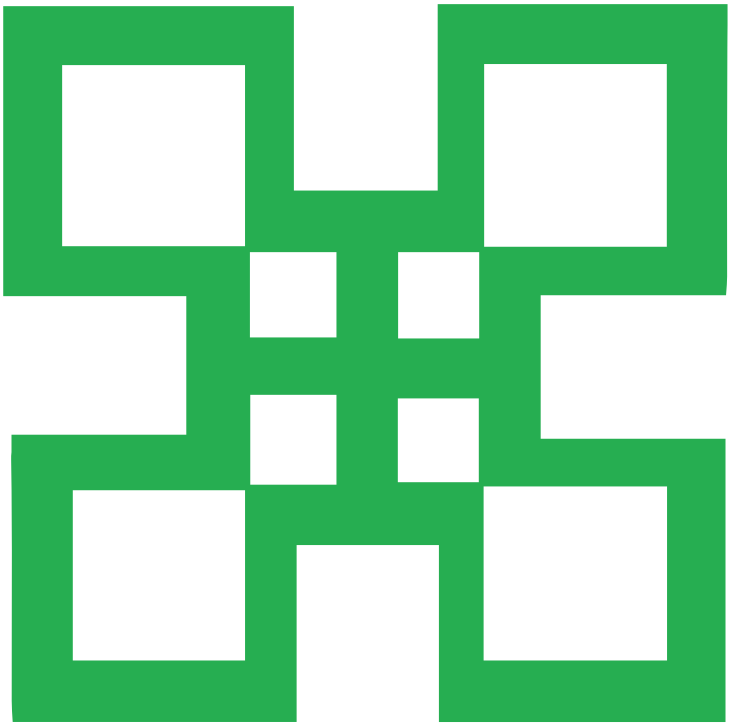
Secondary Education Professional Development Programme

Departmental Professional Learning Community Handbook

SCIENCE

HANDBOOK FOR **TEACHERS**



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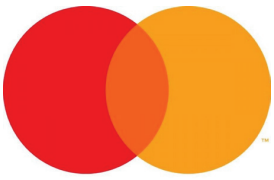

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DEPARTMENTAL PROFESSIONAL LEARNING COMMUNITY HANDBOOK

SCIENCE

Teacher Version

DEPARTMENTAL PROFESSIONAL LEARNING COMMUNITY HANDBOOK

This Departmental Professional Learning Community Handbook will help teachers to familiarise themselves with the details of the new Senior High School (SHS), Senior High Technical (SHTS) and Science, Technology, Engineering and Mathematics (STEM) curriculum ahead of national roll-out in 2024/25.

Professional Learning Community (PLC) sessions were introduced across all SHS and SHTS in Ghana in June 2023 and the first two PLC Handbooks were designed to be used by teachers in mixed departmental groups.

This Departmental Professional Learning Community Handbook signals a shift in approach as we focus on providing more detailed information and guidance to teachers ahead of the roll-out of the new SHS, SHTS and STEM curriculum. This Handbook is therefore intended to be used by teachers working in departmental groupings and should be used in conjunction with subject-specific Year One Teacher Manuals.

The Handbook will guide teachers and help to familiarise them with the Weekly Learning Planner and Teacher Manuals as they develop their own Learning Plans for each subject.

The Handbook contains a total of 13 Sessions covering all 24 weeks in Year One of the new SHS, SHTS and STEM curriculum. In each Session of the Handbook teachers will be expected to collectively prepare 2 weeks of Learning Plans using the information provided in their subject-specific Teacher Manuals. The structure of this Handbook is:

> Session 1: Reviewing Knowledge on previous PLC sessions
> Session 2: Learning Plans for weeks 1 & 2
> Session 3: Learning Plans for weeks 3 & 4
> Session 4: Learning Plans for weeks 5 & 6
> Session 5: Learning Plans for weeks 7 & 8
> Session 6: Learning Plans for weeks 9 & 10
> Session 7: Learning Plans for weeks 11 & 12
> Session 8: Learning Plans for weeks 13 & 14
> Session 9: Learning Plans for weeks 15 & 16
> Session 10: Learning Plans for weeks 17 & 18
> Session 11: Learning Plans for weeks 19 & 20
> Session 12: Learning Plans for weeks 21 & 22
> Session 13: Learning Plans for weeks 23 & 24

Schools must ensure that they complete all 13 Sessions within a maximum of 16 weeks so that the Handbook has been completed by the end of the 2023/24 academic year.

The Handbook will ensure that teachers continue to enhance their professional practice skills and competencies, familiarising themselves with the details of the new curriculum, enabling them to help learners develop the 21st Century skills and competencies that will prepare them for further studies, the world of work and adult life.

This Handbook also provides opportunities for peer-to-peer transfer of knowledge and encourages teachers to use their subject specialisms and unique experiences to make connections between the subjects within their departments, enhancing learning experiences.

Prof Edward Appiah

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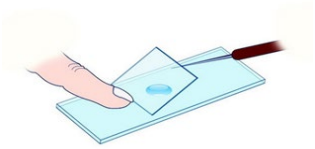
CONTENTS

DPLC Session 1: Reviewing concepts and skills acquired in previous DPLC sessions

The sections below provide the frame for what is to be done in the session.	***Guidance Notes on Teacher Activity during the DPLC Session.*** *What teachers will do during each stage of the session*	***Time in session***
Introduction: Review of previous learning using ideas from the last DPLC session	1.1 Introduce the session with an icebreaker. 1.2 Share your expectations regarding what you hope to gain from the Departmental Professional Learning Community (DPLC) activities (NTS 1a, 1b). *E.g.* *The teacher will be able to understand how to use the DPLC Handbook and the Teacher Subject Manual, etc.* 1.3 Read the purpose of the DPLC Handbook. **Purpose:** The Departmental Professional Learning Community (DPLC) Handbook is intended to serve as the 'bridge' between the Handbook on introduction to the Senior High School (SHS), Senior High Technical School (SHTS) and Science, Technology, Engineering and Mathematics (STEM) curriculum and the subject- based Handbook supporting all teachers to plan and teach the year one subjects in the SHS, SHTS and STEM curriculum. The main purposes of DPLC are to: *A) Build on Session 12 on the learning planner of the DPLC Handbook on the introduction of the SHS, SHTS and STEM curriculum to enable teachers to consolidate their understanding and application of the learning planner* *B) Support teachers to use the year one teacher manual to develop learning plans for all year one lessons in the SHS, SHTS and STEM curriculum using the learning planner* *C) Provide opportunities for teachers to discuss the year one learning planner and align them with the year one teacher manual* *D) To give teachers enough time to study the year one subjects in the SHS, SHTS and STEM curriculum and how these will be taught effectively and efficiently, etc.* ***Note:*** *a) The Handbook is thus principally aimed at helping science teachers to continue to enhance their professional*	*20mins*

	practice skills and competencies whilst guiding them to help learners to develop 21st century skills and competencies that will prepare them for further studies, the world of work and adult life *b) The Handbook will provide opportunities for peer-to-peer transfer of knowledge. It will encourage science teachers to use their subject specialization and context specific teaching experiences to make connections between the teaching and learning of the related subjects in their department* *c) The Handbook contains 13 topics which cover all the 24 weekly learning planners in year one as follows:* *i. Reviewing of knowledge and skills acquired from previous DPLC Sessions* *ii. Learning planners for weeks 1 & 2* *iii. Learning planners for weeks 3 & 4* *iv. Learning planners for weeks 5 & 6* *v. Learning planners for weeks 7 & 8* *vi. Learning planners for weeks 9 & 10* *vii. Learning planners for weeks 11 & 12* *viii. Learning planners for weeks 13 & 14* *ix. Learning planners for weeks 15 & 16* *x. Learning planners for weeks 17& 18* *xi. Learning planners for weeks 19 & 20* *xii. Learning planners for weeks 21 & 22* *xiii. Learning planners for weeks 23 & 24*	
2. **Planning for teaching, learning and assessment activities, promoting national values, GESI, SEL, ICT, 21st century skills and differentiation**	2.1 Read the Purpose, Learning Outcomes (LOs) and Learning Indicators (LIs) for the session. **Purpose:** The purpose of this session is to assist science teachers in revisiting the acquired knowledge, skills, and values from previous DPLC sessions in the planning of lessons using the learning planner LO 1: Apply the knowledge and understanding of the previous DPLC sessions to effectively integrate GESI, SEL and other cross-cutting issues in the planning of science lessons. LI 1.1Discuss at least three pedagogies teachers have used in science lessons delivered as a result of knowledge gained from previous DPLC sessions, taking into consideration GESI, SEL, ICT, 21st century skills, Differentiation and National values. LI 1.2Explain at least three assessment strategies teachers have applied in science lessons delivered as a result of knowledge	*30mins*

	gained from previous DPLC sessions, taking into consideration GESI, SEL, ICT, 21st century Skills, Differentiation and National values. LI 1.3 Identify at least four teaching and learning resources used in the previous DPLC sessions and how they were used to support lessons delivered. LI 1.4 Discuss at least three cross cutting issues that teachers have incorporated into their science lessons as a result of knowledge gained from previous DPLC sessions. 2.2 Discuss at least three pedagogies used in science lessons delivered based on knowledge gained from previous DPLC sessions that impacted learning. *E.g.* *Experiential Learning:The approach where emphasis is placed on hands-on, practical experiences as a way of acquiring knowledge, skills and understanding. It involves engaging actively with real-world situations that help to enhance retention and understanding when theory is connected to practice, etc.* 2.3 Explain at least three assessment strategies you applied in your science lessons which incorporate GESI, SEL, ICT, 21st century skills, Differentiation, and National values. *E.g.* *Multiple Choice Tests: These are tests in which each item has a stem followed by options (alternatives) from which the respondent selects what she/he considers as the option that best completes or answers the stem. The multiple-choice questions were composed of four parts. These are stem (question or incomplete statement), options (suggested answers or completions), distractors/Foils (incorrect responses) and the Key (correct responses). Learners were asked to answer at least five out of ten questions. This was to allow for differentiation. The questions were projected on a screen for all learners to see. After marking, the highly proficient learners together with the teacher assisted the weaker learners. They were also encouraged that they could do it and not to give up. Learners show kindness and respect to one another in mixed ability groups; learners accommodate one another during reflections; Learners become independent thinkers but also show respect to one another and acknowledge their strengths and weaknesses, etc.*	

	2.4 In your (mixed-ability, gender and social-inclusions, where applicable) groupings identify at least four (4) resources used in their previous lessons and share how they used them to support their lessons. *E.g. Resources Used to Support the Lessons:* *a) Biology (Microscope slide, Coverslip, Dissecting kits, Microscope etc.)* *Microscope slide: A sample specimen was placed on the slide. A dropping pipette was used to place a drop of water on the specimen in order to prepare a wet mount slide. A cover slip is placed at the edge of the slide, and with the help of toothpick or hypotonic needle, the cover slip was gently lowered onto the slide (This will prevent air bubbles from being trapped under the cover slip). Finally, the slide was placed on the stage of the microscope for observation using the adjustment knobs, etc.*  *Note:* *i. When you have a clear image of your sample with the lowest power objective, you can change to the next objective lenses. You might need to readjust the sample into focus and/or readjust the condenser and light intensity. If you cannot focus on your specimen, repeat steps 3 through 5 with the higher power objective lens in place. Do not let the objective lens touch the slide!* *ii. When finished, lower the stage, click the low power lens into position and remove the slide* *iii. Do not touch the glass part of the lenses with your fingers. Use only special lens paper to clean the lenses.* *iv. Always keep your microscope covered when not in use.* *v. Always carry a microscope with both hands. Grasp the arm with one hand and place the other hand under the base for support, etc.* *b) Chemistry (Pipette, volumetric flask, burette, chemical balance, organic models, gas preparation kits, goggles etc.)* *Pipette: The pipette was used to measure 25cm^3 volume*	

	of distilled water from a beaker into a conical flask, etc. *c) Physics: meter rule, etc.* *Meter rule: The meter rule was explained as a versatile measuring instrument used for determining length and distance. It was employed by placing one end at the starting point of an object and extending it to measure the object's length accurately, using the markings in centimetres (cm) and millimetres (mm). The meter rule was used to compare lengths, draw straight lines, measure dimensions of objects and calculate perimeters of shapes. The meter rule was demonstrated as a fundamental tool for precise measurements which extends across a wide range of professional fields and everyday activities where precise lessons and distance measurements are essential, etc.* *d) ICT / Computing: Projector, etc.* *Projector: The Projector was used to display images and videos, show demonstrations, simulations and interactive content of the lesson, etc.*  2.5 Think-pair and share with the larger group three cross-cutting issues that they incorporated in their lessons as a result of knowledge gained from the previous DPLC sessions: E.g., *ICT Integration: Teacher used laptop and projector to deliver his/her lessons, used smartphone to access information from the internet in relation to the lesson. Learners were also given the opportunity to use ICT devices to access information and watch YouTube videos in relation to the lesson as well as make presentations, etc.*	
	Refer to Appendix 1 for a sample learning planner	

4. *Evaluation and review of the session: Noting that teachers need to identify critical friends to observe lessons and report at the next session*	4.1 In groups, reflect, write and share what you have learned from all the DPLC sessions and how you feel, with the larger group (NTS 1a). 4.2 Where possible, identify a critical friend to observe your lesson in relation to DPLC Session 1 and provide feedback to you (NTS 3l). 4.3Remember to read the contents of Weeks 1 and 2 of the teacher manual ahead of time and the DPLC Handbook Session 2 in preparation for the next session and bring along your DPLC Handbook and teacher manual (NTS 1a, 1b).	*10 mins*

DPLC Session 2: Developing learning plans for Weeks 1 and2		
The sections below provide the frame for what is to be done in the session	**Guidance Notes on Teacher Activity during the DPLC Session.** *What teachers will do during each stage of the session*	**Time in session**
1. Introduction: Review of previous learning using ideas from the last DPLC session	1.1 Share two things you implemented based on DPLC Session 1, *reviewing concepts and skills acquired in previous DPLC Sessions*, which you think impacted learning positively (NTS 1a, 1b). 1.2 As a critical friend, discuss why you think what a colleague did through the application of lessons learnt in DPLC Session 1, *reviewing concepts and skills acquired in previous DPLC Sessions,* supported learning (NTS 1a-1c).	10 mins
2. Planning for teaching, learning and assessment activities, using the teacher manual to complete the learning planner,	2.1 Read the Purpose, Learning Outcomes (LOs), and Learning Indicators (LIs) for the session (NTS 1b). **Purpose:** The purpose of this session is to support science teachers to use the teacher manual to develop learning plans for lessons in Weeks 1 and 2 of the teacher manuals. Science	60 mins

integrating GESI, SEL, ICT, differentiation, 21st century skills and national values (2 learning planners to be completed per session)	teachers will develop learning plans for the following lessons: A. *General Science: Characteristics of science in nature and its application to design a project* B. *ICT: Create multimedia documents using appropriate computing tools* C. *Biology: The importance and branches of biology, and the scientific method and its application to everyday life* D. *Chemistry: Introduction to chemistry, chemical processes and safety and chemical storage and the scientific method of enquiry* E. *Physics: Application of physics in some sectors of the global economy, units and measurement* F. *Computing: Apply computer Architecture concepts related to the design of modern processors, memories, Input and Output to manipulate data, etc.* LO 1: Review a subject-specific learning plan for teaching week 1 and develop a subject-specific learning plan for teaching Week 2 in the teacher manual, taking into account GESI, ICT, SEL, National values and other cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o). L1.1 Relate the important aspects in Weeks 1 and 2 science lessons of the teacher manual including content standards, LOs, LIs, key concepts, essential questions, pedagogical exemplars and assessment strategies to the sections of the learning planner template. LI 1.2 Complete the learning planner templates for week 2 Science lessons in the teacher manual taking into consideration cross-cutting issues, responsive pedagogical and assessment strategies, essential questions and resources proposed in the teacher manual. LO 2: Review the learning plans for Week 2 of the subject based science lessons (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3j and 3o). LI 2.1 Critique the content (such as essential questions, teaching and learning activities, assessment and closure) of learning plans for Week 2 in line with the LOs, LIs and key	

	concepts in the teacher manual. LI 2.2 Implement the recommendations made by a peer reviewer to the learning plans for Week 2 in line with the LOs, LIs and key concepts in the teacher manual where appropriate. 2.2 Read silently the content standards, LOs, LIs and pedagogical exemplars for your subjects in week 2 of your teacher manual. Refer to Appendix 2.1 and Appendix 2.2 of the DPLC Handbook (NTS 1a, 1b, 2a and 2c). 2.3 Discuss at least two essential questions in preparation towards the lessons in week 2 (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* *a) General Science (Week 1)* *How do I apply knowledge of characteristics of science to design science-based project?, etc.* *b) ICT (Week 1)* *How are software, hardware and other computing features used to create a document?, etc.* *c) Biology (Week 1)* *How relevant is biology to everyday life?, etc.* *d) Chemistry (Week 1)* *How will I relate the content, introduction to chemistry, chemical processes and safety to real life situations for learners to understand?, etc.* *e) Physics (Week 1)* *How does physics contribute to technological advancements and everyday applications?, etc.* *f) Computing (Week 1)* *How can bit pattern be useful in everyday life?, etc.* *g) General Science (Week 2)* *In what ways can the knowledge of characteristics of science be applied in everyday life?, etc.* *h) ICT (Week 2)* *In what ways can the cross-cutting themes - 21st century skills, GESI, SEL, and National values be integrated in teaching the creation of documents with hardware, software and other computing features?, etc.* *i) Biology (Week 2)* *How will I help learners to use the scientific method to solve everyday problems?, etc.* *j) Chemistry (Week 2)* *How will the knowledge and understanding of the*	

	scientific method of enquiry encourage learners to be critical thinkers? *k) Physics (Week 2)* *How can I connect measurements to real-life situations and applications?, etc.* *l) Computing (Week 2)* *How can bit patterns be used to represent different types of data, such as numbers, characters, and images?, etc.* 2.4 Discuss at least two key notes on differentiation for Weeks 1 and 2. See teacher manual for more examples on differentiation on focal areas not covered in this handbook (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* *a) General Science (Week 1)* *i. Learning Tasks* *Write at least three situations in life where characteristics of science are evident, etc.* *ii. Pedagogical Exemplars:* *Learners think about the importance of science and discuss their ideas with a peer. The teacher asks learners to present their ideas to the whole class. The teacher presents videos, charts, pictures, and demonstrations on the characteristics of science to learners and learners in mixed-ability groups discuss the characteristics of science, considering the meaning, importance, and real-life applications, etc.* *iii. Key Assessments (DoK):* *Level 1: Identify at least four (4) characteristics of science, etc.* *b) ICT (Week 1)* *i. Learning Task:* *The teacher should start the lesson by grouping the learners taking into consideration GESI, SEL and other cross cutting issues and have an open class discussion where learners brainstorm about the computer and what it requires to work efficiently, etc.* *ii. Pedagogical Exemplars:* *Think Pair Share: Using mixed-ability/mixed gender groups, learners think, write and discuss the definition of a computer and its purposes, software and hardware components addressing inclusivity and equity. For example, input devices should be discussed to address accessibility issues for learners*	

	with disabilities such as visual impairment, dyslexia, and dysgraphia, etc. *iii. Key Assessments (DoK):* *Level 1: What is a computer?, etc.* *c) Biology (Week 1)* *i. Learning Task:* *Explain the term Biology. Limit content expectation to the definition of Biology, etc.* *ii. Pedagogical Exemplars:* *Learners in mixed ability, gender-balanced groups, observe pictures and videos of specimens relating to Biology (e.g., honey and dried Tilapia, etc.) and share ideas with peers and accept feedback, etc.* *iii. Key Assessments (DoK):* *Level 1: What is Biology?,* etc. *d) Chemistry (Week 1)* *i. Learning Tasks:* *Discuss and distinguish between the traditional branches of chemistry, etc.* *ii. Pedagogical Exemplars:* *Divide learners into mixed ability groups and show them video or slide/pictures on varieties of natural and artificial phenomena that can be explained by chemistry. Visually impaired learners should be considered and alternative plans made for them, etc.* *Note* ***SEN learners should be considered and alternative plans made for them.*** *iii. Key Assessments (DoK):* *Level 1: State three careers that are related to chemistry, etc.* *e) Physics (Week 1)* *i. Learning Tasks:* *Identify Physics-related careers across the various sectors of the economy, etc.* *ii. Pedagogical Exemplars:* *Learners could watch a documentary that illustrates how physics plays a vital role in shaping the world. Let learners identify Physics-related careers linking to branches of physics that the learner may have met before e.g. mechanics, electricity, waves, etc.* *iii. Key Assessments (DoK):*	

	Level 1: Identify at least five Physics related careers in your community, etc. *f) Computing (Week 1)* *i. Learning Task:* *Play an activity ball game with the learners for the binary numbers' conversion. Write down a list of decimal numbers for the conversion (e.g.: 1-9 these varied numbers will cater for differentiation) and passing the activity ball to any learner randomly, the learner with the ball converts one of the decimal numbers of their choice in their books). Another activity may be to have a hat containing numbers on paper, learners pick random numbers to convert to binary, etc.* *ii. Pedagogical Exemplars:* *The teacher should build on the learners understanding by playing flash cards games (or related) with the learners in their mix-ability groupings before proceeding to the binary number conversions to decimal numbers and decimal numbers to binary numbers, etc.* *iii. Key Assessments (DoK):* *Level 1: Convert decimal numbers into their binary representations, etc.* *g) General science (Week 2)* *i. Learning task:* *Identify three steps involved in designing science projects, etc.* *ii. Pedagogical Exemplars:* *Provide videos, charts, diagrams, and pictures for learners on designing science-based projects using the characteristics of science in nature, etc.* *iii. Key Assessments (DOK):* *Level 2: Describe the characteristics of science when designing a scientific project, etc.* *h) ICT (Week 2)* *i. Learning task:* *Creating a new document using a word processing software (Google Docs, MS Word or Office 365) and saving it using the "save as" command", etc.* *ii. Pedagogical Exemplars:* *Engage in project-based learning and practical sessions to create, save, edit and format educational artefacts using word processing software (e.g., MS*	

	Word, Google Docs), taking into consideration the groupings under the Home tab and the features under each group of the Microsoft office word window. Use these features such as cut, copy, paste, using thesaurus, spelling and grammar check. Ensure inclusivity and equity in using ICT tools, etc. *iii. Key Assessments (DoK):* *Level 1: Identify the basic features of a Word document, such as font styles, sizes, and formatting options, etc.* *i) Biology (Week 2)* *i. Learning Task:* *Explain the scientific method, etc.* *ii. Pedagogical Exemplars:* *Learners in mixed-ability, research-based learning, research to understand the basis on which the scientific method is built, and how it is employed in solving problems in the school environment and community at large. Learners learn to be team players in groups research activities, and feel valued in contributing to lessons, etc.* *iii. Key Assessments (DoK):* *Level 1: By which technique do biologists and other scientists solve problems identified in their environment?, etc.* *j) Chemistry (Week 2)* *i. Learning Tasks:* *List at least two key rules to follow when storing chemicals in the laboratory, etc.* *ii. Pedagogies and Exemplars:* *Using field trip as a strategy, support learners to visit the school chemical store or chemistry laboratory to observe how chemicals are stored, etc.* *Note: Take all the necessary precautions to prevent accidents and burns. Make provision for first aid. Also, be mindful of learners who may be allergic to smoke.* *iii. Key Assessments (DoK):* *Level 1: State at least one (1) type of fire that can be extinguished using a carbon dioxide fire extinguisher, etc.*	

	k) Physics (Week 2) *i. Learning Tasks* *Determine fundamental units of quantities using dimensions, etc.* *ii. Pedagogical Exemplars:* *Opportunity for some lesson interactivity/quiz; "if this is the formula, what is the quantity?" Or "if this is the definition, what is the quantity?". Help learners to recall relationships that they already know as a starting point for their work on dimensional analysis, etc.* *iii. Key Assessments (DoK)* *Level 1: Give three uses of dimensional analysis, etc.* *l) Computing (Week 2)* *i. Learning Task:* *The teacher should guide learners with simple logic expressions involving AND, OR, and NOT operators etc.* *With little assistance, ask learners to fill logic truth tables and determine the output for all possible combinations of input values, etc.* *ii. Pedagogical Exemplars:* *Ask students in their mix-ability groups to create truth tables for each logic operation (AND, OR, NOT) from scratch and explain their significance in computing, etc.* *iii. Key Assessments (DoK):* *What does the AND operation do if both input values are 1?, etc.* 2.5 In your subject groups or individually, complete learning planners for Week 2. Include and ensure alignment of teaching, learning and assessment activities, taking into consideration differentiation (such as providing activities with at least three different levels of difficulty), GESI and SEL in each learning planner to cater for all learners (NTS 1a, 1b, 2a, 2c. 3a, 3g and 3h).	
3. Peer-review of learning planners. **· Reviewing planner to ensure alignment between course manual and learning planner based on the templates**	3.1 Exchange one of your learning plans with a colleague in the same department (where applicable) and peer review the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of a learning plan (NTS 1a, 1b, and 1e-1g). *Note:* *Areas for vital review:* *a) Alignment among teacher manual and learning*	10mins

provided.	*planner* *b) Innovativeness of pedagogical choices* *c) Incorporation of GESI, SEL, National values and 21st century skills* *d) Differentiated instruction and assessment* *e) Appropriateness of crafted essential questions, etc.* 3.2 Implement the recommendations made by a peer reviewer to your learning plan as appropriate (NTS 1b).	
4. Reflection on the session: **· Reflecting on what has been learned in the session.** **· Advance preparation towards next DPLC session**	4.1 Share your views and experiences about the session (NTS 1a). 4.2 Complete your learning plans which were not completed during the session (NTS 3l). 4.3Remember to read the contents of Weeks 3 and 4 of the teacher manuals ahead of time and the DPLC Handbook Session 3 in preparation for the next session and bring along your DPLC Handbook and teacher manual (NTS 1a, 1b).	10mins

DPLC Session 3: Developing learning plans for Weeks 3 and4		
The sections below provide the frame for what is to be done in the session	**Guidance Notes on Teacher Activity during the DPLC Session.** *What teachers will do during each stage of the session*	**Time in session**
1. Introduction: Review of previous learning using ideas from the last DPLC session	1.1 Share two things you implemented based on DPLC Session 2, *developing learning plans for Weeks 1 and 2*, which you think impacted learning positively (NTS 1a, 1b). 1.2 As a critical friend, discuss why you think what a colleague did through the application of lessons learnt in DPLC Session 2, *developing learning plans for Weeks 1 and 2,* supported learning (NTS 1a- 1c).	10 mins
2. Planning for teaching, learning and assessment activities, using the teacher manual to	2.1 Read the Purpose, Learning Outcomes (Los), and Learning Indicators (LIs) for the session (NTS 1b). **Purpose:** The purpose of this session is to assist science teachers in utilising the teacher manual to create learning plans for lessons during Weeks 3 and 4.	60 mins

complete the learning planner, integrating GESI, SEL, ICT, differentiation, 21st century skills and national values (2 learning planners to be completed per session)	Science teachers will focus on developing learning plans for the following lessons: A. *General science:* *Application of characteristics of science and uses of solids in life.* B. *ICT:* *Create multimedia documents using appropriate computing tools.* C. *Biology:* *Orientation, body symmetry, sectioning of specimen and safe use of the microscope, and the application of biological concepts in fish farming: the sustainable management and exploitation of wild stock to improve fish production.* D. *Chemistry:* *The structure of the atom as well as Bohr's theory and the filling of electrons in orbitals.* E. *Physics:* *Matter and Classification of quantities into fundamental, derived, scalars and vectors.* F. *Computing:* *Apply computer architecture concepts related to the design of modern processors, memories, Input and Output to manipulate data.* LO 1: Develop subject-specific learning plans for teaching Weeks 3 and 4 lessons using the teacher manual, taking into account GESI, ICT, SEL, National values and other cross-cutting issues (NTS 3a, 3e-3g and 3k). LI 1.1 Discuss the important aspects in Weeks 3 and 4 science lessons in the teacher manual including content standards, Los, LIs, key concepts, essential questions, GESI, pedagogical exemplars and assessment strategies of the learning planner template. LI 1.2 Complete the learning planner templates for Weeks 3 and 4 science lessons taking into consideration cross-cutting issues, GESI responsive resources, pedagogical exemplars and	

	assessment strategies proposed in the teacher manual. LO 2: Review the learning plans for Weeks 3 and4 of the subject-based science lessons (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3j and 3o). LI 2.1 Critique the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of learning plan for Weeks 3 and4 in line with the Los, LIs and key concepts in the teacher manual. LI 2.2 Implement the recommendations made by a peer reviewer to the learning plans for Weeks 3 and 4 in line with the Los, LIs and key concepts in the teacher manual where appropriate. 2.2 Read silently the content standards, Los, LIs and pedagogical exemplars for your subject in Weeks 3 and 4 in your teacher manual. 2.3 Discuss at least two essential questions that will guide the lesson activities in Weeks 3 and 4 (NTS 1a, 2c, 2e, 2f, 3d-3g). *E.g.* *a) General Science (Week 3)* *How is the application of characteristics of science important in everyday lives such as health, agriculture, education?, etc.* *b) ICT (Week 3)* *How are computing tools used responsibly to create multimedia documents containing text, images, etc. in everyday life?, etc.* *c) Biology (Week 3)* *Based on the features of biological drawings, how do learners make good diagrams?, etc.* *d) Chemistry (Week 3)* *How will the knowledge and understanding of the content, the structure of the atom, help learners to predict physical properties of substances such as melting and boiling points, reactivity?, etc.* *e) Physics (Week 3)* *What real-life examples or scenarios can I use to illustrate the concepts of scalars and vectors?, etc.*	

	f) *Computing (Week 3)* *How are control bus, address bus, data bus and the internal clock, Machine cycle Fetch–Decode–Execute-Store cycle used in everyday life?, etc.* g) *General Science (Week 4)* *How do I explain concepts of rusting using experiments and its application in construction?, etc.* h) *ICT (Week 4)* *In what ways can I integrate the cross-cutting themes – 21st century skills, GESI, SEL, and national values in teaching the using of computing tools to responsibly create multimedia documents containing text, images?, etc.* i) *Biology (Week 4)* *Assuming learners are given four fish, describe four different ways you will preserve them?, etc.* j) *Chemistry (Week 4)* *What is the best approach of teaching the content, Bohr's theory and the filling of electrons in orbitals to meet the varied needs of all learners?, etc.* k) *Physics (Week 4)* *How can I convey the real-world significance of understanding matter to motivate my learners?, etc.* l) *Computing (Week 4)* *In what ways can I integrate the cross-cutting themes – 21st century skills, GESI, SEL, and national values in teaching the characteristics of control bus, address bus, data bus and the internal clock, Machine cycle Fetch–Decode–Execute-Store cycle?, etc.* 2.4 Discuss at least two key notes on differentiation for Weeks 3 and 4. See teacher manual for more examples on differentiation on focal areas not covered in this handbook (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* a) *General Science (Week 3)* i. *Learning Tasks:* *Explain how characteristics of science can be applied in everyday life, such as in education, etc.* ii. *Pedagogical Exemplars: Put learners in mixed-ability*	

	groups. Using think-pair-share lets learners search for the applications of the characteristics of science (empirical evidence, systematic observation, objectivity, tentativity) in everyday life, such as agricultural science, health, education, and home and reflect on their findings. Learners discuss their findings on the applications of the characteristics of science in everyday life, etc. *iii. Key Assessments (DoK):* *Level 2: Identify at least three areas where characteristics of science are applied, etc.* *b) ICT (Week 3)* *i. Learning Tasks:* • *Steps for creating a Bulleted List* ○ *Position the cursor where you want to insert the bullet list* ○ *On the Home tab, under paragraph grouping, click the bullet list button to display the bullet library* ○ *Choose a desired bullet* ○ *Type any text and press enter key to create the bulleted list* ○ *Press Enter key on the keyboard twice to deactivate the selected bullet, etc.* *ii. Pedagogical Exemplars:* *Put learners in groups of at least 4 and ask them to write 5 of their best dining meals and 5 things they can see in class individually. Ask learners to share their write up with members in the group, observe the individual lists and describe how the lists were made. Learners share their responses with the larger group, etc.* *iii. Key Assessments (DoK):* *Level 1: Identify the different types of lists that can be created in Word, such as bulleted lists and numbered lists, etc.* *c) Biology (Week 3)* *i. Learning Tasks:* *State the parts of the light microscope and their functions. Limit content expectation to the identification of various parts and relate each part of the light microscope to its functions of the light microscope, etc.* *ii. Pedagogical Exemplars:* *In a mixed-ability, socially inclusive, task-based groups, learners examine the various parts of the microscope (with emphasis on the eyepiece lens, objective lens, stage, clips, revolving nosepiece, diaphragm, limb, base/foot), etc.*	

	iii. Key Assessments (DoK): *Level 1: List the two types of microscopes and state at least two importance of each, etc.* *d) Chemistry (Week 3)* *i. Learning Tasks:* *State at least one postulate of Dalton's atomic theory, etc.* *ii. Pedagogical Exemplars:* *In a whole class discussion, guide learners to review the description of the atom and its sub–atomic particles from JHS syllabus, etc.* *iii. Key Assessments (DoK):* *Level 1: In your own words, state the main postulates of Dalton's atomic theory, etc.* *e) Physics (Week 3)* *i. Learning Tasks:* *Determine fundamental units of quantities using dimensions, etc.* *ii. Pedagogical Exemplars:* *Opportunity for some lesson interactivity/quiz; "if this is the formula, what is the quantity?" Or "if this is the definition, what is the quantity?". Help learners to recall relationships that they already know as a starting point for their work on dimensional analysis, etc.* *iii. Key Assessments (DoK):* *Level 1: Give three uses of dimensional analysis, etc.* *f) Computing (Week 3)* *i. Learning task* *In mixed-ability groupings, the teacher should give learners a project to create a short video explaining what CPU is, how it functions, and why it's important for computer processing speed (They can use simple animations or diagrams to illustrate the concept) and submit for marks. It is important to take note of differentiation in the response to the project of the learners, etc.* *ii. Pedagogical exemplars:* *The teacher leads learners to brainstorm by comparing the CPU to the brain of a computer, with different parts performing specific functions like thinking (processing) and coordinating actions (control unit), etc.* *iii. Key Assessments (DoK)* *Level 1: The CPU is also known as the brain of the computer. True or False?, etc.*	

	g) General science (Week 4) *i. Learning task* *Enumerate three properties each of metals, non-metals, and semi-metals, etc.* *ii. Pedagogical Exemplars:* *Learners can be grouped in mixed-gender and mixed-ability groups to explore the uses of various solid materials in different structures and substances within their community during a walk around their community (e.g., buildings, vehicles, litter, glass, plastic, construction materials etc.)., etc.* *iii. Key Assessments (DoK)* *Level 1: Identify three substances which are solids at room temperature, etc.* *h) ICT (Week 4)* *i. Learning Tasks* *Define the key elements involved in formatting the overall appearance of a page using word processing software, etc.* *ii. Pedagogical Exemplars:* *Provide a list of formatting options such as font styles, sizes, colours, alignment, spacing, and margins, and ask students to identify and explain each one ,etc.* *iii. Key Assessments (DoK):* *Level 1: Identify the different font styles available in Word, such as bold, italic, and underline, etc.* *i) Biology (Week 4)* *i. Learning Tasks* *Name at least three tools that are required in nursery and grow-out stages to improve fish production, etc.* *Note:* ***Limit content expectation to identification and discussion of at least three tools used in harvesting fish*** *ii. Pedagogical Exemplars:* *Teacher should consider the following activities:* *Using think-pair-share, assist learners to identify and discuss the functions of at least three tools and equipment used in harvesting fish., etc.* *iii. Key Assessments (DoK):* *Level 1: List the tools that are required in nursery and grow-out stages to improve fish production. Accept at least two tools used in harvesting fish, etc.* *j) Chemistry (Week 4)* *i. Learning Task:* *Describe Bohr's planetary model of the atom, etc.* *ii. Pedagogical Exemplars* *Collaborative Learning: In small mixed ability or mixed-*	

	gender (where applicable) groups, *a) Provide learners with diagrams or models illustrating the planetary structure of the atom, highlighting the fixed orbits and energy levels as propose by Bohr, etc.* *iii. Key Assessments (DoK)* *Level 1: What was the name of Bohr's model of the atom, etc.* *k) Physics (Week 4)* *i. Learning Tasks* *State the four states of matter., etc.* *ii. Pedagogical Exemplars* *Have learners participate in a think-pair-share activity where learners list the states of matter and classify the objects into the three primary states of matter, e.g. ice cube, water, helium in a balloon, wooden block, pencil lead, etc. This should be a quick activity and accessible for all learners., etc.* *iii. Key Assessments (DoK)* *Level 1: List the three primary states of matter, commonly found in our surroundings, etc.* *l) Computing (Week 4)* *i. Learning Tasks* *Learners watch video as in the scan code to see how the CPU works, etc.* *ii. Pedagogical Exemplars:* *The teacher should begin by introducing each stage of the cycle separately, such as fetch, decode, execute, and store. This approach helps learners understand each step before moving on to the next, etc.* *iii. Key Assessments (DoK):* *Level 2: List the steps involved in the Fetch phase in the Fetch-Decode-Execute-Store cycle, etc.* 2.5 In your subject groups or individually, complete learning planners for Weeks 3 and 4. It should include and ensure alignment of teaching, learning and assessment activities, taking into consideration differentiation (such as providing activities with at least three different levels of difficulty), GESI and SEL in each learning planner to cater for all learners (NTS 1a, 1b, 2a, 2c. 3a, 3g and 3h).	

3. Peer-review of learning planners. **· Reviewing planner to ensure alignment between course manual and learning planner based on the templates provided.**	3.1 Exchange one of your learning plans with a colleague in the same department (where applicable) and peer review the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of a learning plan (NTS 1a, 1b, and 1e-1g). *Note:* *Areas for vital review:* *a) Alignment among teacher manual and learning plan* *b) Innovativeness of pedagogical choices* *c) Incorporation of GESI, SEL, national values and 21st century skills* *d) Differentiated instruction and assessment* *e) Appropriateness of crafted essential questions, etc.* 3.2 Implement the recommendations made by a peer reviewer to your learning plan as appropriate (NTS 1b).	10 mins
4. Reflection on the session: **· Reflecting on what has been learned in the session.** **· Advance preparation towards next DPLC session**	4.1 Share your views and experiences about the session (NTS 1a). 4.2 Complete your learning plans which were not completed during the session (NTS 3l). 4.3Remember to read the contents of Weeks 5 and 6 of the teacher manuals ahead of time and the DPLC Handbook Session 4 in preparation for the next session and bring along your DPLC Handbook and teacher manual (NTS 1a, 1b).	10 mins

DPLC Session 4: Developing learning plans for Weeks 5 and 6		
The sections below provide the frame for what is to be done in the session	**Guidance Notes on Teacher Activity during the DPLC Session.** *What teachers will do during each stage of the session*	**Time in session**
1. Introduction: Review of previous learning using ideas from the last DPLC session	1.1 Share two things you implemented based on DPLC Session 3, *developing learning plans for Weeks 3 and 4*, which you think impacted learning positively (NTS 1a, 1b). 1.2 As a critical friend, discuss why you think what a colleague did through the application of lessons learnt in DPLC Session 3, *developing learning plans for Weeks 3 and 4,* supported learning (NTS 1a- 1c).	10 mins
2. Planning for teaching, learning and assessment activities, using the teacher manual to complete the learning planner, integrating GESI, SEL, ICT, differentiation, 21st century skills and national values (2 learning planners to be completed per session)	2.1 Read the Purpose, Learning Outcomes (LOs), and Learning Indicators (LIs) for the session (NTS 1b). **Purpose:** The purpose of this session is to assist science teachers in utilising the teacher manual to create learning plans for lessons during Weeks 5 and 6. Science teachers will focus on developing learning plans for the following lessons: A. *General science:* *Explain the properties and functions of solids in life.* B. *ICT:* *Create multimedia documents using appropriate computing tools.* C. *Biology:* *Specialised cells, cellular organisation in living things, the concept of cell membrane and on the significance of the various processes involved in the movement of substances in and out of the cell and the factors affecting them, and the application of the knowledge of biological keys to identify living things.* D. *Chemistry:* *Radioactivity and its applications in everyday life and the mole concept.*	60 mins

	E. Physics: *Equations of motion and Newton's law of motion.* *F. Computing:* *Explain the relationships between the components of a computer and how data are transferred among the components.* LO 1: Develop subject-specific learning plans for teaching Weeks 5 and 6 lessons using the teacher manual, taking into account GESI, ICT, SEL, national values and other cross-cutting issues (NTS 3a, 3e-3g and 3k). L1.1 Discuss the important aspects in Weeks 5 and 6 science lessons in the teacher manual including content standards, LOs, LIs, key concepts, essential questions, GESI, pedagogical exemplars and assessment strategies of the learning planner template. LI 1.2 Complete the learning planner for Weeks 5 and 6 science lessons taking into consideration cross-cutting issues, GESI responsive resources, pedagogical exemplars and assessment strategies proposed in the teacher manual. LO 2: Review the learning plans for Weeks 5 and6 of the subject-based science lessons (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3j and 3o). LI 2.1 Critique the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of learning plan for Weeks 5 and6 in line with the LOs, LIs and key concepts in the teacher manual. LI 2.2 Implement the recommendations made by a peer reviewer to the learning plans for Weeks 5 and 6 in line with the LOs, LIs and key concepts in the teacher manual where appropriate. 2.2 Read silently the content standards, LOs, LIs and pedagogical exemplars for your subject in Weeks 5 and 6 in your teacher manual. 2.3 Discuss at least two essential questions that will guide the lesson activities in Weeks 5 and 6 (NTS 1a, 2c, 2e, 2f, 3d-3g). *E.g.* *a) General Science (Week 5)* *How do I explain concepts of rusting using experiment and its application in construction?, etc.*	

	b) *ICT (Week 5)* *How are computing tools used responsibly to create multimedia documents containing text, images, etc. in everyday life?, etc.* c) *Biology (Week 5)* *How would I explain the cell membrane as an essential component of the living cell?, etc.* d) *Chemistry (Week 5)* *How do I make connections between the content, radioactivity and applications to the industry (nuclear power)?, etc.* e) *Physics (Week 5)* *What strategies can I employ to ensure that learners are actively participating and thinking during the lesson on equations of motion?, etc.* f) *Computing (Week 5)* *How are data transferred among the computer components?, etc.* g) *General Science (Week* *How do ionic and covalent compounds conduct electricity, and what are the reasons behind their electrical conductivity?, etc.* h) *ICT (Week 6)* *In what ways can I integrate the cross-cutting themes - 21st century skills, GESI, SEL, and national values in teaching multimedia documents and appropriate computing tools to use in creating multimedia documents?, etc.* i) *Biology (Week 6)* *What tool would I use to make identification of organisms in my community easier for learners?, etc.* j) *Chemistry (Week 6)* *What is the best approach to teaching mole whilst integrating the cross-cutting themes- 21st century skills, GESI, SEL and national values?, etc.* k) *Physics (Week 6)* *What real-life examples or scenarios can I use to illustrate the relevance of Newton's Laws of Motion?, etc.*	

	l) Computing (Week 6) *In what ways can I integrate the cross-cutting themes - 21st century skills, GESI, SEL, and national values in teaching how data are transferred among computer component?, etc.* 2.4 Discuss at least two key notes on differentiation for Weeks 5 and 6. See Teacher Manual for more examples on differentiation on focal areas not covered in this handbook (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* *a) General Science (Week 5)* *i. Learning Task:* *State three uses of solid metals, etc.* *ii. Pedagogical Exemplars:* *Learners' research on how the features of different solids connect to their daily uses from various cultural viewpoints. Learner reflects and cross share their views, etc.* *iii. Key Assessments (DoK):* *Level 1: Provide examples of everyday products that use the electrical conductivity of metals, etc.* *b) ICT (Week 5)* *i. Learning Tasks:* *Launching Microsoft PowerPoint Application Window using the Start Menu Button, etc.* *ii. Pedagogical Exemplars* *Engage in project-based learning and practical sessions to create, save, edit and format educational artefacts using Microsoft PowerPoint software taking into consideration the features of Microsoft PowerPoint application window most especially the Menu Bar. Use the tabs on the menu bar to create a multimedia slide with text, shapes and images Ensure inclusivity and equity in using ICT tools, etc.* *iii. Key Assessments* *(DoK):* *Level 1: Identify the steps involved in creating a new slide in a presentation, etc.* *c) Biology (Week 5)* *i. Learning Task:* *Briefly explain the essential components of cell theory. Limit content to explaining the three cardinal issues raised in the cell theory. Allow fast learners to contribute to learning to support slow learners, etc.*	

	ii. Pedagogical Exemplars: *Use an individual learning approach to search for information on the cell and cell theory and eukaryotic cell; learners acquire the skill of independent thinking and confidence, etc.* *iii. Key Assessments* *(DoK):* *Level 1: Define the cell and give the main types of cells, etc.* *d) Chemistry (Week 5)* *i. Learning Tasks:* *List at least three uses of radioisotopes, etc.* *ii. Pedagogical Exemplars: Collaborative learning, guide learners in pairs to discuss radioactivity and distinguish between nuclear reactions and chemical reactions. Learners present their responses in a power point or flow charts or any appropriate format of their choice, etc.* *iii. Key Assessments* *(DoK):* *Level 1: List at least three (3) uses of radioisotopes, etc.* *e) Physics (Week 5)* *i. Learning Tasks:* *Define the terminologies associated with rectilinear motion (s, u, v, a and t), etc.* *ii. Pedagogical Exemplars* *In mixed-ability groups, learners should brainstorm and define the terminologies; distance, displacement, speed, velocity, acceleration, average velocity and instantaneous velocity and collaboratively distinguish between them, etc.* *iii. Key Assessments (DoK):* *Level 1: Define acceleration, etc.* *f) Computing (Week 5)* *i. Learning Task:* *Learners in their mix-abilities groupings are giving a device (desktop/laptop/smartphone) connected to the internet to research and make comparisons of HDDs vs SDDs, CDs vs DVDs, Keyboards vs Mouse, etc.* *ii. Pedagogical Exemplars:* *Using direct interaction, the teacher should introduce the week's learning indicator and focal area and then use GESI, Learners Research proficiency (e.g., Ask learners to show by hand how many of them have used google search engine for research), Writing Speed and*	

	Communication clarity to form the mix-ability groupings, etc. *iii. Key Assessments (DoK):* *Level 1: Learners should each be able to identify at least three (3) input devices and output devices each, etc.* *g) General science (Week 6)* *i. Learning Tasks:* *Explain the chemical composition of a binary compound, etc.* *ii. Pedagogical Exemplars Guide learners to revise from the JHS curriculum B9.1.1.1.1 about the nature of compounds. Provide opportunities for students to practice respecting others using the talk-for-learning strategies, etc.* *iii. Key Assessments (DoK):* *Level 1: Identify at least four examples of binary compounds, etc.* *h) ICT (Week 6)* *i. Learning Tasks:* *Using the Start Menu Button to open the MS Excel application, etc.* *ii. Pedagogical Exemplars:* *Engage in project-based learning and practical sessions to create, save, edit and format educational artefacts using Microsoft Excel application taking into consideration the features of Microsoft Excel application window most especially the Ribbon Tabs. Use the tabs on the ribbon tabs to create a multimedia worksheet with text, shapes and charts Ensure inclusivity and equity in using ICT tools, etc.* *iii. Key Assessments (DoK):* *Level 1: Identify the steps involved in creating a new worksheet in Excel, etc.* *i) Biology (Week 6)* *i. Learning Tasks:* *Explain the term biological keys. Limit content expectation to explanation of biological keys, etc.* *ii. Pedagogical Exemplars:* *•Using differential project-based learning, guide learners in mixed-ability groups collect different samples of organisms within the school community and apply the acquired knowledge in biological keys to group the sampled organisms, assigning reasons in each case for the identified organisms, etc.*	

	iii. Key Assessments (DoK): *Level 1: List between five to ten sets of morphological features you will require to create a dichotomous key and use them to identify and classify three organisms. Accept a list of at least five morphological features for the construction of a dichotomous key, etc.* *j) Chemistry (Week 6)* *i. Learning Tasks:* *Explain how the atomic mass unit (a.m.u) of an individual particle (atom or molecule) is obtained, etc.* *ii. Pedagogical Exemplars:* *Using talk-for-learning strategy and in mixed ability groups, guide learners to explain how the atomic mass unit, (amu) of an individual particle (atom or molecule) is obtained by using a video or power point presentation. Encourage slow learners to talk by directing questions to them, etc.* *iii. Key Assessments (DoK):* *Level 1: Explain atomic mass unit, (a.m.u), etc.* *k) Physics (Week 6)* *i. Learning Tasks* *State Newton's first law of motion and explain the concept of inertia, etc.* *ii. Pedagogical Exemplars:* *Using talk for learning, collaboratively and inclusively, let learners discuss the situations below to establish a) what forces are acting on the object and b) the object's motion. They should draw diagrams to represent the magnitude and direction of the forces they identify, as well as the direction of motion of the object (if any). They should then share their ideas with the class, etc.* *iii. Key Assessments (DoK): Level 1: Explain inertia and state the factors that affect the inertia of a body, etc.* *l) Computing (Week 6)* *i. Learning Tasks:* *Learners in their mix- abilities should be giving a device connected to the internet, etc.* *ii. Pedagogical Exemplars:* *Using direct interaction, the teacher should introduce the week's learning indicator and focal area, etc.* *iii. Key Assessments (DoK):* *Level 1: Learners should each be able to identify at least three (3) input devices and output devices each, etc.*	

	2.5 In your subject groups or individually, complete learning planners for Weeks 5 and 6. It should include and ensure alignment of teaching, learning and assessment activities, taking into consideration differentiation (such as providing activities with at least three different levels of difficulty), GESI and SEL in each learning planner to cater for all learners (NTS 1a, 1b, 2a, 2c. 3a, 3g and 3h).	
3. Peer-review of learning planners. **· Reviewing planner to ensure alignment between course manual and learning planner based on the templates provided.**	3.1 Exchange one of your learning plans with a colleague in the same department (where applicable) and peer review the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of a learning plan (NTS 1a, 1b, and 1e-1g). *Note:* *Areas for vital review:* *a) Alignment among teacher manual and learning planner* *b) Innovativeness of pedagogical choices* *c) Incorporation of GESI, SEL, national values and 21st century skills* *d) Differentiated instruction and assessment* *e) Appropriateness of crafted essential questions, etc.* 3.2 Implement the recommendations made by a peer reviewer to your learning plan as appropriate (NTS 1b).	10mins
4. Reflection on the session: **· Reflecting on what has been learned in the session.** **· Advance preparation towards next DPLC session**	4.1 Share your views and experiences about the session (NTS 1a). 4.2 Complete your learning plans which were not completed during the session (NTS 3l). 4.3Remember to read the contents of Weeks 7 and 8 of the teacher manual ahead of time and the DPLC Handbook Session 5 in preparation for the next session and bring along your DPLC Handbook and teacher manual (NTS 1a, 1b).	10mins

DPLC Session 5: Developing learning plans for Weeks 7 and8		
The sections below provide the frame for what is to be done in the session	**Guidance Notes on Teacher Activity during the DPLC Session.** *What teachers will do during each stage of the session*	**Time in session**
1. Introduction: Review of previous learning using ideas from the last DPLC session	1.1 Share two things you implemented based on DPLC Session 4, *developing learning plans for Weeks 5 and 6*, which you think impacted learning positively (NTS 1a, 1b). 1.2 As a critical friend, discuss why you think what a colleague did through the application of lessons learnt in DPLC Session 4, *developing learning plans for Weeks 5 and 6,* supported learning (NTS 1a- 1c).	10 mins
2. Planning for teaching, learning and assessment activities, using the teacher manual to	2.1 Read the Purpose, Learning Outcomes (LOs), and Learning Indicators (LIs) for the session (NTS 1b). **Purpose:** The purpose of this session is to assist science teachers in utilising the teacher manual to create learning plans for lessons during Weeks 7 and 8. Science teachers will focus on developing learning plans for the	60 mins

complete the learning planner, integrating GESI, SEL, ICT, differentiation, 21st century skills and national values (2 learning planners to be completed per session)	following lessons: A. *General science:* *Explain the properties, and functions of solids in life and appreciate the movement of substances in biotic and abiotic media.* B. *ICT:* *Learners should be able to explain and apply ethics to digital and Social Media platforms.* C. *Biology:* *Principles of classification of living things, and life processes and economic importance of lower organisms (amoeba, euglena and spirogyra).* D. *Chemistry:* *The mole concept and its related quantities and mole ratio and its applications.* E. *Physics:* *Thermometers, Pascal's principle and operation of hydraulic press and brake system in vehicles.* F. *Computing:* *Explain the relationships between the components of a computer and how data are transferred among the components.* LO 1: Develop subject-specific learning plans for teaching Weeks 7 and 8 lessons using the teacher manual, taking into account GESI, ICT, SEL, national values and other cross-cutting issues (NTS 3a, 3e-3g and 3k). L1.1 Discuss the important aspects in Weeks 7 and 8 science lessons in the teacher manual including content standards, LOs, LIs, key concepts, essential questions, GESI, pedagogical exemplars and assessment strategies of the learning planner template. LI 1.2 Complete the learning planner templates for Weeks 7 and 8 science lessons taking into consideration cross-cutting issues, GESI responsive resources, pedagogical exemplars and assessment strategies proposed in the teacher manual.	

	LO 2: Review the learning plans for Weeks 7 and 8 of the subject-based science lessons (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3j and 3o). LI 2.1 Critique the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of learning plan for Weeks 7 and 8 in line with the LOs, LIs and key concepts in the teacher manual. LI 2.2 Implement the recommendations made by a peer reviewer to the learning plans for Weeks 7 and 8 in line with the LOs, LIs and key concepts in the teacher manual where appropriate. 2.2 Read silently the content standards, LOs, LIs and pedagogical exemplars for your subject in Weeks 7 and 8 in your teacher manual. 2.3 Discuss at least two essential questions that will guide the lesson activities in Weeks 7 and 8 (NTS 1a, 2c, 2e, 2f, 3d-3g). *E.g.* *a) General Science (Week 7)* *Using balance chemical equations, how do I differentiate between covalent and ionic compounds as binary compounds?, etc.* *b) ICT (Week 7)* *How to apply ethics to digital and Social Media platforms?, etc.* *c) Biology (Week 7)* *Why should lower organisms such as the Amoeba and Euglena be considered living organisms, although they are made up of only one cell?, etc.* *d) Chemistry (Week 7)* *How will the knowledge and understanding of the content, mole concept and its related quantities help learners to appreciate its importance in their daily lives?, etc.* *e) Physics (Week 7)* *How does Pascal's principle serve as the fundamental concept behind the operation and advantages of hydraulic systems in various applications?, etc.* *f) Computing (Week 7)* *How does a motherboard communicate with other*	

	computer components?, etc. g) *General Science (Week 8)* *How is the knowledge of osmosis applied in the field of work such as the food industry, treatment of water?, etc.* h) *ICT (Week 8)* *In what ways can I integrate the cross-cutting themes - 21st century skills, GESI, SEL, and national values in teaching the application of ethics to digital and Social Media platforms?, etc.* i) *Biology (Week 8)* *Why should lower organisms such as the Amoeba and Euglena be considered as living organisms, although they are only one cell thick?, etc.* j) *Chemistry (Week 8)* *How will the knowledge and understanding of mole ratio help learners calculate how much a product can be obtained from a given number of moles of reactant?, etc.* k) *Physics (Week 8)* *How can I teach learners to use thermometers responsibly and ethically, considering issues like privacy and safety in healthcare, industry, or research settings where temperature measurements are crucial?, etc.* l) *Computing (Week 8)* *What is the best approach to teach Computer Networks and how they work for all learners to benefit from the lesson?, etc.* 2.4 Discuss at least two key notes on differentiation for Weeks 7 and 8. See Teacher Manual for more examples on differentiation on focal areas not covered in this handbook (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* a) *General Science (Week 7)* i. *Learning Tasks:* • *A compound is formed by burning magnesium in air, etc.* ii. *Pedagogical Exemplars:* *Discuss with learners on the basic concepts of binary compound naming. Use leading questions to engage learners in conversations about the patterns and rules involved in naming binary compounds. Encourage them to share their prior knowledge and build on it collaboratively, etc.*	

	iii. Key Assessments (DoK) *Level 1: Write the chemical formula of one compound formed between each of the following elements: Magnesium and chlorine; Sodium and bromine; Carbon and oxygen, etc.* *b) ICT (Week 7)* *i. Learning Tasks* *The teacher should start the lesson by grouping the learners taking into consideration GESI, SEL and other cross cutting issues and have an open class discussion where learners list other computing devices in their environment or research online aside from the computer, etc.* *ii. Pedagogical Exemplars:* *Using Project-Based Learning: Engage in individual and mixed-ability/gender-sensitive group work to brainstorm and explain the importance of digital devices (e.g., desktop computers, laptop computers, mobile phones, tablet computers, e-readers, storage devices, input devices, and output devices), etc.* *iii. Key Assessments (DoK):* *Level 1: Mention 3 examples of digital devices; how do digital devices help us in our everyday life?, etc.* *c) Biology (Week 7)* *i. Learning Tasks* • *Discuss the background of classification, linking it to simple living organisms, and the factors that are considered in classifying them, etc.* *ii. Pedagogical Exemplars:* • *Using an experiential learning approach, put learners in mixed-ability, gender-balanced groups to embark on tours around the school community to observe and collect data on some simple living things (e.g. lower plants and common invertebrates), etc.* *iii. Key Assessments (DoK)* *Level 1:Identify the key factors required in creating a system for the identification and classification of simple living things, etc.* *d) Chemistry (Week 7)* *i. Learning Tasks* *Calculate the number of oxide ions contained in 0.5 mol of Al_2O_3 [$N_A = 6.02 \times 10^{23}$], etc.* *ii. Key Assessments (DoK)* *Level 1:Calculate the number of sodium ions in 16g of*	

	Na_2CO_3. *[Na = 23, O = 16, C = 12, N_A = 6.02 x 10^{23} particles/mol], etc.* *e) Physics (Week 7)* *i. Learning Tasks* *Define the term pressure* *ii. Pedagogical Exemplars:* *Give each learner a piece of graph paper and ask them to draw around their foot. By counting squares to estimate the area of their foot. They then calculate the pressure exerted on the area under their foot based on their weight on a weighing scale and the area of their foot. This could be differentiated by asking learners to give their results in various units (e.g. Nm^{-2}, Ncm^{-2}, etc.) or to provide a written summary of the effect of wearing stilettos or doing a handstand, etc.* *iii. Key Assessments (DOK)* *Level 1: Identify two systems that produce forces from fluid pressure, etc.* *f) Computing (Week 7)* *i. Learning Tasks :* *Using online simulations, videos or photos, link learners' understanding from weeks 5 and 6 to the role of a motherboard, its parts and features, etc.* *ii. Pedagogical Exemplars:* *Using an online simulation or photos (ICT tools), the teacher can teach the learners using direct instruction and open class discussion to discuss the components of the motherboard, its features and roles, etc.* *iii. Key Assessments (DoK)* *Level 1:What is the role of a motherboard in a computer system?, etc.* *g) General science (Week 8)* *i. Learning Tasks:* *Explain diffusion in everyday life, etc.* *ii. Pedagogical Exemplars:* *Using collaborative learning, Group learners based on mixed-ability and gender to encourage collaborative learning. Assign roles within each group to ensure equitable participation, etc.* *iii. Key Assessments (DoK)* *Level 2: How does temperature affect the rate of diffusion?, etc.*	

	h) ICT (Week 8) *i. Learning Tasks* *The teacher should start the lesson by grouping the learners taking into consideration GESI, SEL and other cross cutting issues and have an open class discussion where learners list other computing devices in their environment or research online aside from the computer, etc.* *ii. Pedagogical Exemplars:* *Using Blended Learning, teacher is expected to combine traditional classroom methods with online activities, allowing learners to pace their own learning and access resources beyond the classroom, etc.* *iii. Key Assessments (DoK):* *Level 1: Name three common features found in most smartphones. List two advantages of using a tablet for reading eBooks compared to a traditional paperback book, etc.* *i) Biology (Week 8)* *i. Learning Tasks* *Name at least three life processes of Amoeba and the special adaptations for these processes. Limit content expectation to the identification at least three life processes in Amoeba, and the adaptive features to perform these life processes, etc.* *ii. Pedagogical Exemplars:* *Use task-based Learningfor learners to observe the Amoeba under the light microscope from temporary slides prepared from freshly fetched water from a ditch or pond; make diagrams of these in sketch books. Learners acquire critical observation skills; learners develop their technological skills through the use of the microscope, etc.* *iii. Key Assessments (DoK)* *Level 1: List at least three life processes of Amoeba, briefly explaining each, etc.* *j) Chemistry (Week 8)* *i. Learning Tasks* *Naming compounds based on the IUPAC system of naming using the following examples: $AlBr_3$,$CrCl_3$, HBr, H_3PO_3, $NaHCO_3$, Al_4C_3, Na_3N, SO_2 , $MgSO_4.7H_2O$, etc.* *ii. Pedagogical Exemplars:* *In small groups, research and give class presentations on the IUPAC rules for naming various groups of*	

	inorganic compounds, etc. *iii. Key Assessments (DoK)* *Level 2:Write the chemical formulae of the following compounds; Potassium chloride, Iron (II) bromide, Copper (II) tetraoxosulphate(VI), Sodium carbonate decahydrate, etc.* *k) Physics (Week 8)* *i. Learning Tasks* *Define thermometric substances.* *ii. Pedagogical Exemplars:* *Using a class discussion approach, learners are encouraged to recall their knowledge of heat and temperature, laying the foundation for the upcoming hands-on activities and allowing learners to connect new knowledge with existing knowledge, etc.* *iii. Key Assessments (DOK)* • *Level 1: Define thermometric substances, etc.* *l) Computing (Week 8)* *i. Learning Tasks* *In direct instruction, learners are to listen attentively to the explanation of Operating Systems, Device Drivers, Utility Software, Application Software and their importance sequentially, etc.* *ii. Pedagogical Exemplars:* *Teachers can start the lesson with direct instruction to explain the key terms, System Software, Operating Systems, Device Drivers, Utility Software, Application Software in the process of note making, etc.* *iii. Key Assessments (DoK)* *Level 1: What is the purpose of an operating system?, etc.* 2.5 In your subject groups or individually, complete learning planners for Weeks 7 and 8. It should include and ensure alignment of teaching, learning and assessment activities, taking into consideration differentiation (such as providing activities with at least three different levels of difficulty), GESI and SEL in each learning planner to cater for all learners (NTS 1a, 1b, 2a, 2c. 3a, 3g and 3h).	

3. Peer-review of learning planners. **· Reviewing planner to ensure alignment between course manual and learning planner based on the templates provided.**	3.1 Exchange one of your learning plans with a colleague in the same department (where applicable) and peer review the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of a learning plan (NTS 1a, 1b, and 1e-1g). *Note:* *Areas for vital review:* *a) Alignment among teacher manual and learning planner* *b) Innovativeness of pedagogical choices* *c) Incorporation of GESI, SEL, national values and 21st century skills* *d) Differentiated instruction and assessment* *e) Appropriateness of crafted essential questions, etc.* 3.2 Implement the recommendations made by a peer reviewer to your learning plan as appropriate (NTS 1b).	10mins
4. Reflection on the session: **· Reflecting on what has been learned in the session.** **· Advance preparation towards next DPLC session**	4.1 Share your views and experiences about the session (NTS 1a). 4.2 Complete your learning plans which were not completed during the session (NTS 3l). 4.3Remember to read the contents of Weeks 9 and 10 of the teacher manual ahead of time and the DPLC Handbook Session 6 in preparation for the next session and bring along your DPLC Handbook and teacher manual (NTS 1a, 1b).	10mins

DPLC Session 6: Developing learning plans for Weeks 9 and10		
The sections below provide the frame for what is to be done in the session	**Guidance Notes on Teacher Activity during the DPLC Session.** *What teachers will do during each stage of the session*	**Time in session**
1. Introduction: Review of previous learning using ideas from the last DPLC session	1.1 Share two things you implemented based on DPLC Session 5, *developing learning plans for Weeks 7 and 8*, which you think impacted learning positively (NTS 1a, 1b). 1.2 As a critical friend, discuss why you think what a colleague did through the application of lessons learnt in DPLC Session 5, *developing learning plans for Weeks 7 and 8,* supported learning (NTS 1a- 1c).	10 mins
2. Planning for teaching, learning and assessment	2.1 Read the Purpose, Learning Outcomes (LOs), and Learning Indicators (LIs) for the session (NTS 1b). **Purpose:**	60 mins

activities, using the teacher manual to complete the learning planner, integrating GESI, SEL, ICT, differentiation, 21st century skills and national values (2 learning planners to be completed per session)	The purpose of this session is to assist science teachers in utilising the teacher manual to create learning plans for lessons during Weeks 9 and 10. Science teachers will focus on developing learning plans for the following lessons: A. *General science:* *Principles of reproduction and movement of substances in biotic and abiotic media.* B. *ICT:* *Create multimedia documents using appropriate computing tools.* C. *Biology:* *The application of the knowledge of ecological terms and the significance of ecological concepts, and the interdependency of living organisms for the sustenance of life.* D. *Chemistry:* *Calculations involving stoichiometric relationship and the kinetic theory of matter and its applications.* E. *Physics:* *Temperature scales and its conversion, Image formation in plane mirror and laws of reflection.* F. *Computing:* *Use skills and knowledge to identify and differentiate between the different types of Network Systems.* LO 1: Develop subject-specific learning plans for teaching Weeks 9 and 10 lessons using the teacher manual, taking into account GESI, ICT, SEL, national values and other cross-cutting issues (NTS 3a, 3e-3g and 3k). LI 1.1 Discuss the important aspects in Weeks 9 and 10 science lessons in the teacher manual including content standards, LOs, LIs, key concepts, essential questions, GESI, pedagogical exemplars and assessment strategies of the learning planner template.	

	LI 1.2 Complete the learning planner templates for Weeks 9 and 10 science lessons taking into consideration cross-cutting issues, GESI responsive resources, pedagogical exemplars and assessment strategies proposed in the teacher manual. LO 2: Review the learning plans for Weeks 9 and 10 of the subject-based science lessons (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3j and 3o). LI 2.1 Critique the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of learning plan for Weeks 9 and 10 in line with the LOs, LIs and key concepts in the teacher manual. LI 2.2 Implement the recommendations made by a peer reviewer to the learning plans for Weeks 9 and 10 in line with the LOs, LIs and key concepts in the teacher manual where appropriate. 2.2 Read silently the content standards, LOs, LIs and pedagogical exemplars for your subject in Weeks 9 and 10 in your teacher manual. 2.3 Discuss at least two essential questions that will guide the lesson activities in Weeks 9 and 10 (NTS 1a, 2c, 2e, 2f, 3d-3g). *E.g.* *a) General Science (Week 9)* *In what ways can the knowledge of principles of reproduction in both plants and mammals be applied in everyday lives such as health, and agriculture?, etc.* *ICT (Week 9)* *How can using the appropriate computing tools for multimedia documents make working with computers easy?, etc.* *b) Biology (Week 9)* *How can learners understand their environment through ecological concepts?, etc.* *c) Chemistry (Week 9)* *What prior knowledge do learners have about stoichiometry that will help them understand calculations involving stoichiometric relationships?, etc.* *d) Physics (Week 9)* *What is the best approach to teach the temperature scales and its conversion in everyday life for all learners*	

	to benefit from the lesson?, etc. *e) Computing (Week 9)* *How does Computer Network work affect everyday life?, etc.* *f) General Science (Week 10)* *How can the knowledge in concept of reproduction in plants applied in crop production?, etc.* *g) ICT (Week 10)* *In what ways can I integrate the cross-cutting themes - 21st century skills, GESI, SEL, and national values in teaching multimedia documents and appropriate computing tools to use in creating multimedia documents?, etc.* *h) Biology (Week 10)* *How would learners explain interdependency of living organisms in various habitats?, etc.* *i) Chemistry (Week 10)* *How do I relate the content, kinetic theory of matter to the existence of matter in different phases?, etc.* *j) Physics (Week 10)* *How can I convey the real-world significance of understanding image formation in mirrors and the laws of reflection to motivate my learners?, etc.* *k) Computing (Week 10)* *In what ways can I integrate the cross-cutting themes- 21st century skills, GESI, SEL and national values in teaching Computer Networks and how they work?, etc.* 2.4 Discuss at least two key notes on differentiation for Weeks 9 and 10. See Teacher Manual for more examples on differentiation on focal areas not covered in this handbook (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* *a) General Science (Week 9)* *i. Learning task* *Define osmosis. etc.* *ii. Pedagogical exemplars* *Research and Discussion* o *Put learners into pairs and assign them the task of researching osmosis from books/internet/science journals etc. Facilitate*	

	student research on osmosis through guiding questions and reliable sources. etc. *iii. Key Assessments (DoK):* *Level 2: Explain three factors that affect osmosis. etc.* *b) ICT (Week 9)* *i. Learning Tasks:* *Here are some tasks to help learners explore and understand the various uses of digital devices (wearable, mobile devices, and Wireless Devices Connection) in different aspects of life and their importance in modern society. Kindly note that some tasks here are based on differentiated learning, the teacher can use them when applicable. etc.* *ii. Pedagogical Exemplars:* *Project-Based Learning: Integrate digital devices in projects where students can research, create presentations, and collaborate with peers, fostering critical thinking and problem-solving skills, etc.* *iii. Key Assessments (DoK):* *Level 1: Identify the primary purpose of smartphones and digital media players, etc.* *c) Biology (Week 9)* *i. Learning tasks:* *Explain the term ecology. Limit content expectation to the definition or brief explanation of ecology, etc.* *ii. Pedagogical Exemplars:* *Individual-based learning: Learners individually research textbooks, the internet and other relevant sources to understand the meaning of various ecological terms (e.g., ecology, biosphere, environment, ecosystems, community, population, habitat, biome, biotic and abiotic factors), etc.* *iii. Key Assessments (DoK):* *Level 1: Explain briefly the term ecology. Accept an explanation with any three keywords:* *o Branch of biology* *o Study* *o Interaction between* *o Living organisms and* *o Environment, etc.* *d) Chemistry (Week 9)* *i. Learning tasks:* *Balance the chemical equation and determine the mole ratio of hydrogen to oxygen in the reaction, etc.*	

	ii. Pedagogical Exemplars *Start the lesson by assessing learners' prior knowledge in basic chemistry concepts such as balancing of chemical equations from the JHS syllabus, etc.* *iii. Key Assessments* *Level 1: Write a balance chemical equation for the reaction between Zn and HCl, etc.* *e) Physics (Week 9)* *i. Learning tasks:* *Identify types of temperature scales, etc.* *ii. Pedagogical exemplars:* *Have learners research the origin, historical context and critical reference points (freezing and boiling points of water for all temperature scales (Celsius, Fahrenheit, Kelvin), etc.* *iii. Key Assessments (DoK)* *Level 1: What is a temperature scale?, etc.* *f) Computing (Week 9)* *i. Learning tasks:* *Teachers can start the lesson by having an open class discussion with the learners about how networks work and its importance, touching on relatable networks available in the community, etc.* *ii. Pedagogical Exemplars:* *Using an inquiry based learning approach, teachers should introduce the week's learning indicator and focal area "Computer Networking", etc.* *iii. Key Assessments (DoK):* *Level 1: What is the primary purpose of computer networking?, etc.* *g) General science (Week 10)* *i. Learning Task:* *Analyse the differences between the types of reproduction in plants, etc.* *ii. Pedagogical Exemplars:* • *Research and Collaborative Method* o *Put learners in groups to research and discuss the meaning of reproduction and types of reproduction in plants.* o *Encourage reflection and sharing of findings with the class for a discussion on different reproductive strategies in plants. Facilitate research activities,*	

	discussions, and presentations within mixed-ability groups, etc. ○ *iii. Key Assessments (DoK)* • *Level 1: Explain the importance of reproduction, etc.* *h) ICT (Week 10)* *i. Learning tasks:* • *The teacher should start the lesson by grouping the learners taking into consideration GESI, SEL and other cross cutting issues and have an open class discussion where learners list other computing devices in their environment or research online aside from the previously discussed digital devices, etc.* *ii. Pedagogical exemplars:* *Facilitate group discussions where students can share their experiences and insights about using different digital devices, etc.* *iii. Key Assessments (DoK)* *Level 1:Name one major difference between a desktop computer and a laptop computer, etc.* *i) Biology (Week 10)* *i. Learning tasks* *Explain the interdependency of living things, etc.* *ii. Pedagogical Exemplars* *In mixed ability, gender-responsive groups, learners, under the guide of the teacher undertake a nature walk on the school compound to identify some of the interdependency of living things within the community such as pollination, predation, decomposition, provision of food and oxygen through photosynthesis, parasitism other symbiotic associations, recycling of nutrients by decomposers and several feeding relationships, etc.* *iii. Key Assessments- DoK* *Level 1: Name a given habitat and make a list of five living things and five non-living things that interact together and are interdepend on one another, etc.* *j) Chemistry (Week 10)* *i. Learning tasks:* *Provide learners with different materials such as water and ice. Ask them to observe and describe the properties of each state of matter (solids and liquids) based on their shape, volume, density. Guide learners to understand how the kinetic theory of matter explains the behaviour of particles in each state. For example, they can discuss*	

	how particles in a solid are closely packed and vibrate in fixed positions, while particles in a liquid move freely and rapidly, etc. *ii. Pedagogical Exemplars:* *In mix-ability groupings, use visual aids such as diagrams, illustrations, and animations to introduce the kinetic theory of matter. Use simple representations to depict the arrangement and motion of particles in solids and liquids. For example, show how particles in a solid are tightly packed and vibrate in fixed positions, while particles in a liquid are more loosely arranged and can slide past each other. Use colourful graphics to make the concepts clearer to learners, etc.* *iii. Key Assessments (DoK):* *Level 2: Draw a simple diagram illustrating the arrangement and motion of particles in a solid and a liquid, etc.* *k) Physics (Week 10)* *i. Learning Tasks* *Describe reflection, etc.* *ii. Pedagogical Exemplars* *Set up a plane mirror on a table and place an object before it. Ask learners to observe the reflection and draw the incident ray (from the object to the mirror) and the reflected ray (from the mirror to the observer's eye), for different object positions. Encourage them to look for patterns in the angles of incidence and reflection, etc.* *iii. Key Assessments (DOK)* *Level 1: Define reflection, etc.* *l) Computing (Week 10)* *i. Learning tasks:* *Teachers can start with a class discussion emphasising again on the importance and why computer networks are essential in modern computing, etc.* *ii. Pedagogical Exemplars:* *Using talk for learning, teachers should have an open class discussion with the learners in the introduction process, etc.* *iii. Key Assessments (DoK):* *Level 1: What devices are connected directly to the central hub in a star topology?, etc.* 2.5 In your subject groups or individually, complete learning planners for Weeks 9 and 10. It should include and ensure	

	alignment of teaching, learning and assessment activities, taking into consideration differentiation (such as providing activities with at least three different levels of difficulty), GESI and SEL in each learning planner to cater for all learners (NTS 1a, 1b, 2a, 2c. 3a, 3g and 3h).	
3. Peer-review of learning planners. **· Reviewing planner to ensure alignment between course manual and learning planner based on the templates provided.**	3.1 Exchange one of your learning plans with a colleague in the same department (where applicable) and peer review the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of a learning plan (NTS 1a, 1b, and 1e-1g). *Note:* *Areas for vital review:* *a) Alignment among teacher manual and learning planner* *b) Innovativeness of pedagogical choices* *c) Incorporation of GESI, SEL, national values and 21st century skills* *d) Differentiated instruction and assessment* *e) Appropriateness of crafted essential questions, etc.* 3.2 Implement the recommendations made by a peer reviewer to your learning plan as appropriate (NTS 1b).	10 mins
4. Reflection on the session: **· Reflecting on what has been learned in the session.** **· Advance preparation towards next DPLC session**	4.1 Share your views and experiences about the session (NTS 1a). 4.2 Complete your learning plans which were not completed during the session (NTS 3l). 4.3Remember to read the contents of Weeks 11 and 12 of the teacher manual ahead of time and the DPLC Handbook Session 7 in preparation for the next session and bring along your DPLC Handbook and teacher manual (NTS 1a, 1b).	10 mins

DPLC Session 7: Developing learning plans for Weeks 11 and12		
The sections below provide the frame for what is to be done in the session	**Guidance Notes on Teacher Activity during the DPLC Session.** *What teachers will do during each stage of the session*	**Time in session**
1. Introduction: Review of previous learning using ideas from the last DPLC session	1.1 Share two things you implemented based on DPLC Session 6, *developing learning plans for Weeks 9 and 10*, which you think impacted learning positively (NTS 1a, 1b). 1.2 As a critical friend, discuss why you think what a colleague did through the application of lessons learnt in DPLC Session 6, *developing learning plans for Weeks 9 and 10,* supported learning (NTS 1a- 1c).	10 mins
2. Planning for teaching, learning and assessment activities, using the teacher manual to	2.1 Read the Purpose, Learning Outcomes (LOs), and Learning Indicators (LIs) for the session (NTS 1b). **Purpose:** The purpose of this session is to assist science teachers in utilising the teacher manual to create learning plans for lessons during Weeks 11 and 12.	60 mins

complete the learning planner, integrating GESI, SEL, ICT, differentiation, 21st century skills and national values (2 learning planners to be completed per session)	Science teachers will focus on developing learning plans for the following lessons: A. *General science:* *Principles of reproduction and how they are applied to address sexually related societal problems* B. *ICT:* *Classify network types and topologies* C. *Biology:* *The use of ecological devices and methods (such as quadrats, pitfall traps, pooter and Lincoln's index) to study the population of living organisms, and the relevance of direct counting, gut examination and radioactive tracer method for determining energy flow in an ecosystem* D. *Chemistry:* *Calculations involving the various gas laws and analysis of their graphs including Graham's law of diffusion/effusion and Dalton's law of partial pressures* E. *Physics:* *Spherical mirrors and Refraction* F. *Computing:* *Apply knowledge of data structures to explain their real-life applications effectively.* LO 1: Develop subject-specific learning plans for teaching Weeks 11 and 12 lessons using the teacher manual, taking into account GESI, ICT, SEL, national values and other cross-cutting issues (NTS 3a, 3e-3g and 3k). LI 1.1 Discuss the important aspects in Weeks 11 and 12 science lessons in the teacher manual including content standards, LOs, LIs, key concepts, essential questions, key notes on differentiation, GESI, pedagogical exemplars and assessment strategies of the learning planner template. LI 1.2 Complete the learning planner templates for Weeks 11 and 12 science lessons taking into consideration cross-cutting issues, GESI responsive resources, pedagogical exemplars and	

	assessment strategies proposed in the teacher manual. LO 2: Review the learning plans for Weeks 11 and 12 of the subject-based science lessons (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3j and 3o). LI 2.1 Critique the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of learning plan for Weeks 11 and 12 in line with the LOs, LIs and key concepts in the teacher manual. LI 2.2 Implement the recommendations made by a peer reviewer to the learning plans forWeeks 11 and 12 in line with the LOs, LIs and key concepts in the teacher manual where appropriate. 2.2 Read silently the content standards, LOs, LIs and pedagogical exemplars for your subject in Weeks 11 and 12 in your teacher manual (NTS 1a, 2c, 2f and 3d-3g). 2.3 Discuss at least two essential questions that will guide the lesson activities in Weeks 11 and 12 (NTS 1a, 2c, 2e, 2f, 3d-3g). *E.g.* *a) General Science (Week 11)* *How can the knowledge in concept of male and female reproductive systems help address sexually related problems such as STIs, infertility, in real-life scenarios?, etc.* *b) ICT (Week 11)* *How can I classify network types and topologies to make the use of the computer less stressful? etc.* *c) Biology (Week 11)* *What would be the need to use some simple ecological tools for estimating populations of species (e.g., pooter, sweep net, pitfall trap, etc.)?, etc.* *d) Chemistry (Week 11)* *How will I relate the content, Graham's law of diffusion/effusion to real life to help learners appreciate the content?, etc.* *Physics (Week 11)* *What real-life examples or scenarios can I use to illustrate the relevance of spherical mirrors in everyday life and scientific applications?, etc.*	

	e) *Computing (Week 11)* *How does a motherboard communicate with other computer components?, etc.* a) *General Science (Week 12)* *How can the knowledge in concept of menstrual cycle address sexually related problems such as teenage pregnancy in real-life scenarios?, etc.* b) *ICT (Week 12)* *In what ways can I integrate the cross-cutting themes - 21st century, GESI, SEL, and National values in teaching how to classify network types and topologies?, etc.* c) *Biology (Week 12)* *Why must learners know how flows of energy in an ecosystem?, etc.* d) *Chemistry (Week 12)* *How will the knowledge and understanding of Dalton's law ofpartial pressures help learners to calculate pressure of gases over the surface of a liquid?, etc.* e) *Physics (Week 12)* *How can I convey the real-world significance of understanding refraction to motivate my learners?, etc.* f) *Computing (Week 12)* *What is the best approach to teach data storage and manipulation for all learners to benefit from the lesson?, etc.* 2.4 Discuss at least two key notes on differentiation for Weeks 11 and 12. See Teacher Manual for more examples on differentiation on focal areas not covered in this handbook (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* a) *General Science (Week 11)* i. *Learning Task:* *Draw the structure of male reproductive system and label at least five parts, etc.* ii. *Pedagogical Exemplars:* *Engage learners to observe models, videos, pictures, or charts of female and male reproductive systems.* *Encourage learners to document their observations, etc.* iii. *Key Assessments (DoK):* *Level 2: Draw and label the structure of the female*	

	reproductive system, etc. *b) ICT (Week 11)* *i. Learning Tasks:* *The teacher should start the lesson by grouping the learners taking into consideration GESI, SEL and other cross cutting issues and have an open class discussion where learners list other computing devices in their environment or research online aside from the previously discussed digital devices, etc.* *ii. Pedagogical Exemplars:* *Facilitate group discussions where students can share their experiences and insights about using different digital devices, etc.* *iii. Key Assessments (DoK):* *Level 1: Name one major difference between a desktop computer and a laptop computer, etc.* *c) Biology (Week 11)* *i. Learning Tasks:* *Identify and discuss the importance of at least five ecological tools used in the estimation of the population size of organisms in a habitat, etc.* *ii. Pedagogical Exemplars:* *Watch a video or listen to a presentation on the estimation of population size and density of organisms in a habitat using the Lincoln Index and other tools. Submit a written report on the steps involved in the process, etc.* *iii. Key Assessment (DoK)* *Level 1: What is the primary function of a quadrant in ecological study?, etc.* *d) Chemistry (Week 11)* *i. Learning Tasks:* *State at least one (1) of the following gas laws: Boyles' law, Charles' law, Gay-Lussac's law and the Combined gas law, etc.* *ii. Pedagogical Exemplars:* *Exploratory Learning:* *In small mixed-ability groups, research from the internet, library, books, and other resources about the various gas laws (Boyle's law, Charles' law, Avogadro's law and Gay–Lussac's law) in terms of: The formulae, variables and conditions required, etc.* *iii. Key Assessments (DoK):* • *Level 1: State Boyle's law, etc.*	

	e) Physics (Week 11) *i. Learning Tasks:* *Difference between concave and convex spherical mirror, etc.* *ii. Pedagogical Exemplars:* *Provide learners with diagrams of concave and convex mirrors. Ask them to label the different parts, such as the pole, principal axis, focal point, centre of curvature and mirror surface. Learners should be tasked with conducting independent research using the internet and reference books to find the meanings and definitions of the terms related to mirrors, etc.* *iii. Key Assessments (DoK):* *Level 1: What is a spherical mirror?, etc.* *f) Computing (Week 11)* *i. Learning Tasks:* *Divide learners into small mixed-ability groups and assign each group a specific network architecture type (e.g., client-server, peer-to-peer, cloud architecture), etc.* *ii. Pedagogical Exemplars:* *In the research based project, guide learners to find relevant information (such as scalability, reliability, security, and cost-effectiveness) and assist them in creation of presentation (if projection materials or virtual boards are available), etc.* *iii. Key Assessments (DoK):* *Level 1: What is the primary purpose of network architecture in computer networking, etc.* *g) General science (Week 12)* *i. Learning Tasks:* *Explain menstrual cycle and identify at least two stages involved, etc.* *ii. Pedagogical Exemplars* *Think-Pair-Share* *Provide charts, diagrams, videos/ animations illustrating and explaining the menstrual cycle, etc.* *iii. Key Assessments (DoK):* *Level 1: Briefly explain the menstrual cycle, etc.* *h) ICT (Week 12)* *i. Learning Tasks: Exploring the World Wide Web: Identify and group images into web browsers, web pages, and search engines, etc.* *ii. Pedagogical Exemplars:* *Using Project-Based Learning engage learners in mixed-*	

	ability/gender-sensitive group to brainstorm the meaning of the internet, evolution, world wide web, etc. *iii. Key Assessments (DoK):* *Level 1: Identify the key differences between the internet and the World Wide Web, etc.* *i) Biology (Week 12)* *i. Learning Tasks* *Identify at least two different techniques used to study and determine the flow of energy in an ecosystem, etc.* *ii. Pedagogical Exemplars:* *Using shower thoughts assist learners to identify at least two techniques used to study and determine the flow of energy in an ecosystem. Support should be given to learners who may strive with the identification of different techniques used to study and determine the flow of energy in an ecosystem, etc.* *iii. Key Assessments (DoK):* *Level 1: Identify three different techniques used to study and determine the flow of energy in an ecosystem. Accept identification of at least two different techniques used to study and determine the flow of energy in an ecosystem, etc.* *j) Chemistry (Week 12)* *i. Learning Tasks:* *DiscussGraham'slaw of diffusion/effusion, etc.* *ii. Pedagogical Exemplars* *Using talk for learning approach, guide learners to discuss the Graham's law of diffusion/ effusion. Encourage each learner to play an active role in the discussions by asking questions, etc.* *iii. Key Assessments (DoK):* *Level 1: State Graham's law of diffusion or effusion, etc.* *k) Physics (Week 12)* *i. Learning Tasks:* *Determine the characteristics of the image using the mirror formula and magnification formula, etc.* *ii. Pedagogical Exemplars:* *Present the mirror formula to the class and emphasise the significance of the formula in understanding the behaviour of spherical mirrors and how it is used to predict the position of the image formed by such mirrors, etc.* *iii. Key Assessments (DoK):* *Level 2: An object is placed 15 cm from a concave mirror*	

	of a focal length of 20 cm. If the height of the object is 7 cm, *Calculate the position of the image, etc.* *l) Computing (Week 12)* *i. Learning Tasks:* *In small groups of mixed abilities, let learners research on specific network transmission medium (UTP, STP, Coaxial Cable, Fiber Optic Cable, Wireless Transmission, PLC, Satellite Communications), etc.* *ii. Pedagogical Exemplars:* *Guide learners through the research and preparation of presentations, etc.* *iii. Key Assessments (DoK):* *Level 2: Briefly define the following data transmission media: twisted pair cables, coaxial cables, fibre optic cables, and wireless communication technologies, etc.* 2.5 In your subject groups or individually, complete learning planners for Weeks 11 and 12. It should include and ensure alignment of teaching, learning and assessment activities, taking into consideration differentiation (such as providing activities with at least three different levels of difficulty), GESI and SEL in each learning planner to cater for all learners (NTS 1a, 1b, 2a, 2c, 3a, 3g and 3h).	
3. Peer-review of learning planners. **· Reviewing planner to ensure alignment between course manual and learning planner based on the templates provided.**	3.1 Exchange one of your learning plans with a colleague in the same department (where applicable) and peer review the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of a learning plan (NTS 1a, 1b, and 1e-1g). *Note:* *Areas for vital review:* *a) Alignment among teacher manual and learning plan* *b) Innovativeness of pedagogical choices* *c) Incorporation of GESI, SEL, national values and 21st century skills* *d) Differentiated instruction and assessment* *e) Appropriateness of crafted essential questions, etc.* 3.2 Implement the recommendations made by a peer reviewer to your learning plan as appropriate (NTS 1b).	10 mins

4. Reflection on the session: **· Reflecting on what has been learned in the session.** **· Advance preparation towards next DPLC session**	4.1 Share your views and experiences about the session (NTS 1a). 4.2 Complete your learning plans which were not completed during the session (NTS 3l). 4.3Remember to read the contents of Weeks 13 and 14 of the teacher manual ahead of time and the DPLC Handbook Session 8 in preparation for the next session and bring along your DPLC Handbook and teacher manual (NTS 1a, 1b).	10 mins

DPLC Session 8: Developing learning plans for weeks 13 & 14		
The sections below provide the frame for what is to be done in the session	**Guidance Notes on Teacher Activity during the DPLC Session.** *What teachers will do during each stage of the session*	**Time in session**
1. Introduction: Review of previous learning using ideas from the last DPLC session	1.1 Share two things you implemented based on the DPLC Session 7, *developing learning plans for Weeks 11 and 12,* which you think impacted learning positively (NTS 1a,1b). 1.2 As a criticalfriend, discuss why you think what a colleague did through the application of lessons learnt in DPLC Session 7, *developing learning plans for Weeks 11 and 12,* supported learning (NTS1a-1c).	10 mins

2. Planning for teaching, learning and assessment activities, using the teacher manual to complete the learning planner, integrating GESI, SEL, ICT, differentiation, 21st century skills and national values (2 learning planners to be completed per session)	2.1 Read the Purpose, Learning Outcomes (LOs), and Learning Indicators (LIs) for the session (NTS 1b). **Purpose:** The purpose of this session is to assist science teachers in utilising the teacher manual to create learning plans for lessons during weeks 13 & 14. Science teachers will focus on developing learning plans for the following lessons: *A. Generalscience:* *Explain form and sources of energy, and their generation.* *B. ICT:* *Connect and use wired and wireless networks.* *C. Biology:* *The efficiency of energy flow in an ecosystem with emphasis on ecological pyramids, and the application of the knowledge of common disease-causing organisms to prevent their effects on humans and theirenvironment.* *D. Chemistry:* *The ideal gas equation and its deviations from ideal behaviour and laboratory preparation of some gases.* *E. Physics:* *Refractive index and Charge carriers.*	60 mins

	F. Computing: *Apply knowledge of data structures to explain their real-life applications effectively.* LO 1: Develop subject-specific learning plans for teaching weeks 13 and 14 lessons using the teacher manual, taking into account GESI, ICT, SEL, National values and other cross-cutting issues (NTS 3a, 3e-3g and 3k). L1.1 Discuss the important aspects in weeks 13 and 14 science lessons in the teacher manual including content standards, LOs, LIs, key concepts, essential questions, GESI, pedagogical exemplars and assessment strategies of the learning planner template. LI 1.2 Complete the learning planner templates for weeks 13 and 14 science lessons taking into consideration cross-cutting issues, GESI responsive resources, pedagogical exemplars and assessment strategies proposed in the teachermanual. LO 2: Review the learning plans for Weeks 3 and 4weeks 13 and 14 of the subject-based science lessons (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g- 3j and 3o). LI 2.1 Critique the content (such as essential questions, key note on differentiation, teaching and learning activities, assessment, and closure) of learning plan for weeks 13 and 14 in line with the LOs, LIs and key concepts in the teacher manual. LI 2.2 Implement the recommendations made by a peer	

	reviewer to the learning plans for weeks 13 and 14 in line with the LOs, LIs and key concepts in the teacher manual where appropriate. 2.2 Read silently the content standards, LOs, LIs and pedagogical exemplars for your subject in weeks 13 and 14 in your teacher manual. (NTS 1a, 2c, 2f and3d-3g). 2.3 Discuss at least two essential questions that will guide the lesson activities in weeks 13 and 14 (NTS 1a, 2c, 2e, 2f,3d-3g). *E.g.* *a) General Science (Week 13)* *In real-life situations, how do I apply the knowledge of forms of energy?, etc.* *b) ICT (Week 13)* *How to Connect and use wired and wireless networks?, etc.* *c) Biology (Week 13)* *Why is a pyramid an effective model for energy flow?, etc.* *d) Chemistry (Week 13) How will I make connections between the content, the ideal gas equation and its deviations from ideal behaviour and real-life experiences?, etc.* *e) Physics (Week 13)* *How can I convey the real-world significance of understanding refractive index to motivate my learners?, etc.*	

	f) Computing (Week 13) *How can learners use data structures to manipulate data efficiently?, etc.* *g) General Science (Week 14)* *How do I help learners to design and build solar panel using locally available materials?, etc.* *h) ICT (Week 14)* *In what ways can I integrate the cross-cutting themes – 21st century skills, GESI, SEL, and national values in teaching how to connect and use wired and wireless networks ?, etc.* *i) Biology (Week 14)* *How would you use your knowledge of the description of cholera based on causative agent, mode of transmission, symptoms, control/preventive measures and treatment to provide education on cholera to the people of your community to prevent an outbreak?, etc.* *j) Chemistry (Week 14)* *How will I make connections between the content, laboratory preparation of gases and industrial preparation of gases? etc.* *k) Physics (Week 14)* *Which activities can I design to allow all learners to apply what they have learned in the lesson on mobile charge carriers in a meaningful way?, etc.* *l) Computing (Week 14)* *In what ways can I integrate the cross-cutting themes- 21st century skills, GESI, SEL and national values in teaching Computer Networks and how they work?, etc.* 2.4 Discuss at least two key notes on differentiation for Weeks 13 and 14. See teacher manual for more examples on differentiation on focal areas not covered in this handbook (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* a) *General Science (Week 13)* *i. Learning Task*	

	Explain the electricity, etc. *ii. Pedagogical Exemplars: Engage learners in a structured discussion by revising various forms of electricity generation from the junior high school curriculum (B7.4.2.1.1) related to solar energy, etc.* *iii. Key Assessment (DoK):* *Explain the process of electricity generation in solar panels, etc.* *b) ICT (Week 13)* *i. Learning Task:* *The teacher should start the lesson by grouping the learners taking into consideration GESI, SEL and other cross cutting issues and have an open class discussion where learners brainstorm the definition of a computer network and it importance. Each group comes out with a definition of and computer with at least three importance of computer networks in writing. Each group read their write ups with the larger group. Teacher t should briefly summarise learners' presentation on definition of computer networks and the importance of computer networks, etc.* *ii. Pedagogical Exemplars:* *Interactive Lectures: Use multimedia presentations to introduce different network devices and their functions. Incorporate real-world examples to illustrate how these devices interact within computer networks, etc.* *iii. Key Assessment (DoK):* *Level 1: What is a computer network? Name two devices that are commonly used in a computer network., etc.* *c) Biology (Week 13)* *i. Learning Task:* *What does the pyramid of numbers represent in an ecosystem? Limit content expectation to the definition of the pyramid of numbers, etc.* *ii. Pedagogical Exemplars:* *Group-based Learning: Watch a video or a presentation on the methods of determining the various ecological pyramids. Using field observations, allow students to observe and count different organisms at different locations of the school compound to construct their own pyramid of numbers, biomass, and energy, etc.*	

	iii. Key Assessment (DoK): *Level 1: What does the pyramid of numbers represent in an ecosystem? Accept the correct definition for the pyramid of numbers. Define biomass and explain its significance in ecological studies. Accept the definition of biomass and explanations of the importance of biomass, etc.* *d) Chemistry (Week 13)* *i. Learning Task:* *What is the ideal gas equation and how is it derived? etc.* *ii. Pedagogical Exemplars:* *Using collaborative learning review the previous knowledge of learners on Boyle's Law, Charles' Law and Avogadro's Law, etc.* *iii. Key Assessment (DoK):* *Level 1: Write the ideal gas equation and define the terms, etc.* *e) Physics (Week 13)* *i. Learning Task:* *Define the term refractive index of a medium and demonstrate understanding of its significance in optics, etc.* *ii. Pedagogical Exemplars:* *Analyse a data set with measurements of the angle of incidence and angle of refraction for different materials. Ask learners to identify the pattern and develop a formula to calculate the refractive index of any transparent medium, etc.* *iii. Key Assessment (DoK):* *Level 1: What is the refractive index of a medium?* *f) Computing (Week 13)* *i. Learning Task:* *Define what Data Structures are and provide examples, etc.* *ii. Pedagogical Exemplars:* *Present a brief lecture or use visual aids to explain the basic definition of Data Structures, such as arrays, linked lists, stacks, queues, trees, and graphs, etc.* *iii. Key Assessment (DoK):* *Level 1: Write basic information about Data Structures, etc.* *g) General science (Week 14)*	

	i. *Learning Task:* *Identify factors to be considered in setting up solar panels in Ghana The setup process of solar panels, including placement, orientation, and connection to the electrical system, etc.* ii. *Pedagogical Exemplars:* *Use think-pair share to explain solar panel, etc.* iii. *Key Assessment (DoK):* *Level 2: Identify and describe routine maintenance tasks required to keep solar panels clean and functioning effectively, such as regular inspection, cleaning, and monitoring of system performance etc.* *h) ICT (Week 14)* i. *Learning Task:* *Teacher begins the lesson with a brief discussion on what a computer network is and why it's important. Teachers ask learners to individually share their prior knowledge on network devices and the functions, etc.* ii. *Pedagogical Exemplars:* *Using Visuals and Simulations: Utilise network simulators, multimedia applications, packet-tracing tools, and visual analogies to help learners visualise network operations and understand complex concepts, etc.* iii. *Key Assessment (DoK):* *Listed response of at least 3 network types, etc.* *i) Biology (Week 14)* i. *Learning Task:* *Name the causative agent for the following diseases.* o *Cholera* o *Typhoidfever* o *Hepatitis A, etc.* ii. *Pedagogical Exemplars:* *Using project-based learning, learners gather data on common diseases among humans within the environment (e.g., Cholera by Vibrio cholerae), etc.* iii. *Key Assessment (DoK):* *Level 1: Name the causative agent of at least one of the following diseases; Cholera, Typhoid fever, Hepatitis A, etc.* *j) Chemistry (Week 14)* i. *Learning Task:*	

	Give three materials needed for the laboratory preparation of hydrogen gas, etc. *ii. Pedagogical Exemplars:* *Collaborative learning: Put learners in small mixed-ability groups to discuss the properties of each of the following gases: hydrogen, carbon dioxide, and ammonia. State their uses in everyday life, etc.* *iii. Key Assessment (DoK):* *Level 1: Explain why hydrogen gas is collected by upward delivery. etc.* *k) Physics (Week 14)* *i. Learning Task:* *Draw a labelled diagram of the Gold leaf electroscope, etc.* *ii. Pedagogical Exemplars:* *Show the learners a physical gold leaf electroscope and explain its basic components, such as the metal rod, the metal leaves, and the housing. Demonstrate how the electroscope responds when charged. A video or picture can be used where the equipment is not available, etc.* *iii. Key Assessment (DoK):* *Level 2: How does a gold leaf electroscope detect a charge?* *l) Computing (Week 14)* *i. Learning Task:* *Define Data Structures and provide examples, etc.* *ii. Pedagogical Exemplars:* *Present a brief lecture or use visual aids to explain the basic definition of Data Structures, such as arrays, linked lists, stacks, queues, trees, and graphs., etc.* *iii. Key Assessment (DoK):* *Level 1: Write half paragraph on basic information about Data Structures, etc.* 2.5 In your subject groups or individually, complete learning planners for weeks 13 and 14. It should include and ensure alignment of teaching, learning and assessment activities, taking into consideration differentiation (such as providing activities with at least three different levels of difficulty), GESI and SEL in each learning planner to cater for all learners (NTS 1a, 1b, 2a, 2c. 3a, 3g and3h).	

3. Peer-review of learning planners. Reviewing planner to ensure alignment between course manual and learning planner based on the templates provided.	3.1 Exchange one of your learning plans with a colleague in the same department (where applicable) and peer review the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of a learning plan (NTS 1a, 1b, and1e-1g). *Note:* *Areas for vital review:* *a) Alignment among teacher manual and learningplanner* *b) Innovativeness of pedagogicalchoices* *c) Incorporation of GESI, SEL, national values and 21st century skills* *d) Differentiated instruction andassessment* *e) Appropriateness of crafted essential questions,etc.* 3.2 Implement the recommendations made by a peer reviewer to your learning plan as appropriate (NTS 1b).	10mins
4. Reflection on the session: **· Reflecting on what has been learned in the session. Advance preparation towards next DPLCsession**	4.1 Share your views and experiences about the session (NTS1a). 4.2 Complete your learning plans which were not completed during the session (NTS3l). 4.3 Remember to read the contents of Weeks 15 and 16 of the teacher manual ahead of time and the DPLC Handbook Session 9 in preparation for the next session and bring along your DPLC Handbookand teacher manual (NTS 1a, 1b).	10min s

DPLC SESSION 9: Developing learning plans for weeks 15 & 16		
The sections below provide the frame for what is to be done in the session	**Guidance Notes on Teacher Activity during the DPLC Session.** *What teachers will do during each stage of the session*	**Time in session**
1. Introduction: Review of previous learning using ideas from the last DPLC session	1.1 Share two things you implemented based on DPLC Handbook Session 8, *developing learning plans for weeks 13 and 14*, which you think impacted learning positively. 1.2 As a criticalfriend, discuss why you think what a colleague did through the application of lessons learned in DPLC Session 8, *developing learning plans for weeks 13 and 14,* supported learning.	10 mins
2. Planning for teaching, learning and assessment activities, using the teacher manual to complete the learning planner, integrating	2.1 Read the Purpose, Learning Outcomes (LOs), and Learning Indicators (LIs) for the session. **Purpose:** The purpose of this session is to assist science teachers in utilizing the teacher manual to create learning plans for lessons during weeks 15 and 16. Science teachers will focus on developing learning plans for following lessons: A. *Generalscience:* *Explain disadvantages of solar energy, forms of energy, form of force, sources, their generation and effects on the environment and motion.* B. *ICT:* *Classify network types and topologies.* C. *Biology:* *Morphological adaptations of mammals, and the Comparative study of the digestive system of different groups ofmammals.* D. *Chemistry:* *The structure of the atom as well as Bohr's theory and the filling of electrons in orbitals.* E. *Physics:* *Matter and Classification of quantities into fundamental, derived, scalars and vectors.*	60 mins

	F. Computing: *Apply knowledge of data structures to explain their real-life applications effectively.* LO 1: Develop subject-specific learning plans for teaching Weeks 15 and 16 lessons using the teacher manual, taking into account GESI, ICT, SEL, national values and other cross-cutting issues (NTS 3a, 3e-3g and 3k). LI 1.1 Discuss the important aspects in Weeks 15 and 16 science lessons in the teacher manual including content standards, LOs, LIs, key concepts, essential questions, key notes on differentiation, GESI, pedagogical exemplars and assessment strategies of the learning planner template. LI 1.2 Complete the learning planner templates for Weeks 15 and 16 science lessons taking into consideration cross-cutting issues, GESI responsive resources, pedagogical exemplars and assessment strategies proposed in the teacher manual. LO 2: Review the learning plans for Weeks 15 and 16 of the subject-based science lessons (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3j and 3o). LI 2.1 Critique the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of the learning plan for Weeks 15 and 16 in line with the LOs, LIs and key concepts in the teacher manual. LI 2.2 Implement the recommendations made by a peer reviewer to the learning plans for Weeks 15 and 16 in line with the LOs, LIs and key concepts in the teacher manual where appropriate. 2.2 Read silently the content standards, LOs, LIs and pedagogical exemplars for your subject in Weeks 15 and 16 in your teacher manual (NTS 1a, 2c, 2f and 3d-3g). 2.3 Discuss at least two essential questions that will guide the lesson activities in Weeks 15 and 16 (NTS 1a, 2c, 2e, 2f, 3d-3g). *E.g.* *a) General Science (week15)* *How do I help learners explain the relationship solar energy and the environment?, etc.*	

	b) *ICT (week 15)* *How can Classify network types and topologies make using the computer less stressful?, etc.* c) *Biology (week 15)* *How would you relate fur or hair, mammary glands, limbs and appendages to theirfunctions?, etc.* d) *Chemistry (week 15)* *How will the understanding of the content, application of solubility and solubility rules help learners appreciate its importance in their dailylives?* e) *Physics (week 15)* *What feedback mechanisms can I put in place to help learners reflect on their learning and adjust as needed?, etc.* f) *Computing (week 15)* *How will the Difference between the types of Data Structures help the learner better manipulate data?, etc.* g) *GeneralScience (week 16)* *How do I explain concepts associated with force such as distance, velocity?, etc.* h) *ICT (week 16)* In what ways can *I integrate the cross-cutting themes - 21st century skills, GESI, SEL, and national values in teaching how to classify network types and topologies?, etc.* i) *Biology (week 16)* *Why do herbivores typically have longer digestive tracts?, etc.* j) *Chemistry (week 16)* *How will understanding the content of qualitative analysis help learners appreciate its importance in forensic investigations?, etc.* k) *Physics (week 16)* *How can I convey the real-world significance of understanding magnets and magnetism to motivate my learners?, etc.* l) *Computing (week 16)* *In what ways can I integratethe cross-cutting themes- Differentiate between the types of Data Structures?, etc.*	

	2.4 Discuss at least two key notes on differentiation for Weeks 15 and 16. See Teacher Manual for more examples on differentiation on focal areas not covered in this handbook (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* *a) General Science (Week 15)* *i. Learning Tasks:* *Compile a list of at least three economic benefits related with the adoption of solar energy in Ghana, etc.* *ii. Pedagogical Exemplars* *Put the learners into small groups and assign each group a specific advantage of solar energy to the economy of Ghana, such as increased energy access or reduced reliance on fossil fuel imports. Have each group research and discuss their assigned advantage, then present their findings to the class. This activity encourages collaboration, critical thinking, and in-depth exploration of the economic benefits of solar energy, etc.* *iii. Key Assessment:* *Level 2: Research and compile a list of at least three economic benefits related with the adoption of solar energy in Ghana* *b) ICT (Week 15)* *i. Learning Tasks* *Engage learners to briefly explain what network topologies are and why they are important. Show examples of star, bus, mesh, and ring topologies using diagrams either in a video or printed format,* *etc.* *ii. Pedagogical Exemplars* *Utilise network simulators, multimedia applications, packet-tracing tools, and visual analogies to help learners visualise network operations and understand complex concepts, etc.* *iii. Key Assessments (DoK):* *Level 1: What is a network topology?, etc.* *c) Biology (week15)* *i. Learning Tasks:* *Provide a list of some external organs and structures that are associated with mammals. Limit content expectation to structures that are located at the external of mammals, and can be observed from the exterior, etc.* *ii. Pedagogical Exemplars:* *Learners in mixed-ability, all-inclusive groups, are to critically observe, discuss and write down their findings*	

	on the external features of a sedated mammal (e.g., Albino rat, rabbit, guinea pig.) presented to them at the lab: Learner experiences lessons in real life scenarios and therefore obtain better understanding in lessons etc. *iii. Key Assessment (DoK)* *Level 1: Name and provide the common features/organs located at the external part of mammals. Accept at least three external organs/features /structures of mammals and their functions, etc.* *d) Chemistry (week 15)* *i. Learning Tasks:* *Explain the term solubility, etc.* *ii. Pedagogical Exemplars:* *Using sample solutions, brainstorm to explain the terms solute, solvent, and solution, etc.* *iii. Key Assessments (DoK):* *Level 1: Define solubility, etc.* *e) Physics (week 15)* *i. Learning Tasks:* *Explain the concept of how charges distribute on different surfaces, particularly conductors and insulators, etc.* *ii. Pedagogical Exemplars:* *Learners should be randomly grouped to research to differentiate how charges are distributed on the surfaces of conductors, etc.* *iii. Key Assessment (DoK)* *Level 1: How do charges distribute themselves on the surface of a conductor?, etc.* *f) Computing (week 15)* *i. Learning Tasks:* *Define and provide examples of basic Data Structures such as arrays, linked lists, stacks, queues, trees, and graph, etc.* *ii. Pedagogical Exemplar:* *Present a lecture or use visual aids to explain the definition and basic characteristics of each Data Structure type* *iii. Key Assessments (DoK)* *Level 1: Discuss the basic types of Data Structures and their key features, etc.* *g) General science (Week 16)* *i. Learning task*	

	Identify the concepts of forces, etc. *ii. Pedagogical Exemplars* *Using the talk-for-learning approach, place learners in mixed-ability/mixed-sex groups to discuss the concepts of distance, displacement, speed, velocity and acceleration with contextual examples, etc.* *iii. Key Assessment (DoK)* *When a carpet is beaten with a stick, dust emerges. Explain, etc.* *h) ICT (Week 16)* *i. Learning task:* *Teachers discuss transmission media with learners and introduce the three main types of guided media to learners. Learners in their groups, research on one type of guided media each using their digital devices (if available) or textbooks. They should focus on their structure, how they transmit data, and their advantages and disadvantages, etc.* *ii. Pedagogical Exemplars:* *Critical Media Literacy: This approach prepares educators to teach learners to critically analyse media and technology. It involves questioning systemic issues of power and engaging in social justice through media creation, etc.* *iii. Key Assessments (DoK):* *Level 1: What are the three main types of guided media?, etc.* *i) Biology (Week 16)* *i. Learning Task:* • *List the three major groups of mammals based on their dietary preferences. Provide support to struggling learners, etc.* *ii. Pedagogical Exemplars:* *Using task-based learning, randomly formed mixed-ability and gender-responsive groups, obtain three different species of small mammals and dissect them, discuss the arrangement and functions of the internal organs and tissues, and compare them with those of other mammals, etc.* *iii. Key Assessments (DoK):* *Level 1: What are the three major groups of mammals based on their dietary preferences?, etc.* *j) Chemistry (Week 16)* *i. Learning Tasks:* *Explain the importance of qualitative analysis in chemistry, etc.*	

	ii. Pedagogical Exemplars: *Talk-for-learning: Brainstorm to explain the solubility rules and predict the effect of precipitating agents on some ions, etc.* *iii. Key Assessments (DoK):* *Level 1: Give one example of a cation, whose salts are soluble, etc.* *k) Physics (week 16)* *i. Learning Task:* *Define what it means for a material to be magnetic or non-magnetic, etc.* *ii. Pedagogical Exemplars:* *Provide a variety of objects made of different materials (e.g., paperclip, coin, pencil, aluminium foil, iron nail). Ask learners to experiment with a magnet and observe which objects are attracted to it and those which are not, etc.* *iii. Key Assessments (DoK):* *Level 1: What is a magnetic material? Provide an example, etc.* *l) Computing (Week 16)* *i. Learning Tasks:* • *Define and differentiate between the basic types of Data Structures such as arrays, linked lists, stacks, queues, trees, and graphs, etc.* *ii. Pedagogical Exemplars::* • *Present a comparison chart or visual aid that highlights the key characteristics and differences of each Data Structure type, etc.* *iii. Key Assessments (DoK):* • *Level 1: Identify the distinct features of different Data Structures, etc.* 2.5 In your subject groups or individually, complete learning planners for Weeks 15 and 16. It should include and ensure alignment of teaching, learning and assessment activities, taking into consideration differentiation (such as providing activities with at least three different levels of difficulty), GESI and SEL in each learning planner to cater for all learners (NTS 1a, 1b, 2a, 2c, 3a, 3g and 3h).	

3. Peer-review of learning planners. **Reviewing planner to ensure alignment between course manual and learning planner based on the templates provided.**	3.1 Exchange one of your learning plans with a colleague in the same department (where applicable) and peer review the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of a learning plan (NTS 1a, 1b, and 1e-1g). *Note:* *Areas for vital review:* *a) Alignment among teacher manual and learning planner* *b) Innovativeness of pedagogical choices* *c) Incorporation of GESI, SEL, national values and 21st century skills* *d) Differentiated instruction and assessment* *e) Appropriateness of crafted essential questions, etc.* 3.2 Implement the recommendations made by a peer reviewer to your learning plan as appropriate (NTS 1b).	10 mins
4. Reflection on the session: **· Reflecting on what has been learned in the session.** **· Advance preparation towards next DPLC session**	4.1 Share your views and experiences about the session (NTS 1a). 4.2 Complete your learning plans which were not completed during the session (NTS 3l). 4.3Remember to read the contents of Weeks 17 and 18 of the teacher manual ahead of time and the DPLC Handbook Session 10 in preparation for the next session and bring along your DPLC Handbook and teacher manual (NTS 1a, 1b).	10 mins

DPLC Session 10: Developing learning plans for Weeks 17 and18		
The sections below provide the frame for what is to be done in the session	**Guidance Notes on Teacher Activity during the DPLC Session.** *What teachers will do during each stage of the session*	**Time in session**
1. Introduction: Review of previous learning using ideas from the last DPLC session	1.1 Share two things you implemented based on DPLC Session 9, *developing learning plans for Weeks 15 and 16*, which you think impacted learning positively (NTS 1a, 1b). 1.2 As a critical friend, discuss why you think what a colleague did through the application of lessons learnt in DPLC Session 9, *developing learning plans for Weeks 15 and 16,* supported learning (NTS 1a- 1c).	10 mins
2. Planning for teaching,	2.1 Read the Purpose, Learning Outcomes (LOs), and Learning Indicators (LIs) for the session (NTS 1b).	60 mins

learning and assessment activities, using the teacher manual to complete the learning planner, integrating GESI, SEL, ICT, differentiation, 21st century skills and national values (2 learning planners to be completed per session)	**Purpose:** The purpose of this session is to assist science teachers in utilising the teacher manual to create learning plans for lessons during Weeks 17 and 18. Science teachers will focus on developing learning plans for the following lessons: A. *General science:* *Uses of electronic components in household electronic gadgets and how to manage hazard in everyday life.* B. *ICT:* *Classify transmission media used to send and receive data in a network environment.* C. *Biology:* *The Morphology of flowering plants, and Distinguishing features of angiosperms.* D. *Chemistry:* *Periodicity and ionic bonding.* E. *Physics:* *Semiconductors and transducers.* F. *Computing:* *Apply Algorithms in various real-life and programming situations problems.* LO 1: Develop subject-specific learning plans for teaching Weeks 17 and 18 lessons using the teacher manual, taking into account GESI, ICT, SEL, national values and other cross-cutting issues (NTS 3a, 3e-3g and 3k). LI 1.1 Discuss the important aspects in Weeks 17 and 18 science lessons in the teacher manual including content standards, LOs, LIs, key concepts, essential questions, GESI, pedagogical exemplars and assessment strategies of the learning planner template. LI 1.2 Complete the learning planner templates for Weeks 17 and 18 science lessons taking into consideration cross-cutting issues, GESI responsive resources, pedagogical exemplars and	

	assessment strategies proposed in the teacher manual. LO 2: Review the learning plans for Weeks 17 and 18 of the subject-based science lessons (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3j and 3o). LI 2.1 Critique the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of the learning plan for Weeks 17 and 18 in line with the LOs, LIs and key concepts in the teacher manual. LI 2.2 Implement the recommendations made by a peer reviewer to the learning plans for Weeks 17 and 18 in line with the LOs, LIs and key concepts in the teacher manual where appropriate. 2.2 Read silently the content standards, LOs, LIs and pedagogical exemplars for your subject in Weeks 17 and 18 in your teacher manual (NTS 1a, 2c, 2f and 3d-3g). 2.3 Discuss at least two essential questions that will guide the lesson activities in Weeks 17 and 18 (NTS 1a, 2c, 2e, 2f, 3d-3g). *E.g.* *a) General Science (Week 17)* *How do I apply the knowledge of uses of electronic components to prevent everyday hazard when using electronic household gadgets?, etc.* *b) ICT (Week 17)* *How can transmission media be used effectively to send and receive data in a network environment?, etc.* *c) Biology (Week 17)* *How can I describe the morphological features of flowering plants to show them as the most successful group in the evolution of the plant kingdom?, etc.* *d) Chemistry (Week 17)* *How will I make connections between the content, periodicity and real-life experiences?, etc.* *e) Physics (Week 17)* *What real-life examples or scenarios can I use to illustrate the relevance of transducers in everyday life in various fields, such as engineering, medicine, and environmental monitoring?, etc.*	

	f) *Computing (Week 17)* *How can learners use the various stages of app development to design their own app?, etc.* g) *General Science (Week 18)* *How can the knowledge of hazard management be applied in everyday life such as workplaces, home?, etc.* h) *ICT (Week 18)* *In what ways can I integrate the cross-cutting themes - 21st century skills, GESI, SEL, and national values in teaching how to transmission media be used effectively to send and receive data in a network environment?, etc.* i) *Biology (Week 18)* *How will I use your knowledge of monocot and dicot plants to help learners identify these two species of cocoa and maize?, etc.* j) *Chemistry (Week 18)* *How do I make connections between the content, Ionic bonding and household compounds with ionic bonds?, etc.* k) *Physics (Week 18)* *In what ways can I integrate the cross-cutting themes- 21st century skills, GESI, SEL and national values in teaching semiconductors?, etc.* l) *Computing (Week 18)* *What are the different user experience and user interface design principles used in app development? etc.* 2.4 Discuss at least two key notes on differentiation for Weeks 17 and 18. See Teacher Manual for more examples on differentiation on focal areas not covered in this handbook (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* *General Science (Week 17)* i. *Learning Tasks:* *Identify electronic components in household devices, etc.* ii. *Pedagogical Exemplars:* *Guide learners in revising the basic electronics components from the JHS curriculum using talk-for-learning approaches and internet resources, etc.* iii. *Key Assessments (DoK):* *Level 1: Draw circuit symbols of four electronic components, etc.*	

	b) ICT (Week 17) *i. Learning Tasks:* *Divide learners into groups, and assign each group a specific transmission mode (simplex, half-duplex, or full-duplex) and have group act out scenarios related to their assigned mode using role play, etc.* *ii. Pedagogical Exemplars:* *Provide a list of transmission modes such as simplex, half-duplex, and full-duplex, and ask learners to identify and explain each mode, etc.* *iii. Key Assessments (DoK):* *Level 1: Discuss the basic concepts of transmission modes in computer networks, etc.* *a) Biology (Week 17)* *i. Learning Tasks:* *In a tabular form, state three external differences between* *ii. Pedagogical Exemplars:* *In mixed-ability gender-responsive and all -inclusive tasked-based groups, learners' sample different flowering plants from their immediate environment, and carefully observe and write down features that are common to monocotyledonous and dicotyledonous groups. Learners appreciate real-life situations by undertaking project assignment in their immediate environment, etc.* *iii. Key Assessments (DoK):* *Level 1: List any six features that distinguish monocotyledonous from dicotyledonous, hence, state the extent to which these two groups of flowering plants differ in each factor, etc.* *b) Chemistry (Week 17)* *i. Learning Tasks:* *How does the electron configuration of an atom relate to the block in which the element is found on the periodic table?, etc.* *ii. Pedagogical Exemplars:* *Using the Activity-based-learning approach, guide learners to write the electron configuration of the first thirty elements individually based on the orbital notation, etc.* *iii. Key Assessments (DoK):* *Level 1: An element X, has electron configuration $1S^2\ 2S^2$, State the block that X belongs to. Which group does X belong to?, etc.*	

	c) Physics (Week 17) *i. Learning Tasks:* *Define n-type and p-type semiconductors?, etc.* *Pedagogical Exemplars:* *Use an interactive simulation or app to demonstrate the doping process in a semiconductor. Allow learners to adjust the dopant concentration and observe how it affects the formation of n-type and p-type regions, etc.* *ii. Key Assessments (DoK):* *Level 1: What are n-type and p-type semiconductors?, etc.* *d) Computing (Week 17)* *i. Learning Tasks:* *In groups guide learners to explain Algorithms with examples, etc.* *ii. Pedagogical Exemplars:* *Group discussion on the understanding of algorithms and relate it to real time problems, etc.* *iii. Key Assessments (DoK):* *Level 1: Explain Algorithms, etc.* *e) General science (Week 18)* *i. Learning Tasks:* *Explain and identify hazards in the environment, etc.* *ii. Pedagogical Exemplars:* *Visit an accessible local industry, such as sawmills, palm kernel oil production, gari processing, etc., and assess their activities' possible risks and hazards, etc.* *iii. Key Assessments (DoK):* *Explain four ways in which industrial activities and transportation contribute to each hazard, etc.* *f) ICT (Week 18)* *i. Learning Tasks:* *Divide learners into groups, and assign each group a specific computer safety measures and have group act out scenarios related to their assigned task using role play, etc.* *ii. Pedagogical Exemplars:* *Provide a list of computer safety such as simplex, half-duplex, and full-duplex, and ask learners to identify and explain each mode, etc.* *iii. Key Assessments (DoK):* *Level 1: Discuss the basic computer safety measures in the society, etc.*	

	g) Biology (Week 18) *i. Learning Tasks:* *Mention at least two monocotyledonous and dicotyledonous plants, etc.* *ii. Pedagogical Exemplars:* • *In employing individual-based learning,Sample flowering plants from the immediate environment, and create a poster on monocotyledonous and dicotyledonous plants, focusing on the features that are common to both groups of plants. Learners listen to their peers' opinions and accept constructive criticism, etc.* *iii. Key Assessments (DoK):* *Level 1: List at least five monocotyledonous plants, etc.* *h) Chemistry (Week 18)* *i. Learning Tasks:* *Explain chemical bonding, etc.* *ii. Pedagogical Exemplars:* *Review the meaning of chemical bonding and the types of interatomic bonding (ionic, covalent and metallic) from the JHS curriculum, etc.* *iii. Key Assessments (DoK):* *Level 2: Describe how calcium ions are formed. Using the Lewis dot structures, describe the formation of calcium oxide, etc.* *i) Physics (Week 18)* *i. Learning Tasks:* *Define a transducer and explain its function in converting energy between different forms, etc.* *ii. Pedagogical Exemplars:* *Provide a clear and concise definition of a transducer, emphasising its role in converting one form of energy into another. Ask learners to rephrase the definition in their own words to ensure comprehension, etc.* *iii. Key Assessments (DoK):* *Level 1: Provide a simple example of a transducer and its input, etc.* *j) Computing (Week 18)* *i. Learning Tasks:* *In groups guide learners to discuss Algorithms with examples, etc.* *ii. Pedagogical Exemplars:* *Group discussion on the understanding of algorithms and relate it to real time problems, etc*	

	iii. Key Assessments (DoK): *Level 1: Oral discussion of at least 2 ways Algorithms can be applied in real life, etc.* 2.4 In your subject groups or individually, complete learning planners for Weeks 17 and 18. It should include and ensure alignment of teaching, learning and assessment activities, taking into consideration differentiation (such as providing activities with at least three different levels of difficulty), GESI and SEL in each learning planner to cater for all learners (NTS 1a, 1b, 2a, 2c. 3a, 3g and 3h).	
3. Peer-review of learning planners. **· Reviewing planner to ensure alignment between course manual and learning planner based on the templates provided.**	3.1 Exchange one of your learning plans with a colleague in the same department (where applicable) and peer review the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of a learning plan (NTS 1a, 1b, and 1e-1g). *Note:* *Areas for vital review:* *a) Alignment between teacher manual and learning plan* *b) Innovativeness of pedagogical choices* *c) Incorporation of GESI, SEL, national values and 21st century skills* *d) Differentiated instruction and assessment* *e) Appropriateness of crafted essential questions, etc.* 3.2 Implement the recommendations made by a peer reviewer to your learning plan as appropriate (NTS 1b).	10mins
4. Reflection on the session: **· Reflecting on what has been learned in the session.** **· Advance preparation towards next DPLC session**	4.1 Share your views and experiences about the session (NTS 1a). 4.2 Complete your learning plans which were not completed during the session (NTS 3l). 4.3Remember to read the contents of Weeks 19 and 20 of the teacher manual ahead of time and the DPLC Handbook Session 11 in preparation for the next session and bring along your DPLC Handbook and teacher manual (NTS 1a, 1b).	10mins

DPLC Session 11: Developing learning plans for Weeks 19 and20		
The sections below provide the frame for what is to be done in the session	**Guidance Notes on Teacher Activity during the DPLC Session.** *What teachers will do during each stage of the session*	**Time in session**
1. Introduction: Review of previous learning using ideas from the last DPLC session	1.1 Share two things you implemented based on DPLC Session 10, *developing learning plans for Weeks 17 and 18*, which you think impacted learning positively (NTS 1a, 1b). 1.2 As a critical friend, discuss why you think what a colleague did through the application of lessons learnt in DPLC Session 10, *developing learning plans for Weeks 17 and 18,* supported learning (NTS 1a- 1c).	10 mins
2. Planning for teaching, learning and assessment activities, using the teacher manual to complete the learning planner, integrating GESI, SEL, ICT, differentiation, 21st century skills and national values (2 learning planners to be completed per session)	2.1 Read the Purpose, Learning Outcomes (LOs), and Learning Indicators (LIs) for the session (NTS 1b). **Purpose:** The purpose of this session is to assist science teachers in utilising the teacher manual to create learning plans for lessons during Weeks 19 and 20. Science teachers will focus on developing learning plans for the following lessons: A. *General science:* *Concepts of Lifestyle diseases and effects of drugs on humans.* B. *ICT:* *Discuss Physical Safety Risk (Electrocution, Fire hazard, Tripping hazard, Personal injury) in the use of computers.* C. *Biology:* *Distinctive features of monocotyledonous and dicotyledonous plants and how they relate to their functions, and relating the tissues of the roots of monocotyledonous and dicotyledonous plants to their functions.* D. *Chemistry:* *Covalent bonding and metallic bonding as well as hydrogen bonding and Van der Waals forces.*	60 mins

	E. Physics: *Biasing of transistors and processes of transducers.* *F. Computing:* *Apply Algorithms in various real-life and programming situations problems.* LO 1: Develop subject-specific learning plans for teaching Weeks 19 and 20 lessons using the teacher manual, taking into account GESI, ICT, SEL, National values and other cross-cutting issues (NTS 3a, 3e-3g and 3k). LI 1.1 Discuss the important aspects in Weeks 19 and 20 science lessons in the teacher manual including content standards, LOs, LIs, key concepts, essential questions, key notes on differentiation, GESI, pedagogical exemplars and assessment strategies of the learning planner template. LI 1.2 Complete the learning planner templates for Weeks 19 and 20 science lessons taking into consideration cross-cutting issues, GESI responsive resources, pedagogical exemplars and assessment strategies proposed in the teacher manual. LO 2: Review the learning plans for Weeks 19 and 20 of the subject-based science lessons (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3j and 3o). LI 2.1 Critique the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment,	

	and closure) of learning plan for Weeks 19 and 20 in line with the LOs, LIs and key concepts in the teacher manual. LI 2.2 Implement the recommendations made by a peer reviewer to the learning plans forWeeks 19 and 20 in line with the LOs, LIs and key concepts in the teacher manual where appropriate. 2.2 Read silently the content standards, LOs, LIs and pedagogical exemplars for your subject in Weeks 19 and 20 in your teacher manual (NTS 1a, 2c, 2f and 3d-3g). 2.3 Discuss at least two essential questions that will guide the lesson activities in Weeks 19 and 20 (NTS 1a, 2c, 2e, 2f, 3d-3g). *E.g.* *a) General Science (Week 19)* *How do I explain the concepts lifestyle diseases in real-life scenarios?, etc.* *b) ICT (Week 19)* *How can Physical Safety Risk affect the use of computers?, etc.* *c) Biology (Week 19)* *How are dicots more robust than monocots*?, *etc.* *d) Chemistry (Week 19)* *How will the knowledge and understanding of the content, covalent bonding help learners appreciate the existence of the liquid and gaseous phase?,etc.* *e) Physics (Week 19)* *Which activities can I design to allow all learners to apply what they have learnt in the lesson on the process of transducers in a meaningful way?, etc.* *f) Computing (Week 19)* *How does App development have a positive impact on daily life?, etc.* *g) General Science (Week 20)* *In real-life scenarios, how do I explain concept of drugs and their effects on humans?, etc.*	

	h) *ICT (Week 20)* *In what ways can I integrate the cross-cutting themes - 21st Century, GESI, SEL, and National values in teaching Physical Safety Risk?,* etc. i) *Biology (Week 20)* *How will I identify a monocot root and a dicot root based on the internal structures?, etc.* j) *Chemistry (Week 20)* *How do I make connections between hydrogen bonding and solubility, boiling point, adhesion and cohesion?, etc.* k) *Physics (Week 20)* *How can I convey the real-world significance of understanding semiconductors and their applications to motivate my learners?, etc.* l) *Computing (Week 20)* *In what ways can the principles of App development be integrated in my lesson?, etc.* 2.4 Discuss at least two key notes on differentiation for Weeks 19 and 20. See Teacher Manual for more examples on differentiation on focal areas not covered in this handbook (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* a) *General Science (Week 19)* i. *Learning Tasks:* *Identify at least four lifestyle diseases, etc.* ii. *Pedagogical Exemplars:* *Invite a resource person (Healthcare giver/Medical practitioner/public health Nurse) to discuss lifestyle diseases, etc.* iii. *Key Assessments (DoK):* *Investigate the influence of cultural norms and traditions on the causes and effects of lifestyle diseases, etc.* b) *ICT (Week 19)* i. *Learning Tasks:* *Guide learners to discuss Internet safety, etc.* ii. *Pedagogical Exemplars:* *Assign tasks where learners analyse case studies or scenarios to determine internet safety/child protection, etc.*	

	iii. Key Assessments (DoK): *Level 1: List of at least 4 internet safety/child protection, etc.* *c) Biology (Week 19)* *i. Learning Tasks:* *List at least five external features of monocotyledonous plants, etc.* *ii. Pedagogical Exemplars:* *Using collaborative learning strategy, place learners into groups and assist them to design and present PowerPoint presentations on the morphological adaptations, similarities and differences between monocotyledonous and dicotyledonous plants to the entire class. By carrying out this task, learners work together, build self-confidence and believe that their thoughts and opinions are valued, etc.* *iii. Key Assessments (DoK):* *Level 2: List at least five external features of monocotyledonous plants, etc.* *d) Chemistry (Week 19)* *i. Learning Tasks:* *Identify the nature of elements that combine to form a covalent compound, etc.* *ii. Pedagogical Exemplars:* *Using talk-for- learning strategy ask probing questions to review the previous knowledge of learners on covalent bonding from the JHS curriculum, etc.* *iii. Key Assessments (DoK):* *Level 1: Define a covalent bond, etc.* *e) Physics (Week 19)* *i. Learning Tasks:* *Identify some transducers and their processes in turning physical changes into electrical signals, etc.* *ii. Pedagogical Exemplars:* *Ask learners to research and create a presentation explaining their assigned transducer's working principle and processes, etc.* *iii. Key Assessments (DoK):* *Level 2: Explain the operation of a loudspeaker, including how it converts electrical signals into sound, etc.* *f) Computing (Week 19)* *i. Learning Tasks:* *Discuss Algorithm, etc.* *ii. Pedagogical Exemplars:*	

	Using short responses, learners implement algorithm into programs with the use of flow chart, etc. *iii. Key Assessments (DoK):* *Level 1: Discuss algorithm implementation into programs with the use of flow charts, etc.* *g) General science (Week 20)* *i. Learning Tasks:* *Explain the term drugs, etc.* *ii. Pedagogical Exemplars:* *Invite guest speakers, such as healthcare professionals, substance abuse counsellors, or recovered addicts, to share their expertise and personal experiences with drug use and addiction, etc.* *iii. Key Assessments (DoK):* *Level 3: Describe any four classes of drugs and their effects, etc.* *h) ICT (Week 20)* *i. Learning Tasks:* *Guide learners to discuss, causes of physical safety, etc.* *ii. Pedagogical Exemplars:* *In mixed ability groups, learners list causes of physical safety in the computer laboratory, etc.* *iii. Key Assessments (DoK):* *Level 1: State 5 physical safety measures to observe in the computer laboratory, etc.* *i) Biology (Week 20)* *i. Learning Tasks:* *List five internal structures each for monocotyledonous and dicotyledonous plants, etc.* *ii. Pedagogical Exemplars* *Use group-based and experiential learning to facilitate this lesson. In mixed-ability and tasked-based groups, ask learners to watch videos/pictures/charts or listen to presentations on the internal tissues of flowering plants. Learners discuss what they learn from the video or presentation to build self-confidence and they learn to critic their peers' opinions and express disagreement in constructive ways, etc.* *iii. Key Assessments (DoK):* *Level 2: Describe the essential components of the root and shoot systems of flowering plants, etc.* *j) Chemistry (Week 20)* *i. Learning Tasks:*	

	Describe how hydrogen bonds formed?, etc. *ii. Pedagogical Exemplars:* *Using talk-for-learning approach, show charts, models or other resources and guide learners to identify and discuss different types of intermolecular forces found in compounds (ionic and covalent compounds). Note: Ionic compounds are linked by inter-ionic or electrostatic forces, etc.* *iii. Key Assessments (DoK):* *Level 2: In terms of intermolecular forces, explain why the solubility of ethanol in water is greater than the solubility of ether in water, etc.* *k) Physics (Week 20)* *i. Learning Tasks:* *Explore the BJT diagram and label the emitter, base, and collector regions, etc.* *ii. Pedagogical Exemplars:* *Provide learners with interactive diagrams of a BJT, showing its layers and terminal connections. Explore the diagram and a physical BJT, label and describe the functions of the emitter, base, and collector regions and discuss the significance of the arrow symbol and how it represents the direction of conventional current flow, etc.* *iii. Key Assessments (DoK):* *Correctly label the emitter, base, and collector regions of a blank BJT diagram and briefly explain each region's function, etc.* *l) Computing (Week 20)* *i. Learning Tasks:* *Algorithm implementation definition, etc.* *ii. Pedagogical Exemplars:* *Using written text, learners develop an algorithm into programs with the use of flow chart, etc.* *iii. Key Assessments (DoK):* *Level 1: What are algorithm implementation into programs with the use of flow chart, etc.* 2.5 In your subject groups or individually, complete learning planners for Weeks 19 and 20. It should include and ensure alignment of teaching, learning and assessment activities, taking into consideration differentiation (such as providing activities with at least three different levels of difficulty), GESI and SEL in each learning planner to cater for all learners (NTS 1a, 1b, 2a, 2c. 3a, 3g and 3h).	

3. Peer-review of learning planners. **· Reviewing planner to ensure alignment between course manual and learning planner based on the templates provided.**	3.1 Exchange one of your learning plans with a colleague in the same department (where applicable) and peer review the content (such as essential questions, key notes on differentiation, teaching and learning activities, assessment, and closure) of a learning plan (NTS 1a, 1b, and 1e-1g). *Note:* *Areas for vital review:* *a) Alignment among teacher manual and learning planner* *b) Innovativeness of pedagogical choices* *c) Incorporation of GESI, SEL, national values and 21st century skills* *d) Differentiated instruction and assessment* *e) Appropriateness of crafted essential questions, etc.* 3.2 Implement the recommendations made by a peer reviewer to your learning plan as appropriate (NTS 1b).	10mins
4. Reflection on the session: **· Reflecting on what has been learned in the session.** **· Advance preparation towards next DPLC session**	4.1 Share your views and experiences about the session (NTS 1a). 4.2 Complete your learning plans which were not completed during the session (NTS 3l). 4.3Remember to read the contents of Weeks 21 and 22 of the teacher manual ahead of time and the DPLC Handbook Session 12 in preparation for the next session and bring along their DPLC Handbook and teacher manual (NTS 1a, 1b).	10mins

DPLC SESSION 12: Developing learning plans for Weeks 21 & 22		
The sections below provide the frame for what is to be done in the session	**Guidance Notes on Teacher Activity during the DPLC Session.** *What teachers will do during each stage of the session*	**Time in session**
1. Introduction: Review of previous learning using ideas from the last DPLC session	1.1 Share two things you implemented based on DPLC Handbook Session 11, *developing learning plans for Weeks 19 and 20*, which you think impacted learning positively. 1.2 As a critical friend, discuss why you think what a colleague did through the application of lessons learned in DPLC Session 11, *developing learning plans for Weeks 19 and 20,* supported learning (NTS 1a- 1c)	10 mins
2. Planning for teaching, learning and assessment activities, using the teacher	2. 1 Read the session's Purpose, Learning Outcomes (LOs), and Learning Indicators (LIs) for the session (NTS 1b). **Purpose:** The purpose of this session is to assist science teachers in utilising the teacher manual to create learning plans for lessons during Weeks 21 & 22. science teachers will focus on developing	60 mins

manual to complete the learning planner, integrating GESI, SEL, ICT, differentiation, 21st century skills and national values (2 learning planners to be completed per session)	learning plans for following lessons: A. *General science:* *Describe the production and design method of local soap making for different purposes.* B. *ICT:* *Discuss Causes of Physical Safety Risk of computer equipment.* C. *Biology:* *Relating the tissues of the stem of monocotyledonous and dicotyledonous plants to their functions and relating the tissues of the leaf of monocotyledonous and dicotyledonous plants to their functions.* D. *Chemistry:* *Intermolecular forces and properties of covalent compounds and methods of separation and purification of organic compounds.* E. *Physics:* *Configuration of transistor and Description of the evolution of the various atomic models. i.e., J. J. Thompson's, Rutherford's, and Bohr's.* F. *Computing:* *Explain the basic principles of web design and identify the modern technologies used in web design.* LO 1: Develop subject-specific learning plans for teaching Weeks 21 and 22 in the teacher manual, taking into account GESI, ICT, SEL, national values and other cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o). L1.1 Discuss the important aspects in Weeks 21 and 22 science lessons in the teacher manual including content standards, LOs, LIs, key concepts, essential questions, GESI, pedagogical exemplars and assessment strategies of the learning planner template. LI 1.2 Complete the learning planner templates for Weeks 21 and 22 science lessons in the teacher manual taking into consideration cross-cutting issues, GESI responsive resources, pedagogical exemplars, and assessment strategies proposed in	

	the teacher manual. LO 2: Review the learning plans for Weeks 21 and 22 of the subject based science lessons (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3j and 3o). LI 2.1 Critique the content (such as essential questions, teaching and learning activities, assessment, and closure) of learning plans for Weeks 21 and 22 in line with the LOs, LIs and key concepts in the teacher manual. LI 2.2 Implement the recommendations made by a peer reviewer to the learning plans for Weeks 21 and 22 in line with the LOs, LIs and key concepts in the teacher manual where appropriate. 2.2 Read silently the content standards, LOs, LIs and pedagogical exemplars for your subject in Weeks 21 and 22 in your teacher manual (NTS 1a, 1b, 2a and 2c). 2.3 Discuss at least two essential questions that will guide the lesson activities in Weeks 21 and 22 (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* *a) General Science (Week 21)* *How do I use experiments to explain the role of four materials needed in saponification?, etc.* *b) ICT (Week 21)* *How can one identify Physical Safety Risk?, etc.* *c) Biology (Week 21)* *What makes woody stems different from other plants parts?, etc.* *d) Chemistry (Week 21)* *How will the understanding of the content, intermolecular forces and properties of covalent compounds help learners relate it with the physical properties of substance?, etc.* *e) Physics (Week 21)* *How can I convey the significance of understanding the historical development of atomic models and its impact on the field of science?, etc.* *f) Computing (Week 21)* *How can web design affect everyday life positively?, etc.*	

	g) *General science (Week 22)* *How can the knowledge of local soaps help in the production of different local soaps for different purpose in a community?, etc.* h) *ICT (Week 22)* *In what ways can I integrate the cross-cutting themes - 21st century skills, GESI, SEL, and National values in teaching Causes of Physical Safety Risk?, etc.* i) *Biology (Week 22)* *What do learners already know about tissues found in plants?, etc.* j) *Chemistry (Week 22)* *How will I relate the content, methods of separation of mixtures with what learners already know, e.g., winnowing, used to remove stones from rice?, etc.* k) *Physics (Week 22)* *In what ways can I integrate the cross-cutting themes- 21st Century, GESI, SEL and National values in teaching transistor configuration?, etc.* l) *Computing (Week 22)* *In what ways can I integrate the cross-cutting themes - 21st century skills, GESI, SEL, and national values in teaching the principles of web design?, etc.* 2.4 Discuss at least two key notes on differentiation for Weeks 21 and 22. See Teacher manual for more examples on differentiation on focal areas not covered in this handbook (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* a) *General Science (Week 21)* i. *Learning task* *Explain term saponification, etc.* ii. *Pedagogical Exemplars* *Organise a visit or field trips to local soap making facilities where learners can observe the production process firsthand, etc.* iii. *Key Assessment* *Explain any 3 processes in the production of local soap, etc.* b) *ICT (Week 21)* i. *Learning Tasks:*	

	Guide learners to discuss computer related health problems, etc. *ii. Pedagogical Exemplars:* *Create a simulation or interactive activity where learners can list computer related health problems, etc.* *iii. Key Assessments (DoK):* *Level 1: List 5 computer related health problems, etc.* *c) Biology (Week 21)* *i. Learning Tasks:* *Explain the term epidermis as used in plant leaves, etc.* *ii. Pedagogical Exemplars* *Using diamond -nine strategy, guide learners to describe the structure of the monocotyledonous stem, etc.* *iii. Key Assessments (DoK)* *Level 1: List the structures of the monocotyledonous stem, etc.* *d) Chemistry (Week 21)* *i. Learning Tasks:* *Which intermolecular forces occur in highly polar covalent compounds?, etc.* *ii. Pedagogical Exemplars:* *Discuss and explain how intermolecular forces affect physical properties such as solubility, density, viscosity, enthalpy of vaporisation, volatility, surface tension, melting point and boiling points of compounds, etc.* *iii. Key Assessments (DoK):* *Level 2: Arrange the following compounds in order of increasing boiling point and give reasons for the order: H_2O, CH_4, CH_3OH, etc.* *e) Physics (Week 21)* *i. Learning Tasks* *Identify and briefly describe the main transistor configurations: Common Emitter, Common Base, and Common Collector, etc.* *ii. Pedagogical Exemplars* *Provide diagrams of the common emitter, common collector, and common base configurations, explaining terminal connections and their effects on input and output, etc.* *iii. Key Assessments (DoK)* *Level 1: List the three common transistor configurations and briefly mention one key characteristic of each, etc.*	

	f) Computing (Week 21) *i. Learning Tasks:* • *Define web design, etc.* *ii. Pedagogical Exemplars:* *Group discussion on the understanding of what a web design is in learners own words, etc.* *iii. Key Assessments (DoK):* • *Level 1: Define web design, etc.* *g) General science (Week 22)* *i. Learning task* • *Name four materials needed in saponification, etc.* *ii. Pedagogical Exemplars* • *Organize a workshop where participants can learn about the soap making process step-by-step, etc.* *iii. Key Assessment* • *Level 1: Name four materials needed in saponification, etc.* *h) ICT (Week 22)* *i. Learning Tasks:* • *Learners lead discussions on the causes of physical safety risk of computer equipment, etc.* *ii. Pedagogical Exemplars:* • *Create a simulation or interactive activity where learners can identify the various causes of physical safety risk of computer equipment, etc.* *iii. Key Assessments (DoK):* • *Level 1: List 5 causes of physical safety risk of computer equipment, etc.* *i) Biology (Week 22)* *i. Learning Tasks* • *List the six distinct regions of the transverse section of dicotyledonous root, etc.* *ii. Pedagogical Exemplars* • *In mixed-ability gender-responsive and all -inclusive tasked-based groups, learners' sample different flowering plants from their immediate environment, and carefully observe and write down features that are common to monocotyledonous and dicotyledonous groups, etc.* *iii. Key Assessments (DoK)* • *Level 1: List any six features that distinguish monocotyledonous from dicotyledonous, hence state the extent to which these two groups of flowering plants differ in each factor, etc.* •	

	j) Chemistry (Week 22) *i. Learning Tasks:* • *What is the principle behind the use of distillation as a separation method?, etc.* *ii. Pedagogical Exemplars:* • *Watch video clips or observe teacher demonstration of: Distillation, Fractional distillation, Crystallisation, Discuss the key steps in the use of crystallisation, drying and distillation to purify a given impure organic compound, etc.* *iii. Key Assessments (DoK):* • *Level 1: What is meant by the term crystallisation?, etc.* *k) Physics (Week 22)* *i. Learning Tasks* • *Define the concept of an atomic model, etc.* *ii. Pedagogical Exemplars* • *Outline the historical progression of atomic theory from ancient philosophies and discuss how ancient philosophers such as Democritus proposed the existence of indivisible particles to modern models, etc.* *iii. Key Assessments* • *Level 1: Define an atomic model and explain its purpose in studying atoms, etc.* *l) Computing (Week 22)* *i. Learning Tasks:* • *Explain web design, etc.* *ii. Pedagogical Exemplars:* • *Utilise think-pair-share or similar collaborative approaches to facilitate discussions among learners and identify the various components found in a web page. Encourage learners to list and describe the components they identify, etc.* *iii. Key Assessments (DoK):* • *Level 1: What are the main languages or platform used for web design?, etc.* 2.5 In your subject groups or individually, complete learning planners for Weeks 21 and 22. It should include and ensure alignment of teaching, learning and assessment activities, taking into consideration differentiation (such as providing activities with at least three different levels of difficulty), GESI and SEL in each learning planner to cater for all learners (NTS 1a, 1b, 2a, 2c. 3a, 3g and 3h).	

3. Peer-review of learning planners. **· Reviewing planner to ensure alignment between course manual and learning planner based on the templates provided.**	3.1 Exchange one of your completed learning plans with a colleague in the same department (where applicable) and peer review the content (such as essential questions, teaching and learning activities, assessment, and closure) of the learning plan (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3j and 3o). Areas for vital review: *a) Alignment among curriculum, teacher manual and learning plan* *b) Innovativeness of pedagogical choices* *c) Incorporation of GESI, SEL, national values and 21st century skills* *d) Differentiated instruction and assessment* *e) Appropriateness of crafted essential questions, etc.* 3.2 Implement the recommendations made by a peer reviewer to your learning plans as appropriate (NTS 2b).	10mins
4. Reflection on the session: **· Reflecting on what has been learned in the session.** **· Advance preparation towards next DPLC session**	4.1 Share your views and experiences about the session (NTS 1a, 1b and 3b). 4. 2 Complete your learning plans which were not completed during the session (NTS 3l). 4.3Remember to read the contents of Weeks 23 and 24 in the teacher manual ahead of time and the DPLC Handbook Session 13 in preparation for the next session and bring along your DPLC Handbook and teacher manual (NTS 1a, 1b).	10mins

DPLC SESSION 13: Developing learning plans for Weeks 23 & 24		
The sections below provide the frame for what is to be done in the session	**Guidance Notes on Teacher Activity during the DPLC Session.** *What teachers will do during each stage of the session*	**Time in session**
1. Introduction: Review of previous learning using ideas from the last DPLC session	1.1 Share two things you implemented based on DPLC Handbook Session 12, *developing learning plans for Weeks 21 and 22*, which you think impacted learning positively. 1.2 As a critical friend, discuss why you think what a colleague did through the application of lessons learnt in DPLC Session 12, *developing learning plans for Weeks 21 and 22,* supported learning (NTS 1a-1c).	10 mins
2. Planning for teaching, learning and assessment activities, using the teacher manual to complete the learning planner, integrating GESI, SEL, ICT, differentiation, 21st century skills and national values (2 learning planners to be completed per session)	2.1 Read the session's Purpose, Learning Outcomes (LOs), and Learning Indicators (LIs) for the session (NTS 1b). **Purpose:** The purpose of this session is to assist science teachers in utilising the teacher manual to create learning plans for lessons during Weeks 23 & 24. Science teachers will focus on developing learning plans for following lessons: A. *General science:* *Indigenous foods and written reports, projects on their production* B. *ICT:* *Discuss Causes of Physical Safety Risk of computer equipment.* C. *Biology:* *Explanation of factors that affect the growth and development of flowering plants, and good practices for the growth and development in flowering plants.* D. *Chemistry:* *Qualitative and quantitative elemental analysis of organic and classification of organic compounds.* E. *Physics:* *Explanation of Radioactivity and balancing of nuclear*	60 mins

	reactions. *F. Computing:* *Apply computer Explain the basic principles of web design and identify the modern technologies used in web design.* LO 1: Develop subject-specific learning plans for teaching Weeks 23 and 24 using the teacher manual, taking into account GESI, ICT, SEL, National values and other cross-cutting issues (NTS 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3k and 3o). LI 1.1 Discuss the important aspects in Weeks 23 and 24 science lessons in the teacher manual including content standards, LOs, LIs, key concepts, essential questions, GESI, pedagogical exemplars and assessment strategies of the learning planner template. LI 1.2 Complete the learning planner templates for Weeks 23 and 24 science lessons taking into consideration cross-cutting issues, GESI responsive resources, pedagogical exemplars, and assessment strategies proposed in the teacher manual. LO 2: Review the learning plans for Weeks 23 and 24 of the subject based science lessons (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3j and 3o). LI 2.1 Critique the content (such as essential questions, teaching and learning activities, assessment and closure) of learning plans for Weeks 23 and 24 in line with the LOs, LIs and key concepts in the teacher manual. LI 2.2 Implement the recommendations made by a peer reviewer to the learning plans for Weeks 23 and 24 in line with the LOs, LIs and key concepts in the teacher manual where appropriate. 2.2 Read silently the content standards, LOs, LIs and pedagogical exemplars for your subject in Weeks 23 and 24 in your teacher manual (NTS 1a, 1b, 2a and 2c). 2.3 Discuss at least two essential questions that will guide the lesson activities in Weeks 23 and 24 (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* *a) General Science (Week 23)* *How do I write a report on the science processes involved in gari production?, etc.*	

	b) *ICT (Week 23)* *How can evaluation of Physical Safety Risk be identified?, etc.* c) *Biology (Week 23)* *Why would you consider factors such light, water, temperature, and nutrients in order to become a good farmer or gardener?, etc.* *Chemistry (Week 23)* *How will I relate the applications of qualitative and quantitative elemental analysis of organic compounds to other fields such as biochemistry, pharmaceuticals, environmental science, and more?, etc.* d) *Physics (Week 23)* *What strategies can I employ to ensure that learners are actively participating and thinking during the lesson on radioactivity?, etc.* e) *Computing (Week 23)* *How does web design have a positive impact on daily life?, etc.* *General science (Week 24)* *How can I demonstrate how long the fermentation process typically takes and what factors can affect it?, etc.* f) *ICT (Week 24)* *In what ways can I integrate the cross-cutting themes - 21st Century, GESI, SEL, and National values in teaching evaluation of Physical Safety Risk?, etc.* g) *Biology (Week 24)* *How would you ensure healthy plant growth and development in your backyard garden?, etc.* h) *Chemistry (Week 24)* *What is the best approach to teaching classification of organic compounds to meet the varied needs of learning?, etc.* i) *Physics (Week 24)* *What is the best approach to teach the principles of reproduction apply in balancing of nuclear equations for all learners to benefit from the lesson?, etc.*	

	j) Computing (Week 24) *In what ways can I integrate principles of web design in my lesson?, etc.* 2.4 Discuss at least two key notes on differentiation for Weeks 23 and 24. See teacher manual for more examples on differentiation on focal areas not covered in this handbook (NTS 1a, 2b,2e, 2f, 3a and 3c-3j). *E.g.* *a) General Science (Week23)* *i. Content* *Identify indigenous food in your community and its ingredients, etc.* *ii. Pedagogical Exemplars* *Place learners into mixed-ability and mixed-sex groups learning styles (where applicable.) Let the learners design an activity to prepare a named local food etc.* *iii. Key Assessment (DoK): Identify one indigenous food in your community and its ingredients, etc.* *b) ICT (Week 23)* *i. Learning Tasks* *Using think-pair-share identify various preventive measures on physical safety risk, etc.* *ii. Pedagogical Exemplars:* *Create a simulation or interactive activity where learners can identify the various preventive measures on physical safety risk, etc.* *iii. Key Assessments (DoK):* *Level 1:List 4 preventive measures on physical safety risk, etc.* *c) Biology (Week 23)* *i. Learning Tasks* *Predict the four primary factors that affect plant growth, etc.* *ii. Pedagogical Exemplars* *Using inquiry-based learning, guide learners to Research on the factors that affect the growth and development of flowering plants. Learners learn to work independently, develop self-confidence and believe that their thoughts and opinions are valued, etc.* *iii. Key Assessments (DoK)* *Level 1: List the factors that affect the growth and development of flowering plants in their natural environment, etc.*	

	d) Chemistry (Week 23) *i. Content* *Describe how to test for Carbon and hydrogen in a hydrocarbon compound, etc.* *ii. Pedagogical Exemplars:* *In small mixed-ability groups, design and conduct experiments to test for the presence of carbon, hydrogen, sulphur, nitrogen and halogens in organic compounds, etc.* *iii. Key Assessments (DoK):* *Level 1: Name the reagents used to test for the presence of carbon in an organic compound, etc.* *e) Physics (Week 23)* *i. Learning Tasks* *Define the nucleus of an atom and explain its role in the overall structure and stability of the atom, etc.* *ii. Pedagogical Exemplars* *Begin with a multimedia presentation that includes animations to clearly illustrate the structure of an atom, focusing on the roles and characteristics of protons, neutrons, and electrons. Enhance understanding through a mix of diagrams, historical context, and quizzes, etc.* *iii. Key Assessments (DoK):* *Level 1: Define the nucleus of an atom and explain its primary function within the atom, etc.* *f) Computing (Week 23)* *i. Learning Tasks:* *Identify the principles of web design, etc.* *ii. Pedagogical Exemplars:* *Using Think –pair-share, let learners Identify the principles of web design, etc.* *iii. Key Assessments (DoK):* *Level 1; Identify the principles of web design, etc.* *g) General science (Week 24)* *i. Learning Task:* *Importance of washing the corn before grinding it for Kenkey, etc.* *ii. Pedagogical Exemplars* *Organise a visit or field trip to local kenkey-making facilities where learners can observe the production process first-hand. Learners will then reflect and make presentations, etc.* *iii. Key Assessment* *Level 2: Write down the science processes involved in*	

	kenkey production, etc. *h) ICT (Week 24)* *i. Learning Task:* *Further discuss preventive measures on physical safety risk, etc.* *ii. Pedagogical Exemplars:* *In pairs, learners briefly explain further preventive measures on physical safety risk with the aid of a diagram, etc.* *iii. Key Assessments (DoK):* *Level 1:Write briefly on 5 preventive measures on physical safety risk, etc.* *i) Biology (Week 24)* *i. Learning Tasks* *What is the importance of adding natural compost or manure to the soil, etc.* *ii. Pedagogical Exemplars* *Using diamond -nine strategies, ask learners to identify the Soil texture and quality as presented before them and tell how it may possibly affect the growth and development of flowering plants, etc.* *iii. Key Assessments (DoK)* *Level 2: Explain Soil texture and quality, etc.* *j) Chemistry (Week 24)* *i. Learning Tasks:* *Identify unique properties of carbon that helps in the formation of organic compounds, etc.* *ii. Pedagogical Exemplars:* *Prior to the lesson, investigate to find out answers to the following task: The meaning of organic chemistry and why carbon forms many, etc.* *iii. Key Assessments (DoK):* *Level 1: What is meant by the term aromatic hydrocarbon?, etc.* *k) Physics (Week24)* *i. Learning Tasks:* *Define a nuclear reaction and distinguish it from a chemical reaction, focusing on the changes in the nucleus and the release of energy, etc.* *ii. Pedagogical Exemplars:* *Guide students through balancing nuclear equations from simple to complex using interactive class discussions, etc.* *iii. Key Assessment*	

	Level 1: Define nuclear reactions and explain what occurs at the atomic level during such reactions, etc. *l) Computing (Week 24)* *i. Content* *Identify the modern technologies used in web design, etc.* *ii. Pedagogical Exemplars:* *Using think –pair-share, let learners Identify the modern technologies used in web design, let learners Identify the modern technologies used in web design, etc.* *iii. Key Assessments (DoK):* *Level 1: Identify modern technologies used in web design, etc.* 2.5 In your subject groups or individually, complete learning planners for Weeks 23 and 24. It should include and ensure alignment of teaching, learning and assessment activities, taking into consideration differentiation (such as providing activities with at least three different levels of difficulty), GESI and SEL in each learning planner to cater for all learners (NTS 1a, 1b, 2a, 2c. 3a, 3g and 3h).	
3. Peer-review of learning planners. **· Reviewing planner to ensure alignment between course manual and learning planner based on the templates provided.**	3.1 Exchange one of your completed learning plans with a colleague in the same department (where applicable) and peer review the content (such as essential questions, teaching and learning activities, assessment and closure) of a learning plan (NTS 1a, 1b, 2b, 2c, 2e, 2f, 3a, 3d, 3e, 3g-3j and 3o). Areas for vital review: *a) Alignment between teacher manual and learning plan* *b) Innovativeness of pedagogical choices* *c) Incorporation of GESI, SEL, national values and 21st century skills* *d) Differentiated instruction and assessment* *e) Appropriateness of crafted essential questions, etc.* 3.2 Implement the recommendations made by a peer reviewer to your learning plan as appropriate (NTS 2b).	10mins

4. Reflection on the session: **· Reflecting on what has been learned in the session.** **· Advance preparation towards next DPLC session**	4.1 Share your views and experiences about the session (NTS 1a, 1b and 3b). 4. 2 Complete your learning plans which were not completed during the session (NTS 3l). 4.3 Prepare for a review of all Year 1 DPLC sessions by *writing down notes on areas that went well, areas that can be improved upon* and two suggestions for innovative *actions andshare with the whole group in the next DPLC session.*(NTS 1a, 1b).	10mins

Appendix 1

General Science

<table>
<tr><th colspan="8">Learning Planner</th></tr>
<tr><td>Subject</td><td>General Science</td><td>Week</td><td>1</td><td>Duration</td><td>180 minutes</td><td>Form</td><td>1</td></tr>
<tr><td>Strand</td><td>Exploring Materials</td><td>Sub-Strand</td><td colspan="5">Science and materials in nature</td></tr>
<tr><td>Content Standard</td><td colspan="7">Demonstrate knowledge and understanding of the characteristics of science and show how they are applied in everyday life.</td></tr>
<tr><td>Learning Outcome(s)</td><td colspan="7">Evaluate the characteristics of science.</td></tr>
<tr><td>Learning Indicator(s)</td><td colspan="7">Explain the various characteristics of science in nature.</td></tr>
<tr><td>Essential Question(s)</td><td colspan="7">a) Carefully observe daily scientific principles and explain the characteristics of science applied within.
b) How do you create a chart using the characteristics of science?
c) How do you apply the characteristics of science, Measure the volume of water using a measuring cylinder?</td></tr>
<tr><td>Pedagogical Strategies</td><td colspan="7">a) Talk for learning approach, Inquiry-based method
b) Think pair share
c) Demonstration/ practical activity
d) Collaborative learning, discussion method.</td></tr>
<tr><td>Teaching & Learning Resources</td><td colspan="7">Measuring cylinder, Beaker, Funnel, Litmus paper, Water, vinegar, Metre rule, Projector, Video and Internet</td></tr>
<tr><td colspan="8">Key Notes on Differentiation</td></tr>
<tr><td colspan="8">i. Learning Task
☐ Write at least three situations in life where characteristics of science are evident
☐ Identify at least four characteristics of science in nature
☐ Explain at least four characteristics of science in nature, etc.
ii. Pedagogical Exemplars:
☐ Learners think about the importance of science and discuss their ideas with a peer. The teacher asks learners to present their ideas to the whole class. The teacher presents videos, charts, pictures, and demonstrations on the characteristics of science to learners, and learners in mixed-ability groups discuss the characteristics of science, considering its meaning and importance in real life.
☐ Learners in mixed ability groups experiment as shown in Fig. 1, 2, 3 (refer to manual) to demonstrate the characteristics of science such as replicability, predictability (the ability of scientific investigations to make accurate and reliable predictions about future events), empirical (relies on observations and data gathered)</td></tr>
</table>

- Learners reflect and share their views of different situations in life where the characteristics of science are evident with peers for critique
- Group learners create a poster showing the key characteristics of science/definitions, significance, and application in daily life for a whole class gallery walk and presentation, etc.

iii. Key Assessment

- Level 1: Identify at least four (4) characteristics of science
- Level 2: Explain four (4) characteristics of science
- Level 2: Explain at least any four (4) characteristics of science in everyday life
- Level 2: Explain the need to study the characteristics of science
- Level 2: Describe how the scientific processes can be used to make predictions etc.

Keywords	Empirical, replication. systematic, consistency, predictability, validity, Precision and accuracy.

Lesson 1

Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Teacher Manual

Teacher Activity	**Learner Activity**
Starter <u>Activity (5 minutes)</u> **Start with a riddle.** **Riddle! Riddle!** **I am something.** **The longer I grow, the shorter I become.** **What am I?** **Expected Response** **candle** **Note: Demonstrate with a burning candle.**	**Learners listen to the riddle and give a response**
<u>Introductory Activity (10 minutes)</u> I. Put learners into mixed-ability groups and discuss the science overview and its importance using talk-for-learning. II. Encourage learners to accommodate individuals' diverse views as they interact and collaborate in their groups. **<u>Activity 1 (15 minutes)</u>** i. Presents videos or charts or pictures or photos, and demonstrations on the	**<u>Introductory Activity (1 0 minutes)</u>** In mixed-ability groups discuss the science overview and its importance in using talk-for-learning. **<u>Activity 1 (15 minutes)</u>** i. Watch and take down notes on the presented videos or charts or pictures or photos, and demonstrations on the characteristics of science. ii. in mixed-ability groups discuss and present the characteristics of science to the class, considering its meaning.

characteristics of science to learners. ii. Ask learners in mixed-ability groups to discuss and present the characteristics of science to the class, considering its meaning. E.g., Empirical replication. Systematic, consistency, predictability, validity, experimentation, observation, recording, etc. iii. Note: Allow adequate time for the presentation. **Activity 2 (15 minutes)** Together with learners, Summarise the characteristics of science from the learners' presentation.	E.g., Empirical replication. Systematic, consistency, predictability, validity, experimentation, observation, recording, etc. iii. Group in turns do their presentation. **Activity 2 (15 minutes)** Listen and put down notes.
Assessment DoK aligned to the Curriculum and Subject Teacher Manual	
1. Level 1: Identify at least four (4) characteristics of science. 2. Level 2: Explain four (4) characteristics of science. 3. Level 2: Explain at least any four (4) characteristics of science in everyday life	
Lesson Closure **In completing this part, refer to the Essential Questions to check that learning has taken place.**	
Activity (15 minutes) a) Ask learners to share what they learned from the lesson with the whole class. (Offer learners the opportunity to ask questions for further clarification and address misconceptions). b) Ask learners how the replication process contributes to the reliability of scientific findings. c) Assign an activity for the next lesson.	
Reflection & Remarks	
Reflection a) What went well during the lesson delivery? b) Were the learners able to understand the characteristics of science in nature? c) The learners could explain the characteristics of science in everyday life.	
Lesson 2	
Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Teacher Manual	
Teacher Activity	**Learner Activity**
Starter Activity (5 minutes) Imagine you're an explorer setting out on a quest to uncover hidden treasures in an	

uncharted land. What qualities do you think you'd need to succeed in such an adventure? Take a moment to jot down your thoughts.
Expected responses: Good observation, curiosity, record keeping, mapping of trail etc.

Now, let's shift our focus from exploration to scientific inquiry. How do the qualities you listed align with the characteristics of science? In today's lesson, we'll delve into the scientific mindset and explore the key traits that distinguish scientific inquiry from other ways of understanding the world.

Introductory activity (10 minutes) Learners discuss the characteristics of science. Expected response. Empirical replication. Systematic, consistency, predictability, validity, experimentation, observation, recording. Encourage Learners to respect one another's views as they interact and collaborate in their groups. **Activity 1 (40 minutes)** Put Learners in mixed ability groups to experiment with Measuring cylinder, Beaker, Funnel, Litmus paper, Water, vinegar, metre rule,etc the characteristics of science such as replicability, predictability (the ability of scientific investigations to make accurate and reliable predictions about future events), and empirical (relying on observations and data gathered) in different situations in life. **Activity 2 (30 minutes)** Learners reflect and share their views of different situations in life where the characteristics of science are evident with peers for critique. **Activity 3 (25 minutes)** In Groups, learners create a poster that shows the characteristics of science definitions for a whole class gallery walk and presentation.	**Introductory activity (10 minutes)** Discuss the characteristics of science. **Activity 1(40 minutes)** in mixed ability groups experiment with Measuring cylinder, Beaker, Funnel, Litmus paper, Water, vinegar, metre rule,etc the characteristics of science such as replicability, predictability (the ability of scientific investigations to make accurate and reliable predictions about future events), and empirical (relies on observations and data gathered) in different situations in life. **Activity 2 (30 minutes)** Reflect and share their views of different situations in life where the characteristics of science are evident with peers for critique. **Activity 3 (25 minutes)** Create a poster that shows the characteristics of science definitions for a whole class gallery walk and presentation.
Assessment DoK aligned to the Curriculum and Subject Teacher Manual.	
1. Level 2: Explain the need to study the characteristics of science.	

2. Level 2: Describe how the scientific processes can be used to make predictions etc.

Lesson Closure
In completing this part, refer to the Essential Questions to check that learning has taken place.

Activity (10 minutes)

a) Ask learners to share what they learned from the lesson with the whole class. (Offer learners the opportunity to ask questions for further clarification and address misconceptions).
b) Assign an activity for the next lesson.

Reflection & Remarks

Reflection
a) What went well during the lesson delivery?
b) Were the learners able to understand the characteristics of science in nature?
c) The learners could explain the characteristics of science in everyday life.
Remarks:

Biology

Learning Plan

Subject	*Biology*	**Week**	*1*	**Duration**	*60 minutes*	**Form**	*1*
Strand	*Exploring Biology in the Society1*	**Sub-Strand**	*Biology as the Science of life*				
Content Standard	*Demonstrate knowledge and understanding of Biology, the various branches and fields of study, and their benefits in everyday life*						
Learning Outcome(s)	*Explain the importance of Biology and its branches and relate this to everyday life.*						
Learning Indicator(s)	*a) Observe and discuss the importance of Biology, its various branches and their applications in everyday life.* *b) Explain the importance of Biology, its various branches and their applications in everyday life* *c) Explain the importance of Biology, its various branches and their applications in everyday life*						
Essential Question(s)	*Lesson 1* *a) How would you apply the relevance of Biology in your everyday life and why?* *b) What would you do to improve upon food production as one of the importance of biology?* *c) What pedagogical strategies can I employ to help learners to understand the importance of biology in everyday life?* *Lesson 2* *a) How would you use the knowledge of different fields of biology to select different professions in biology?* *b) How can you relate the knowledge of the branches of biology to*						

	the production of some common items and products we use in our everyday life? (e.g., honey, dried fish/ "Koobi", bottled fruit juice, any antibiotic drug, lab coat, body cream, soap, bread, kenkey, palm wine, leather shoes and bags, etc.,) *c) Which teaching and learning resources can I use to help learners to identify the various branches of biology?*
Pedagogical Strategies	*Collaborative learning, Talk for Learning (TFL), Think-pair-share, Inquiry-Based Learning*
Teaching & Learning Resources	*Honey, dried fish/ "Koobi", bottled fruit juice, any antibiotic drug, lab coat, body cream, soap, bread, kenkey, palm wine, leather shoes and bags, etc., or their pictures if these materials are not readily available laptop, smartphone, USB drive, CD of video of biologists at work, Textbooks, Scientific journals, Professionals in the various fields of biology.*

Key Notes on Differentiation

Learning Tasks:

a) Explain the term Biology. Limit content expectation to the definition of Biology.

b) Describe at least four ways in which the knowledge of Biology is useful in everyday life. Extend content expectation to the discussion /explanation of how useful the knowledge of Biology is in the following areas of food production, gardening, home hygiene, human, animal, and plant health as well as conservation of natural resources.

c) *Discuss the importance of Biology in the production of Honey, Dried fish/ "Koobi", and bottled fruit juice. Extend content response to the importance of Biology in the following areas Honey production, Dried fish/'Koobi 'and bottled juice.*

Pedagogical Exemplars:

a) Collaborative Learning: learners in mixed ability, gender-balanced groups, observe pictures and videos of specimens relating to Biology (e.g., honey and dry Tilapia, etc.) and share ideas with peers and accept feedback.

b) Learners in mixed-ability groups learn from each other and provide emotional support to one another to achieve targets.

c) Talk-For Learning: Learners in pairs discuss, analyse and share the contribution of biologists in the development of society; learners learn from each other and improve upon their communication skills. Communication and Collaboration: Learners speak politely and clearly as they share ideas on the video and pictures they watched with their peers and accept constructive feedback from their peers

Key Assessments (DoK):

a) Level 1: What is Biology? Accept oral/written responses for different definitions of biology.

b) Level 2: How is the knowledge of Biology applied in everyday life? Accept oral/written explanations for four ways the knowledge of Biology is applied in everyday life.

c) Level 3: Discuss the importance of Biology in the production of Honey, Dry fish/ "Kobi" and bottled fruit juice. Accept oral/written discussion on the importance of Biology in Honey, Dried fish/koobi and fruit juice production.

c) Level 4: Describe briefly how you will use the knowledge gained in Biology to reclaim

degraded land. Accept oral /written responses for four ways a degraded land can be reclaimed using knowledge gained in Biology	
Keywords	*Botany, Zoology, Microbiology, Mycology, Parasitology, Cytology, Histology, Entomology, Ecology, etc.*
Lesson 1	
Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Teacher Manual	
Teacher Activity	***Learner Activity***
Starter *Activity (5 minutes)* *Introduce lesson by showing learners some items related to Biology such as, plants, fish, lab coat, honey, dried fish/ "Koobi", bottled fruit juice, any antibiotic drug, lab coat, body cream, soap, bread, kenkey, palm wine, leather shoes and bags, etc., and ask learners to individually identify each and write what they know about these items.*	
Introductory Activity (10minutes) *Put learners in mixed-ability, gender-balanced groups, and ask learners to share ideas on what they recollect and know about the items shown in the starter activity. Encourage learners to show respect for individuals diverse views as they interact and collaborate in their groups* ***Activity 1 (20 minutes)*** *Ask learners to pair within their groups to brainstorm and respond to what they recollect and know about the items shown in starter activity.* ***Activity 2 (20 minutes)*** *Ask learners to use available resources (e.g. Textbooks, the internet, library, etc.) to research branches of Biology and their importance.* *The teacher provides the rubrics for the presentation to guide learners prepare their written group reports for the presentation*	***Introductory Activity (10minutes)*** *Learners share ideas about items presented to them and discuss these materials in their groups. Learners show respect for one another's views they interact and collaborate in their groups* ***Activity 1 (20 minutes)*** *In pairs learners recollect and discuss what they know about the items shown in the starter activity* ***Activity 2 (20 minutes)*** *Learners make use of available resources (e.g. Textbooks, the internet, library, etc.) to research further, branches of Biology and their importance. Learners prepare written group reports for presentation within the given time.*
AssessmentDoK aligned to the Curriculum and Subject Teacher Manual	
Level 1: Recall: *List at least five branches of biology*	

Level 2: Skills of conceptual understanding;
Summarise your understanding of the term Biology.
Level 3: Strategic Thinking
Considering the items given, explain 5 to 8 ways the knowledge of Biology is applied in everyday life.
Level 3: Strategic Thinking
Cite evidence on how can Biology is linked to other fields of study.

Lesson Closure

In completing this part, refer to the Essential Questions to check that learning has taken place.

Activity (5 minutes)

a) *Ask each group to present a concept map of the focal point of each activity as a summary of the lesson*
b) *Assign an activity for the fields of work related to biology*

Reflection & Remarks (After the lesson)

a) *What was my best moment in the lesson?*
b) *Did I managed and control my class well?*
c) *What will I do differently?*
d) *What did the learners find difficult to understand?*
e) *What activities did the learners complete with ease and on time?*
f) *Did I pay particular attention to learners with special educational needs (SEN)?*

Lesson 2

Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Teacher Manual

Teacher Activity	***Learner Activity***
Starter *Activity (5 minutes)* *Learners watch a short video/ pictures of scientists at work in different branches relating to biology and randomly call learners to predict the main theme/focal point of the lesson.*	
Introductory activity (10 minutes) *Put learners in mixed-ability, gender-balanced groups, and ask them to link the various branches of biology they can identify in the picture of the various units in a hospital. Encourage learners to support one another as they collaborate in their groups.* ***Activity 1 (20 minutes)*** *Put learners in mixed-ability, gender-balanced groups, and ask them to discuss and link the various branches of biology they can identify in the various units in a named community.*	***Introductory activity (10 minutes)*** *Learners discuss in their groups and link the various branches of biology they identify in the various units of the hospital in the picture provided. Learners support one another as they collaborate in their groups* ***Activity 1(20 minutes)*** *Discuss in their groups and link the various branches of biology they identify in the various units in their community* ***Activity 2 (20 minutes)*** *Learners individually write down at least 10 fields of science where the knowledge of*

Activity 2 (20 minutes) *Ask learners to individually write down at least 10 fields of science where the knowledge of biology is applied and explain how the knowledge of biology is applied in any 5 of the fields listed.*	*biology is applied and explain how the knowledge of biology is applied in any 5 of the fields listed.*

AssessmentDoK aligned to the Curriculum and Subject Teacher Manual

Level 2: Skills of conceptual understanding;
What are the various branches in Biology and their everyday application?
Level 3: Strategic thinking
Describe the importance of 5 to 8 branches mentioned
Level 3: Strategic thinking
Which branch of Biology is linked to the mode of transmission and treatment of diseases?

Lesson Closure
In completing this part, refer to the Essential Questions to check that learning has taken place.

Activity (5 minutes)

a) *Draw learner's attention to the end of the lesson.*
b) *Ask each group to present a concept map approach as a summary of the focal point of each lesson.*
c) *Provide feedback to learners.*
d) *Assign an activity for the next lesson.*

Reflection & Remarks (After the lesson)

a) *What was my best moment in the lesson?*
b) *Did I manage and control my class well?*
c) *What will I do differently?*
d) *What did the learners find difficult to understand?*
e) *What activities did the learners complete with ease and on time?*
f) *Did I pay particular attention to learners with special educational needs (SEN)?*

Chemistry

Learning Planner							
Subject	*Chemistry*	**Week**	*1*	**Duration**	*240 min*	**Form**	*1*
Strand	*Physical chemistry*	**Sub-Strand**	*Matter and its properties*				
Content Standard	*Demonstrate understanding of the scientific practices in chemistry using relevant acquired skills to solve problems as well as explaining the structure of the atom and its stability.*						
Learning Outcome(s)	*Use the knowledge and understanding of the scientific practices in chemistry to explain the structure of the atom as well as the stability of its nucleus.*						
Learning Indicator(s)	*Describe chemical processes around us and their applications in everyday life*						

	Discuss and explain safety rules and hazard symbols in the laboratory.
Essential Question(s)	*1. What prior knowledge do learners have about chemical processes that will help them understand Chemistry in everyday life.* *2. What are the main branches of Chemistry?* *3. Identify at least three importance of Chemistry to the society* *4. How will I teach and assess learners on chemical processes around us and their application in everyday life.*
Pedagogical Strategies	*Digital learning, Talk-for-Life Learning, Collaboration and Communication*
Teaching & Learning Resources	*Videos, slides, pictures, charts, projector, labelled cards, computer or laptop. Household items with labels, Chemical containers with labels, Personal protective equipment (eye goggle, laboratory coat/apron, hand gloves), Flammable materials, Oxidizing materials, Hazard symbols, Prohibition signs.*

Key Notes on Differentiation

Learning Tasks:

1. Discuss and distinguish between the traditional branches of chemistry.

2. Discuss the centrality of chemistry as a science discipline which is related to other science subjects.

3. Draw flowcharts and pictures to summarize ways in which chemistry affects daily lives under the following headings: (Food and nutrition, Agriculture, Medicine, Transportation, Energy, etc.)

Pedagogical Exemplars:

Digital learning:

a. Divide learners into mixed ability groups and show them video or slide/pictures on variety of natural and artificial phenomena that can be explained by chemistry. Visually impaired learners should be considered and alternative plans made for them.

b. Guide learners to discuss and distinguish among the traditional branches of chemistry. Ask questions and encourage all learners to talk in the group.

c. Using mixed ability groups, guide learners to draw flowcharts and pictures to summarize ways in which chemistry affects daily lives under the following headings: (Food and nutrition, Agriculture, Medicine, Transportation, Energy, etc.)

Visually impaired learners should be considered and alternative plans made for them.

Keywords	*Chemistry, Pure and Applied Chemistry, Physical Chemistry, Organic chemistry, Inorganic chemistry, etc.*

Lesson 1

Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Teacher Manual

Teacher Activity	***Learner Activity***
Starter ***Activity (10 minutes):*** *Introduce the lesson by asking the following questions to review relevant previous knowledge and deal with misconceptions.* *1. What is matter?* *2. Can matter be changed from one form to another?*	

If yes, give examples

Use their responses to introduce the meaning of chemistry.

Introductory Activity (15minutes) *III. Teacher projects a video, pictures/ charts showing a variety of natural and artificial phenomena that can be explained by chemistry and ask learners to watch.* *NB: Teacher should consider the SEN learners and make provisions for them.* ***Activity 1 (40 minutes)*** *I. Use concept map to explain the branches of chemistry.* ***Activity 2 (40 minutes)*** *I. Establish that chemistry is related to the other science discipline*	***Introductory Activity (15minutes)*** *I. In an all-inclusive class, learners watch a video, pictures/ charts showing a variety of natural and artificial phenomena that can be explained by chemistry. Learners then observe, deduce and discuss the meaning of chemistry* ***Activity 1 (40 minutes)*** *I. Sort a given number of topics and subjects into the branches of chemistry.* ***Activity 2 (40 minutes)*** *I. Construct a table to show the relationship between chemistry and other subjects (physics, biology, geography etc).*

AssessmentDoK aligned to the Curriculum and Subject Teacher Manual

Level 1:

1. *With clicker questions, define Chemistry.*

Level 2:

1. *Distinguish between pure and applied chemistry.*

Lesson Closure

In completing this part, refer to the Essential Questions to check that learning has taken place.

Activity (15 minutes)

d) State two ways by which chemistry is applied in everyday life.

e) In your own words, distinguish between Pure and Applied chemistry

Reflection & Remarks

Reflection:

1. *What went well during the lesson delivery?*
2. *Which teaching approach helped learners to understand what chemistry is?*
3. *Were the learners able to show the relationship between chemistry and other sciences?*
4. *Was the concept map useful for the lesson and must it be sustained?*

Lesson 2

Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Teacher Manual

Teacher Activity	***Learner Activity***

Starter *Activity (10 minutes)*

Review learners' previous knowledge of safety in the laboratory by showing a short video (audiovisual) of wrong practices in the kitchen and guide learners to discuss the content after which the lesson is introduced.

Introductory activity (25 minutes) *I. Help learners to organize themselves in pairs or groups and show a video of wrong practices in the chemistry laboratory and provide suitable alternative for SEN learners.* ***Activity 1 (25 minutes)*** ***I.*** *Show a chart of the various hazard symbols to learners in their small groups and randomly distribute chemical reagents, electrical gadgets and other materials for learners to identify the hazard symbols on them based on the following headings: Corrosive, toxic, oxidizing, flammable, explosive, radioactive, irritant/harmful, biohazards. Encourage learners to be tolerant and circumspect with their criticisms and commentary on others' presentations.* ***Activity 2 (25 minutes)*** *I. Provide a worksheet of the prohibition signs for learners to identify, sketch and describe them under the following headings: (First aid, danger, No smoking, High voltage, etc).* ***Activity 3 (25 minutes)*** *I. Provide learners with pictures of the personal protective equipment and help them design a poster to be pasted at vantage places in the laboratory*	***Introductory activity (25 minutes)*** *I. In your pairs or groups, learners watch the video and discuss the dos and don'ts in the chemistry laboratory and hence the rules and regulations that should be followed in the laboratory. Encourage learners to, show respect to others' views as they carry out discussions by interacting and collaborating with group members.* ***Activity 1(25 minutes)*** *I. Using think-pair-share approach examine and discuss the assay of the chemical reagents, electrical gadgets and other materials under the headings provided.* ***Activity 2 (25 minutes)*** *I. Sketch and describe the prohibition signs under the headings provided.* ***Activity 3 (25 minutes)*** *I. In mixed ability groups design posters on the need to use personal protective equipment and make a presentation.*

AssessmentDoK aligned to the Curriculum and Subject Teacher Manual
Level 1: 1. *With clicker questions, give two (2) examples of personal protective equipment used in the chemistry laboratory.* *Level 2:* 1. *With safety procedure processes explain why it isk not advisable to start a car in a closed garage?* *Level 3:* 1. *Mercury is a heavy metal used in illegal mining (galamsey) of gold in water bodies. It was accidentally released into a river body. In presentations, what are the possible implications on the health of the people in the community.*
Lesson Closure ***In completing this part, refer to the Essential Questions to check that learning has taken place.***
Activity (10 minutes) a) *Ask learners to summarize the key words (i.e. safety, hazards and personal protective equipment) in their own words.*
Reflection & Remarks
Reflection: 1. *Which of the safety rules were well understood by the learners?* 2. *Which personal protective equipment can help mitigate the potential risks of a chosen hazard symbol in the laboratory?* 3. *Which interactive approach during the lesson delivery helped to demystify hazard symbols and empower learners to recognize and interpret them accurately?* *Remarks:*

Computing

Learning Planner							
Subject	*Computing*	**Week**	*1*	**Duration**	*240 minutes*	**Form**	*1*
Strand	*Computer Architecture and Organisation*	**Sub-Strand**	*Data Storage and Manipulation*				
Content Standard	*Demonstrate knowledge and understanding of data representation and Data Manipulation.*						
Learning Outcome(s)	*Apply computer Architecture concepts related to the design of modern processors, memories, Input and Output to manipulate data.*						
Learning Indicator(s)	1. *Describe data as Bit Patterns.*						
Essential	1. *How would you express decimal numbers into binary digit and*						

Question(s)	*vice versa?* 2. *What are bit patterns and how are they represented in computing?* 3. *How can bit patterns be used to represent different types of data, such as numbers, characters, and images?* 4. *What is the best approach to teach data representation as bit patterns for all learners to benefit from the lesson?* 5. *In what ways can I integrate the cross-cutting themes- 21st Century, GESI, SEL and National values in teaching data representation as bit patterns?*
Pedagogical Strategies	*Problem-Based Learning;* *Project-Based Learning;* *Talk for Learning;* *Experiential learning;* *Group work/collaborative learning.* *Small group and large group discussions,* *Think-pair-share,* *Questioning* *Demonstration* *Brainstorming* *Brain writing*
Teaching & Learning Resources	*Notepad or exercise book* *Pen* *Smartphones* *Laptop computers* *Desktop computers* *Tablets* *TV* *Radio* *Productivity tools* *Open Educational Resources (Including: YouTube, MOOCS-Udemy/ Coursera, khan academy, TESSA)* *The iBox (CENDLOS)* *Subject based application software* *Instructional Laboratories (with multimedia equipment and smartboards)* *Maintenance and repair workshops*
Key Notes on Differentiation	
i. Learning Task: ☐ *Play an activity ball game with the learners for the binary numbers' conversion. Write down a list of decimal numbers for the conversion (e.g.: 1-9 these varied numbers will cater for differentiation) and passing the activity ball to any learner randomly, the learner with the ball converts one of the decimal numbers of their choice in their books). Another activity may be to have a hat containing numbers on paper, learners pick random numbers to convert to binary* ☐ *Use the answers of the learners to categorise the learners into proficiency levels and proceed to the differentiated tasks, etc.*	

ii. Pedagogical Exemplars:

- ☐ *The teacher should build on the learners understanding by playing flash cards games (or related) with the learners in their mix-ability groupings before proceeding to the binary number conversions to decimal numbers and decimal numbers to binary numbers*
- ☐ *Team teaching is recommended for the conversion activities. The teacher(s) should emphasis on how computers understand only binary numbers ("0s" and "1s"). The teacher can invite a mathematics teacher to support him/her on the delivery of this content before doing some of the suggested activities above), etc.*

iii. Key Assessments (DoK):

- ☐ *Level 1: Convert decimal numbers into their binary representations*
- ☐ *Level 2:Given the binary number 101101, divide it into groups of three bits starting from the right. Add leading zeros if necessary. Convert each group into its decimal representation, etc.*

Keywords	*Decimal numbers, bit patterns, data representation, nibbles, Octal, hexadecimal*

Lesson 1

Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Teacher Manual

Teacher Activity	***Learner Activity***
Starter *Activity (10 minutes)* *I. Establish rapport with learners by engaging them in brief discussion about the myths and misconceptions people have about Computing. For instance; Computing is only for men and hackers. You need to be good at Mathematics, etc.* *II. Explain to learners that, everyone can excel in the Subject regardless of their gender, background, socio – economic, etc. You can also give success stories of great achievers in Computing and how they started.*	
Introductory Activity (25minutes) *I. Use index or flash cards to introduce key words related with the concept to learners.* *II. Task them to brainstorm and explain how computers store text and other data. Engage all learners in the discussion.* *III. Using questioning, assist learners to express decimal numbers into binary and verse versa. Let them use either desktop computers or calculators if available to express decimal numbers to other number base systems in this exercise.*	***Introductory Activity (25minutes)*** *I. Identify key words shown.* *II. Think – pair – share their thought with class.* *III. Forms groups with instructions from teacher.* *IV. Collaborate with one another to accomplish the given task.* *V. Express decimal numbers into binary and other number base systems with their computers or calculators.* *VI. Think – pair – share their observations with one another.* ***Activity 1 (25 minutes)*** *I. Observe how bit patterns can be group*

IV. *Invite learner to explain how the conversion is done and their observation about different number conversions.* V. *Provide clear explanations of the binary number system and how it relates to representing data in computers.* VI. *Encourage learners to think critically, ask questions, and discuss their thoughts processes during these activities to enhance their understanding.* ***Activity 1 (25 minutes)*** ***I.*** *With demonstration, introduce the concept of mapping decimal numbers to their corresponding nibble bit patterns.* II. *Show learners the nibble patterns for decimal numbers 0 to 15, emphasizing that each pattern represents a unique value.* *Octal (Base-8 System):* *Explain that octal is a base-8 numbering system, where each digit represents three bits.* *Discuss how octal digits range from 0 to 7, emphasizing that each digit represents a unique combination of three bits.* III. *Guide learners to convert decimal numbers to octal by grouping the bits into sets of three and assigning an octal digit to each group.* *Reinforce that each octal digit represents a unique combination of three bits.* *Hexadecimal (Base-16 System):* *Introduce hexadecimal as a base-16 numbering system, where each digit represents four bits.* *Explain that hexadecimal digits range from 0 to 9 and A to F, where A represents 10, B represents 11,*	*into nibble and practice grouping bits as instructed. Ask questions where there for clarification when necessary.* II. *Observe and practice as instructed. Ask questions where there for clarification when necessary.* III. *convert decimal numbers to octal by grouping the bits into sets of three and assigning an octal digit to each group* IV. *Practice as instructed. Ask questions where there for clarification when necessary.* V. *Practice as instructed. Ask questions where there for clarification when necessary.* ***Activity 2 (35 minutes)*** I. *Forms mixed ability or gender groups base on given instructions to carry out the task. Collaborate with one another to play the game.*

and so on up to F representing 15. ***IV.*** *Show learners examples of converting decimal numbers to hexadecimal by grouping the bits into sets of four and assigning a hexadecimal digit to each group. Reinforce that each hexadecimal digit represents a unique combination of four bits.* *Provide learners with exercises and problems that involve converting between decimal, binary, nibbles, octal, and hexadecimal.* *Include practice problems that require converting between different representations, such as converting a decimal number to its binary, nibble, octal, and hexadecimal equivalents.* *Use visual aids, such as tables or charts, to show the relationships between data and information.* ***Activity 2 (35 minutes)*** *I. Group work/collaborative learning: In mixed ability/gender groups, assign binary patterns to represent each of the object. For example, a pencil could be represented in 4-bit pattern as 0110 and a book as 1101.*	
AssessmentDoK aligned to the Curriculum and Subject Teacher Manual	
Level 1: *1. Convert decimal numbers into their binary representations*	
Lesson Closure ***In completing this part, refer to the Essential Questions to check that learning has taken place.***	
Activity (25 minutes) *Guide learners to present their responses on the following ;* *a)* The process of converting a decimal number to its binary representation is called _____? *b) The binary representation of the decimal number 9 is _____?*	
Reflection & Remarks	

Reflection

What were my best moments in today's lesson and how can I create more situations?
What went well in the lesson?
Were the different subgroups in the class catered for?
What did not go well in today's lesson?
What must I do to improve on the challenges in the next lesson?

Lesson 2

Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Teacher Manual

Teacher Activity	***Learner Activity***
Starter *<u>Activity (10 minutes)</u>* *I. Have you ever wondered why your smartphone or computer takes a little longer to launch or open an application for the first time but become faster on subsequent launches? Let's uncover the secret behind this speed boost by exploring the role of cache memory.* *II. Encourage all learners to think-pair- share their thought with class. Encourage all learners to participate in this activity.*	
<u>Introductory activity (25 minutes)</u> *I. Guide learners to describe the process of converting a binary number to its decimal equivalent.* *II.* ***<u>Activity 1 (25 minutes)</u>*** *II. Let learners take turns in guessing each other's objects based on their binary representation (bit patterns)* ***<u>Activity 2 (40 minutes)</u>*** *I. Using Game like Bit Flipping Challenge, let each learner get a sheet of paper or a **digital worksheet** with a grid of 8 bits (e.g., 0 0 0 0 0 0 0 0). Instruct them to start flipping the bits one by one, from **right to left**, and observe the changes in the resulting number. For each bit flipped, have them write down the decimal value of the new binary number.*	***<u>Introductory activity (25 minutes)</u>*** *I. Describe the process of converting a binary number to its decimal equivalent.* *II.* ***<u>Activity 1(25 minutes)</u>*** *I. Take turns in guessing each other's objects based on their binary representation (bit patterns)* *II.* ***<u>Activity 2 (40 minutes)</u>*** *I. Get a sheet of paper or a **digital worksheet** with a grid of 8 bits (e.g., 0 0 0 0 0 0 0 0). Instruct them to start flipping the bits one by one, from **right to left**, and observe the changes in the resulting number. For each bit flipped, have them write down the decimal value of the new binary number.*

AssessmentDoK aligned to the Curriculum and Subject Teacher Manual

Level 2:

1. *Given the binary number 101101, divide it into groups of three bits starting from the right. Add leading zeros if necessary. Convert each group into its decimal representation, etc.*

Lesson Closure

In completing this part, refer to the Essential Questions to check that learning has taken place.

Activity (10 minutes)

Guide learners to do a presentation on how bit patterns can be used to represent different types of data, such as numbers, characters, and images.

Reflection & Remarks

Reflection

What were my best moments in today's lesson and how can I create more situations?
What went well in the lesson?
Were the different subgroups in the class catered for?
What did not go well in today's lesson?
What must I do to improve on the challenges in the next lesson?

ICT

Learning Planner

Subject	*Information & Communications Technology*	**Week**	*1*	**Duration**	*120 minutes*	**Form**	*1*
Strand	*ICTs in the Society*	**Sub-Strand**	*Organizing, Managing and Presenting Information Using Essential Productivity Tools*				
Content Standard	*Demonstrate knowledge and understanding of the use of various computing tools to create multimedia documents.*						
Learning Outcome(s)	*Create multimedia documents using appropriate computing tools*						
Learning Indicator(s)	2. *Describe software, hardware, and other computing features needed to create a document.* 3. *Create, Edit and Format text and paragraphs using desktop/online computing tools*						
Essential Question(s)	▪ *How will you explain computer hardware? Understanding* ▪ *How are the categories of hardware related? (Understanding, analyze,)* ▪ *How do you use these hardware types in creating a document? (Understanding, analyze, evaluate)* ▪ *How are the types of software related? (evaluate)* ▪ *What are the best approaches to teach computer hardware and computer software?* ▪ *In what ways can I integrate cross cutting theme GESI SEL*						

	national values in teaching components of the computer: Hardware and Software?
Pedagogical Strategies	*Problem-Based Learning;* *Project-Based Learning;* *Talk for Learning;* *Experiential learning;* *Group work/collaborative learning.* *Small group and large group discussions,* *Think-pair-share,* *Questioning* *Demonstration* *Brainstorming* *Brain writing*
Teaching & Learning Resources	*Notepad or exercise book* *Pen* *Smartphones* *Laptop computers* *Desktop computers* *Tablets* *TV* *Radio* *Productivity tools* *Open Educational Resources (Including: YouTube, MOOCS-Udemy/ Coursera, khan academy, TESSA)* *The iBox (CENDLOS)* *Subject based application software* *Instructional Laboratories (with multimedia equipment and smartboards)* *Maintenance and repair workshops*

Key Notes on Differentiation

i. Learning Task:

- ☐ *The teacher should start the lesson by grouping the learners taking into consideration GESI, SEL and other cross cutting issues and have an open class discussion where learners brainstorm about the computer and what it requires to work efficiently*
- ☐ *Teachers can ask learners in their groups to individually think-write-share with their group members the definition of a computer and agree on one definition. Teachers can then ask each group to present their definition*
- ☐ *Teachers should task learners in their groups to brainstorm the purpose of computers in everyday life and ask each group to share their write up with the class using tell-it-all*
- ☐ *Teachers can ask learners in their groups to individually think-write-share with their group members the definition of computer hardware and software based on the outcome of the purposes of a computer. Teachers can then ask each group to present their definition*
- ☐ *Using a projector, teachers project a designed puzzle of names of hardware and software components and ask learners to write out words from the puzzle. Teachers*

ask members in each group to read out their words and ask other groups to write computer related words down. Teachers ask each group to regroup their written words under hardware and software components of a computer and present their responses to the class

- ☐ *Teachers tasked each group to discuss the categories of hardware and software components with examples and present their results with the class. Teachers guide the whole class to draw the relations between hardware and software components, etc.*

ii. Pedagogical Exemplars:

- ☐ *Think Pair Share: Using mixed-ability/mixed gender groups, learners think, write and discuss the definition of a computer and its purposes, software and hardware components addressing inclusivity and equity. For example, input devices should be discussed to address accessibility issues for learners with disabilities such as visual impairment, dyslexia, and dysgraphia*
- ☐ *Tell-it-all: In small groupings, (ability, language, background, gender, etc.), learners list some hardware and software related words from a puzzle and group the words into hardware and software components. One group gives examples of hardware from their write up. Other groups repeat examples given by others and add their examples. This activity is repeated for examples of software as well*
- ☐ *Ink-Pair-Share: In pairs, learners write the relationship between hardware and software components using pen and paper and exchange their write ups with their colleagues. The teachers randomly select a few learners to read what colleagues wrote. Teacher then guides learners to draw a clear relationship between software and hardware components of a computer system, etc.*

iii. Key Assessments (DoK):

- ☐ *Level 1:What is a computer?*
- ☐ *Level 2: The external and internal devices and equipment that enable you to perform major functions such as input, output, storage, communication, processing, and more is known as……*
- ☐ *Level 3:Distinguish between application software and systems software*
- ☐ *Level 4: It is the hardware part of the computer that makes the computer intelligent and not the software. True or False. (Explain your answer), etc.*
- ☐ *Enter twenty (20) words into a text editing software, using keyboard or any other input device.*

Keywords	*Software, Hardware, word processing application software input, processing, output, storage, communication, Liveware*

Lesson 1	
Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Teacher Manual	
Teacher Activity	***Learner Activity***
Starter *<u>Activity (10 minutes)</u>* ***Brainstorming:*** • *An electric train is moving from Tamale (in the north) to Accra (in the south). What will be the direction of the smoke? (understanding)*	

Teacher brainstorms with learners to define and identify

- ☐ *the key points in defining computer software and hardware. Use a concept map to link the key points*
- ☐ *What learners use to place calls home.*
- ☐ *The type of applications on mobile phones used to perform a task.*

Introductory Activity (15minutes) *II. In small groupings (ability, language, background, gender, etc.) let learners List at least 10 hardware components and categorize them into input, processing, output and storage for large group discussion.* ***Activity 1 (15 minutes)*** *I. engage learners in an interactive discussion and use questioning to explain that without system software a hardware will have no function and that system software is required as a platform for other software.* ***Activity 2 (15 minutes)*** *I. In a large group discussion, let learners discuss the various types of software and show how the types of software are related?*	***Introductory Activity (15minutes)*** *II. In small groupings, (ability, language, background, gender, etc.), state and classify 10 hardware components into input, processing, output and storage for large group discussion.* ***Activity 1 (15 minutes)*** *I. engage in class discussion and answer questions to gain understanding of how system software is used to manage hardware and how they function as a platform for other software.* ***Activity 2 (15 minutes)*** *I. Discuss the various types of software in your groups and show how the types are related in your notebooks*

Assessment DoK aligned to the Curriculum and Subject Teacher Manual

Level 1:

1. *What is a computer?*

Level 2:

1. *The external and internal devices and equipment that enable you to perform major functions such as input, output, storage, communication, processing, and more is known as……*

Lesson Closure

In completing this part, refer to the Essential Questions to check that learning has taken place.

Activity (15 minutes)

Guide learners to recap their discussion and the points identified in the lesson. With the following as guiding questions;

f) Describe software, hardware, and other computing features needed to create a document.

g) Create, Edit and Format text and paragraphs using desktop/online computing tools

Reflection & Remarks

Reflection
What was my best moments in today's lesson and how can I create more situations?
What went well in the lesson?
Were the different subgroups in the class catered for?
What did not go well in today's lesson?
What must I do to improve on the challenges in the next lesson?

Lesson 2

Main Lesson drawing on Concepts, Skills and Competencies to reinforce as in the Subject Teacher Manual

Teacher Activity	***Learner Activity***
Starter *Activity (10 minutes)* ***Brainstorming:*** • *It is the hardware part of the computer that makes the computer intelligent and not the software. True or False (understanding)*	
Introductory activity (25 minutes) *II. In small groupings (ability, language, background, gender, etc.) let learners List at least 10 hardware components and categorize them into input, processing, output and storage for large group discussion.* ***Activity 1 (25 minutes)*** *III. Show a relatively short video tutorial on how to create word document* ***Activity 2 (25 minutes)*** *II. Guide learners to use these hardware components to create newsletters and birthday card.*	***Introductory activity (25 minutes)*** *II. In small groupings, (ability, language, background, gender, etc.), state and classify 10 hardware components into input, processing, output and storage for large group discussion.* ***Activity 1(25 minutes)*** *I. follow/watch a video to create word document* ***Activity 2 (25 minutes)*** *I. In groups, use the hardware components of the computer to create newsletter and birthday card*

Assessment DoK aligned to the Curriculum and Subject Teacher Manual

Level 4

1. *Enter twenty (20) words into a text editing software, using keyboard or any other input device.*
2. *(Learners should enter text (20 words) unaided – this should be their own original work or copied from given text).*

Lesson Closure
In completing this part, refer to the Essential Questions to check that learning has taken place.

Activity (15 minutes)

Guide learners to recap their discussion and the points identified in the lesson. With the following as guiding questions;

a) *Enter twenty (20) words into a text editing software, using keyboard or any other input device.*
b) *(Learners should enter text (20 words) unaided – this should be their own original work or copied from given text).*

Reflection & Remarks

Reflection

What was my best moments in today's lesson and how can I create more situations?
What went well in the lesson?
Were the different subgroups in the class catered for?
What did not go well in today's lesson?
What must I do to improve on the challenges in the next lesson?

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

b1. 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 behavior 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 leaners 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**

---

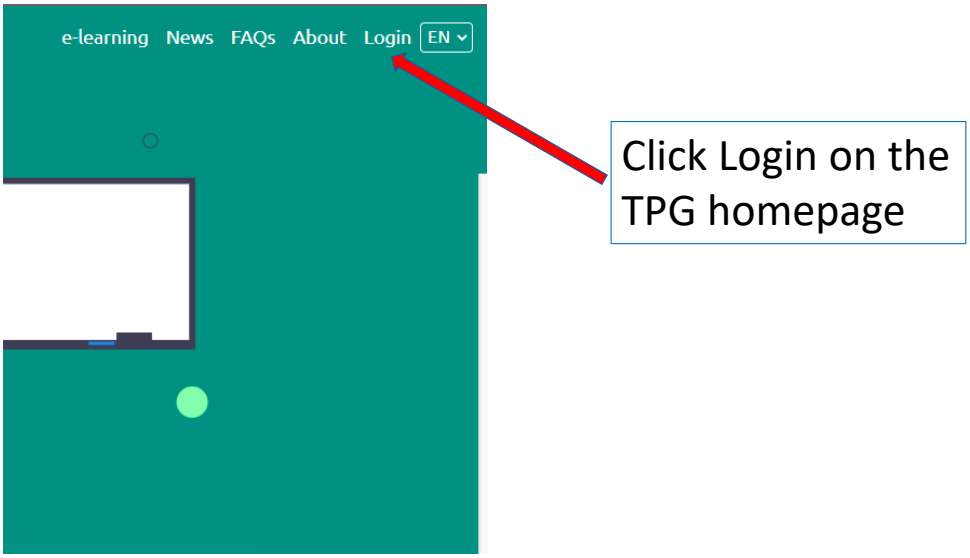
23. **Next steps for teacher**

---

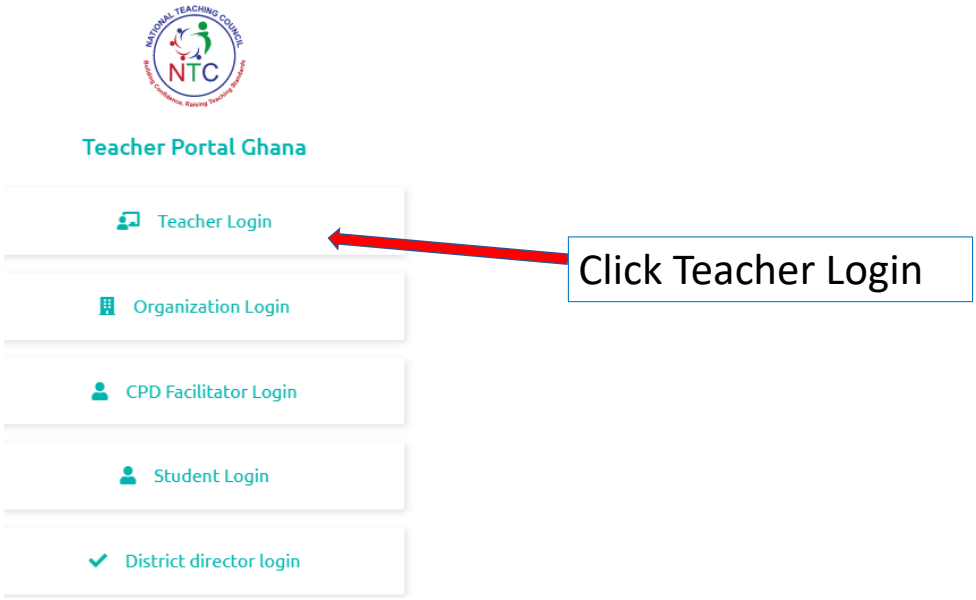
24. **Additional Notes (on teacher's actions, the flow of activities, etc.)**

HOW TO AWARD CPD POINTS TO DESERVING TEACHERS

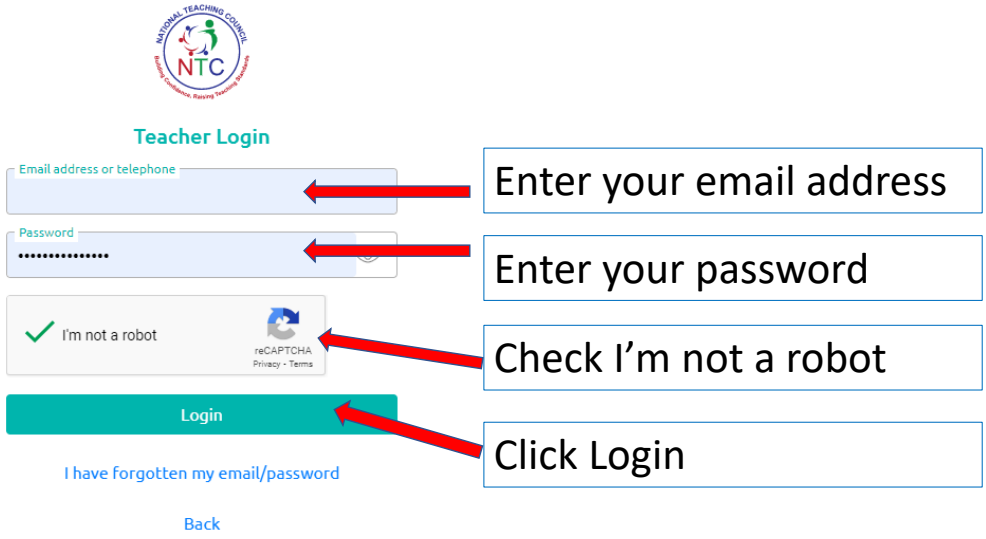
1. Visit *tpg.ntc.gov.gh* and click Login



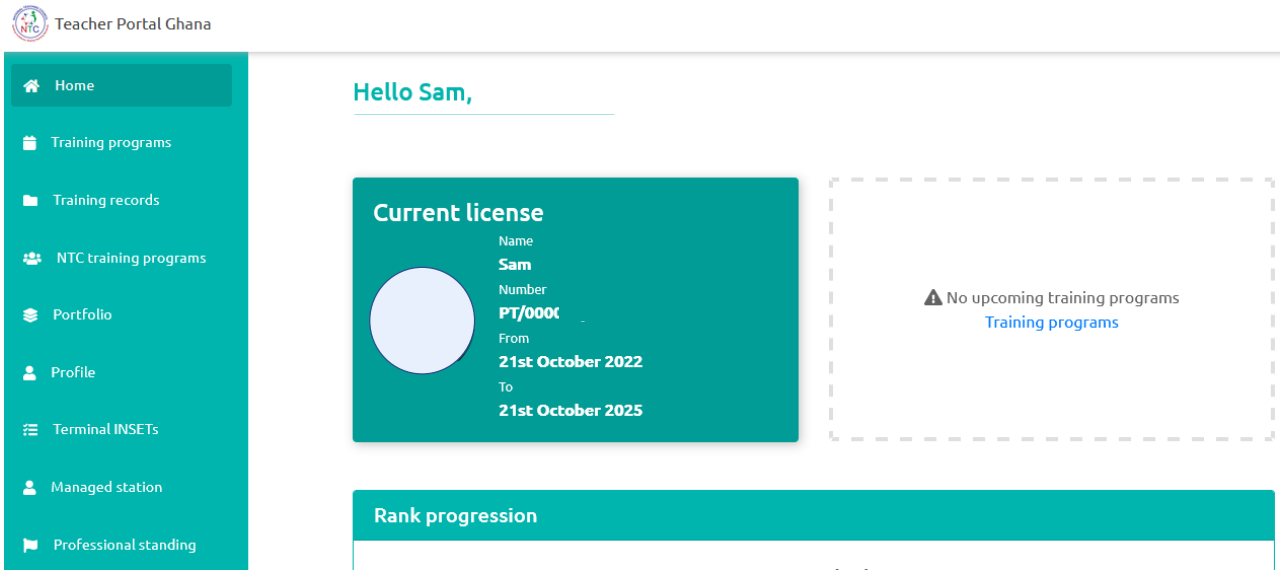
2. On the Login page, click Teacher Login



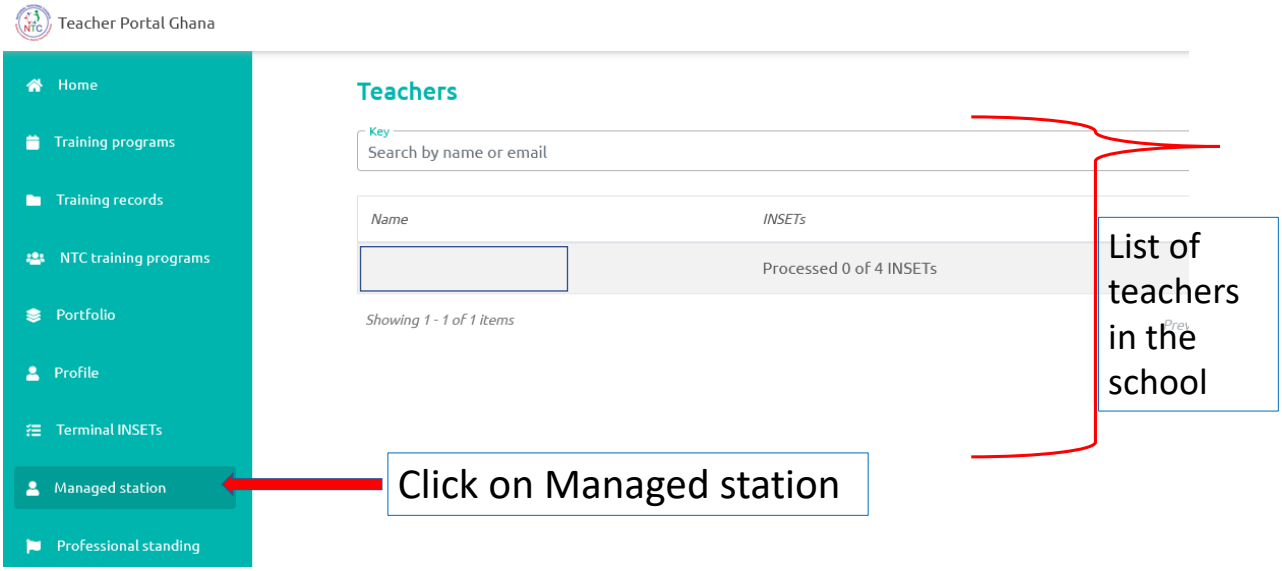
3. On the Teacher Login page enter your email address and password and then click Login



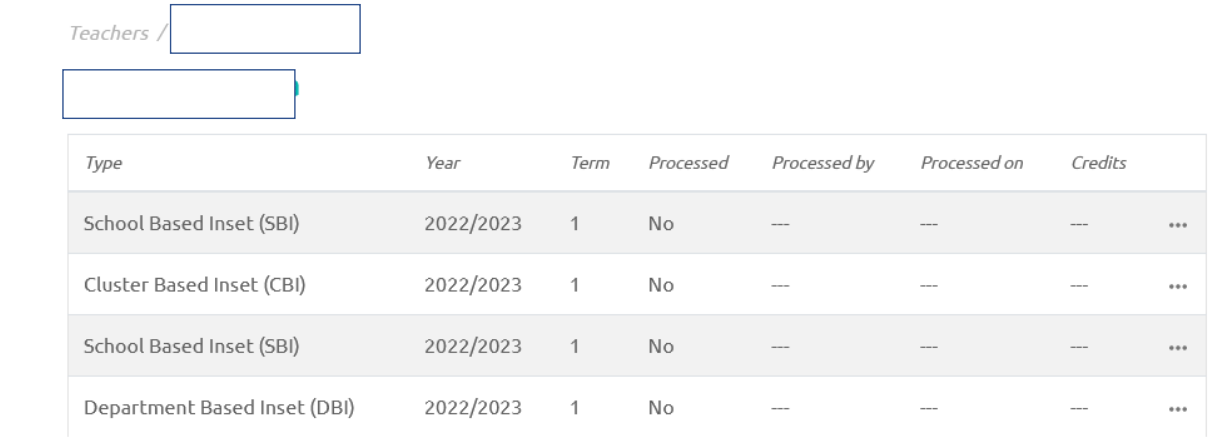
4. After a successful login you will get access to your TPG account (Check image below)



5. To award CPD points, from the side menu tap on Managed station to display list of teachers

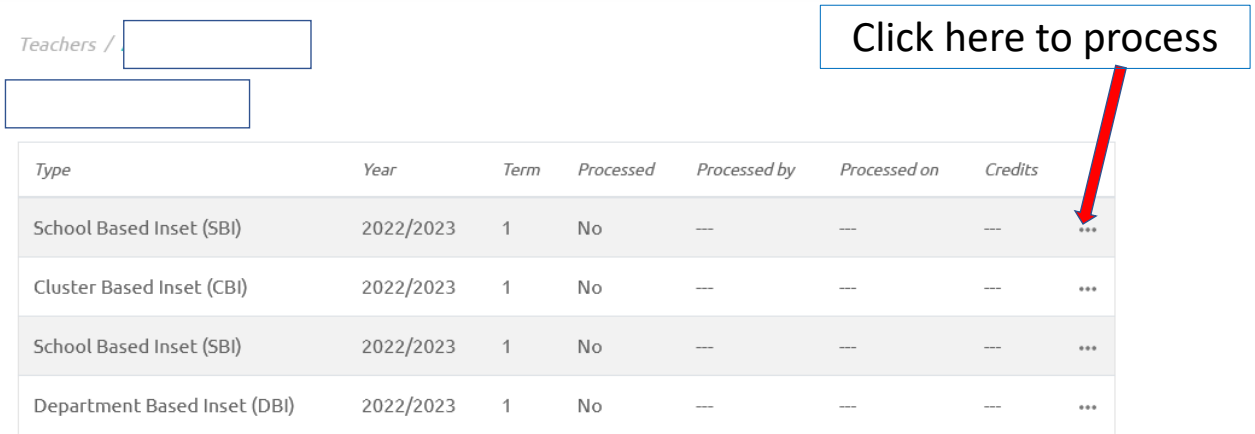


6. Click on the name of the teacher to display the page for awarding CPD points (Check image below)



Type	Year	Term	Processed	Processed by	Processed on	Credits	
School Based Inset (SBI)	2022/2023	1	No	---	---	---	•••
Cluster Based Inset (CBI)	2022/2023	1	No	---	---	---	•••
School Based Inset (SBI)	2022/2023	1	No	---	---	---	•••
Department Based Inset (DBI)	2022/2023	1	No	---	---	---	•••

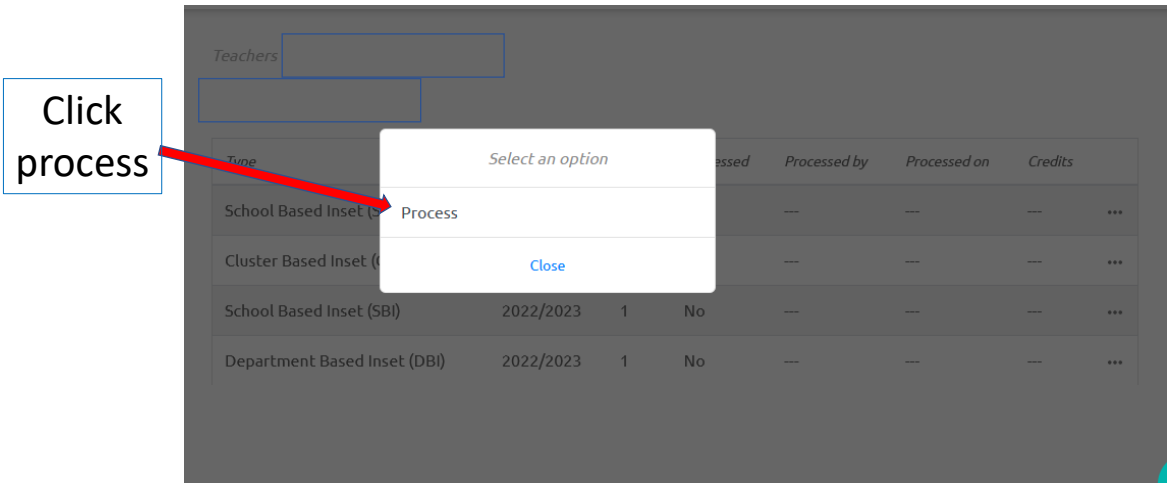
7. Click on the 3 dots after the Credits column at the extreme right side to process (Check image below)



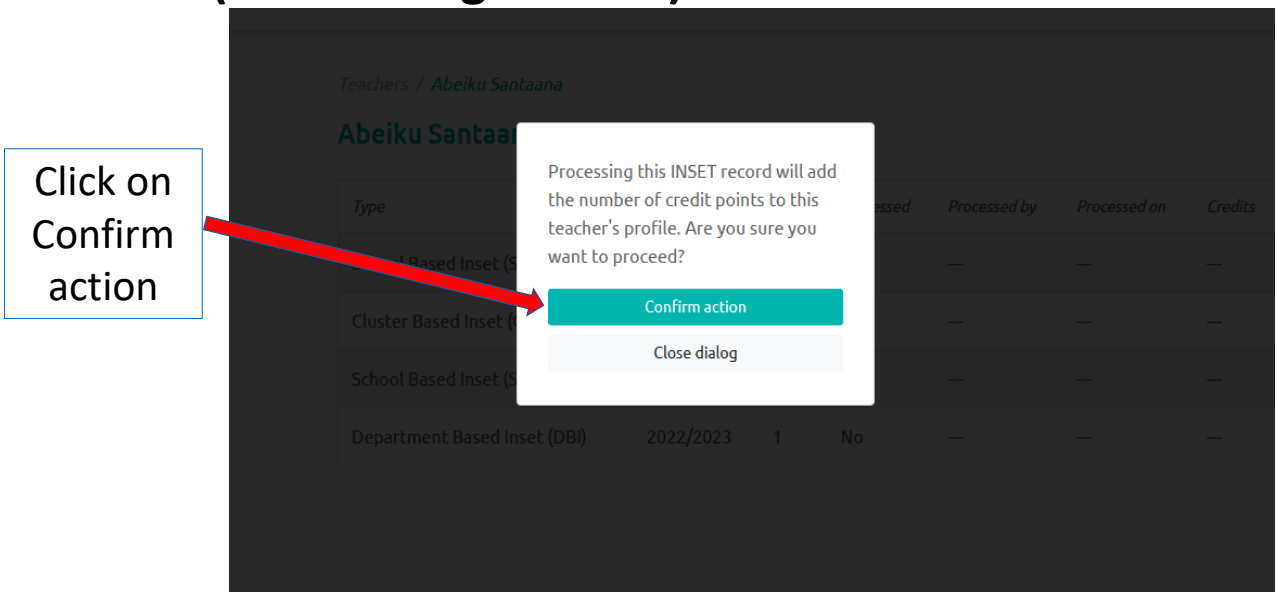
Type	Year	Term	Processed	Processed by	Processed on	Credits	
School Based Inset (SBI)	2022/2023	1	No	---	---	---	•••
Cluster Based Inset (CBI)	2022/2023	1	No	---	---	---	•••
School Based Inset (SBI)	2022/2023	1	No	---	---	---	•••
Department Based Inset (DBI)	2022/2023	1	No	---	---	---	•••

Note: You will repeat same actions for all the INSET/PLC types

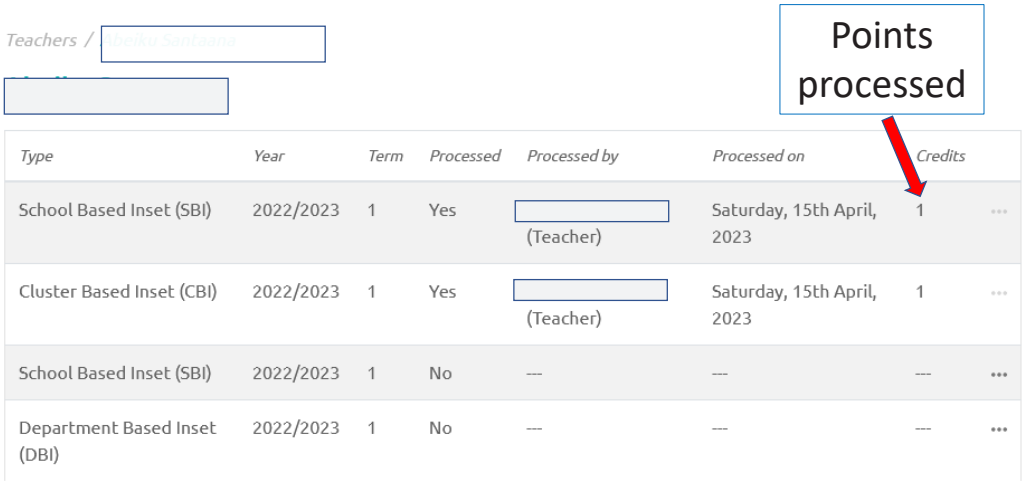
8. On the new page that appears click on Process (Check image below)



8. On the new page that appears click on Confirm action (Check image below)



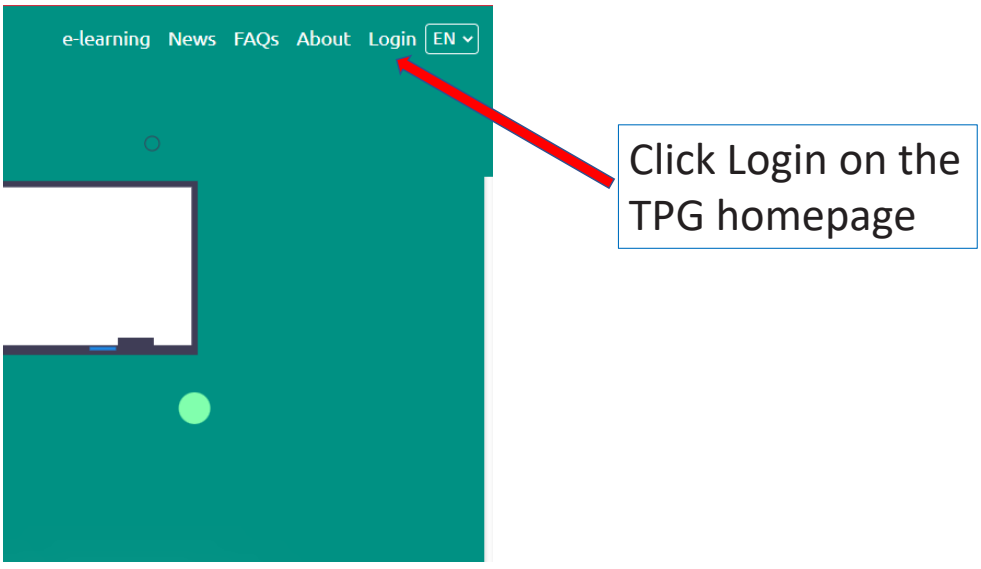
9. The points for the teacher will then be processed (Check image below)



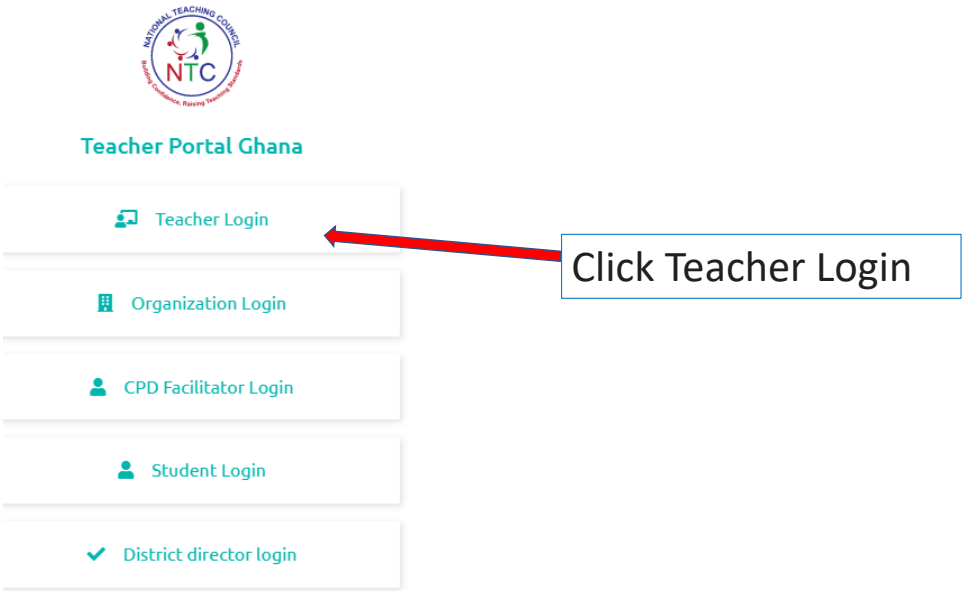
THANK YOU

HOW TO CHECK CPD POINTS AND TRAINING RECORDS ON TEACHER PORTAL GHANA

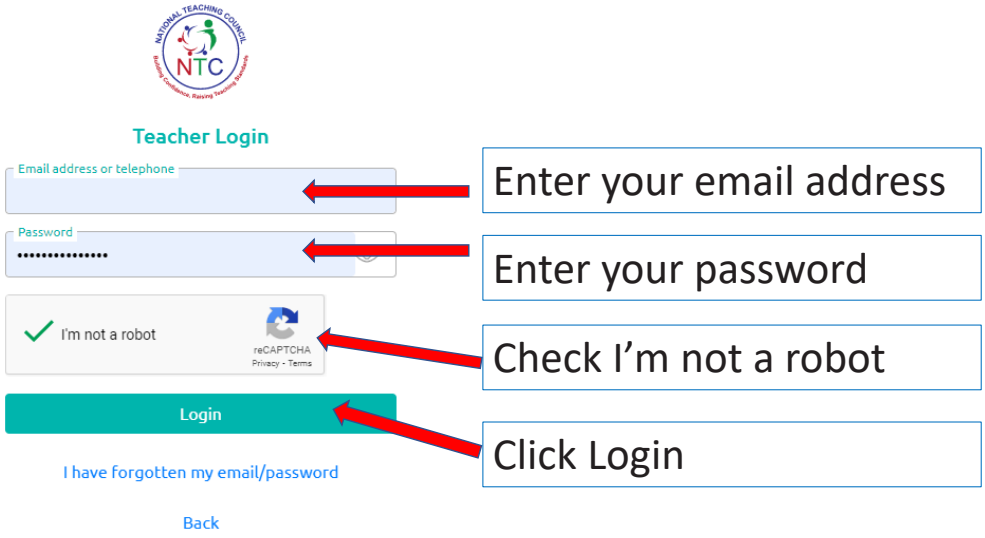
1. Visit *tpg.ntc.gov.gh* and click Login



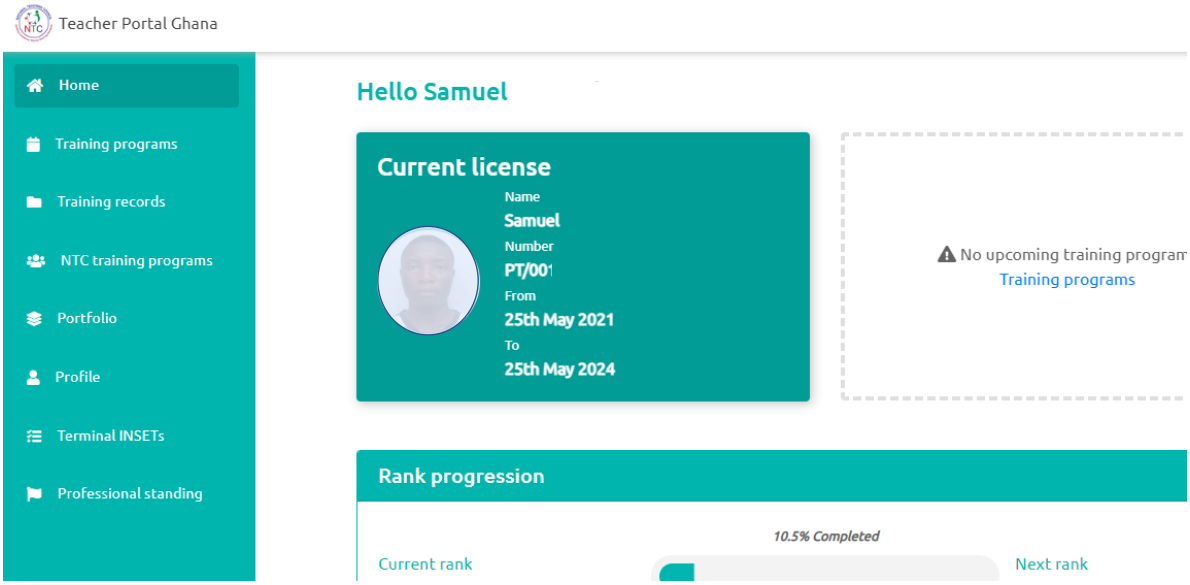
2. On the Login page, click Teacher Login



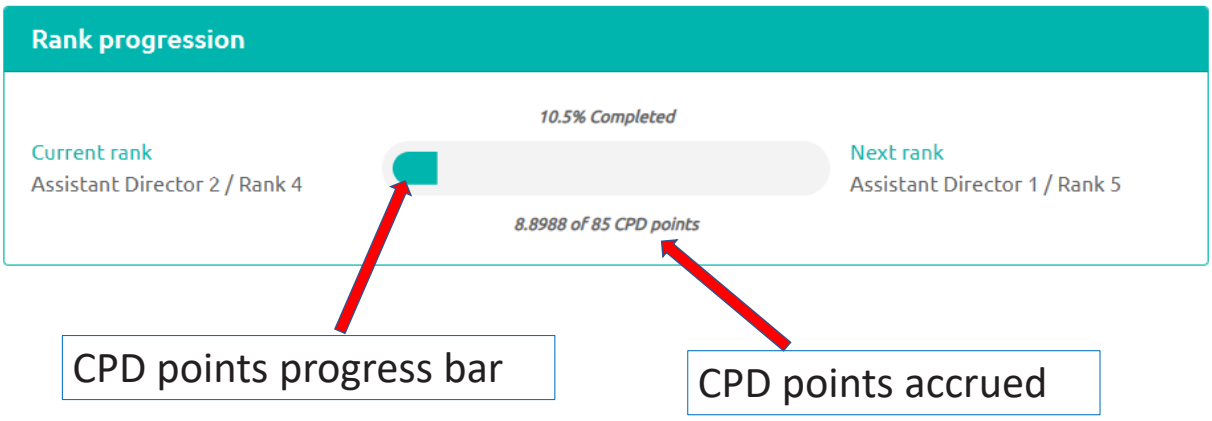
3. On the Teacher Login page enter your email address and password and then click Login



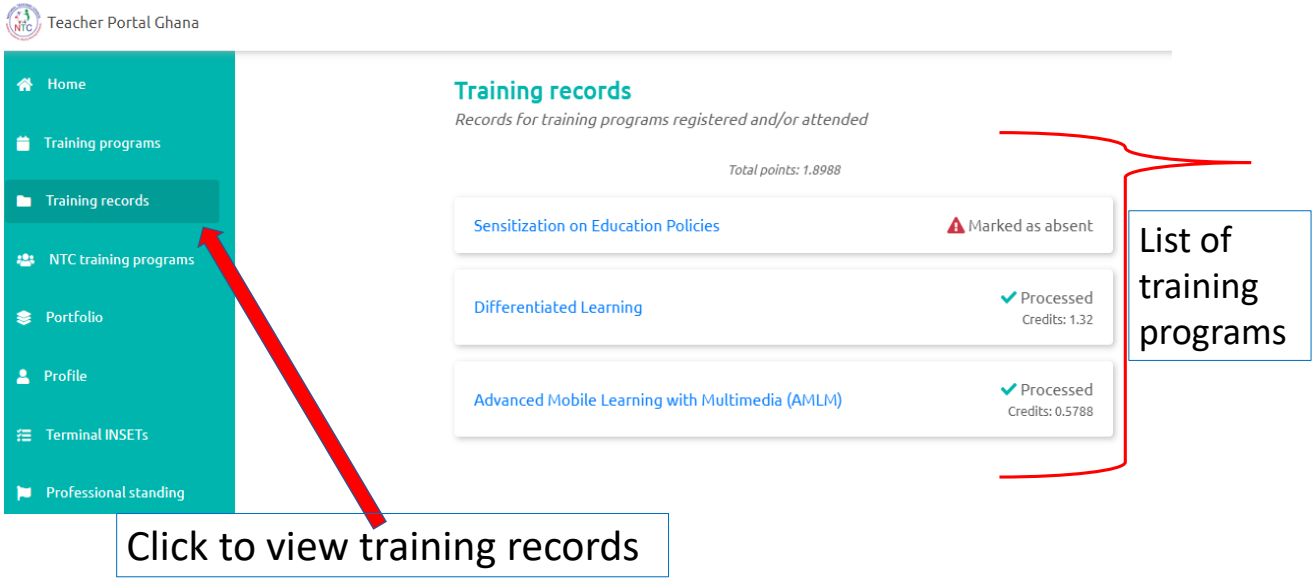
4. After a successful login you will get access to your TPG account (Check image below)



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)



THANK YOU