MODULE 2:
APPLYING ICT IN SCIENCE, MATHEMATICS AND ENGLISH TEACHING

Units, Topics and Activities
ACKNOWLEDGEMENT

The Ministry of Education and Vocational Training in collaboration with GESCI developed these Modular Outlines with financial support from Sida.
Content
Module Overview .................................................................................................................. 6
Module Objectives: ............................................................................................................. 6
Module Outcomes: ............................................................................................................. 7
Module Resources: ............................................................................................................. 7

Unit 1: Information and Communication Technology (ICT) and the Science, Mathematics
and English (SME) Curriculum ......................................................................................... 8
Topic 1: What is Information and Communication Technology? ..................................... 9
  Activity 1: What is Information? What is Communication? What is Technology? .......... 9
Topic 2: What are the New Pedagogies for Science, Mathematics and English Teaching? 14
  Activity 2: What are the New Pedagogies for Teaching and Learning in Science,
  Mathematics and English? .............................................................................................. 15
Topic 3: What is Technology, Pedagogy and Content Knowledge? ................................. 17
  Activity 3: What is Technology, Pedagogy and Content Knowledge (TPCK)? .......... 18
Unit Summary ................................................................................................................... 20

Unit 2: ICT in the SME Curriculum – Planning Technology Use ..................................... 21
Topic 5: Planning for Technology Use in Science, Mathematics and English ................. 25
  Activity 5: Introducing Technology in Science, Mathematics and English Teaching .... 26
Topic 6: Exploring PowerPoint Presentation Resources for Science, Mathematics and
  English ............................................................................................................................... 29
  Activity 6 – Exploring PowerPoint Presentation Resources for Science, Mathematics and
  English teaching ............................................................................................................ 30
Topic 7: Exploring CD-ROMs in Science, Mathematics and English Teaching ............ 32
  Activity 7: Using CD-ROMs in SME Teaching ................................................................ 32
Topic 8: Exploring Software Tools in Science, Mathematics and English Teaching .... 35
  Activity 8: Exploring Free and Open Software Tools to fit SME goals ....................... 37
Topic 9: Exploring the Use of the Internet in SME ......................................................... 40
  Activity 9: Sharing experiences on using the internet and WWW in SME teaching and
  learning ............................................................................................................................ 41
Unit Summary ................................................................................................................... 43
UNIT 3: Learning Environment – Developing SME Plans & Resources

Topic 10: Integrating Technology into SME Lessons

Activity 10: Integrating Technology into Lesson Instruction & Assessment

Topic 11: Your Turn - Lesson Planning Notes for ICT Integration in SME

Activity 11: Now Your Turn – Let’s Develop Lesson Plan Notes

Topic 12: Your Turn - Lesson Plans for ICT Integration in SME

Activity 12: Your Turn – Let’s Develop Lesson Plans & Resources


Activity 13: Your Turn – Lesson Plan Review, Simulation, Observation, Reflection & Development

Unit Summary

Module References
Module Overview

Module 2 has been designed for the Science, Mathematics and English teachers involved in the pilot project “Teaching and Learning Science Mathematics and English through ICT”. The module focuses on Applying ICT in Science, Mathematics and English teaching. This module is a follow-on from Module 1 where the focus was on providing basic ICT literacy skills in operating systems, word processors, spreadsheets, presentations, email and internet. The module has been developed collaboratively with GESCI and tutors and professors from the Teacher Colleges and Faculties of Education. The activities and exercises provided here are based on the activities that are carried out by teachers in their practice.

The complete Module takes 30 hours as outlined below:

- Unit 1: Information and Communication Technology (ICT) and Science, Mathematics and English (SME) – 4 hours
- Unit 2: ICT in the SME Curriculum – Planning Technology Use - 11 hours
- Unit 3: Learning Environment – Developing SME Plans and Resources – 15 hours

Module Objectives:

By the end of the module the teachers should be able to:

a) explain the concept of information communication and technology
b) research and describe the use of new pedagogies in Science, Mathematics and English teaching
c) research and describe the potential use of ICT applications & skills to support pedagogy and content in SME
d) communicate ideas and information with peers on the use of technology to support Science, Mathematics and English content and pedagogy
e) examine the potential of Science, Mathematics and English subjects for contributing to national educational objectives
f) use a technology, pedagogy and content knowledge (TPCK) framework to evaluate technology use in SME lesson planning
g) evaluate technology resources for SME pedagogy and content planning
h) identify appropriate ICT PowerPoint resources for SME curriculum topics  
i) identify ICT software resources for SME curriculum topics  
j) search information from internet for SME application  
k) evaluate information from the internet  
l) develop activities for using presentation software, open software and digital resources to support SME instruction  
m) select ICT instruction and assessment pedagogical approaches & resources to introduce and evaluate SME concepts  
n) design lesson plans that include teaching on the use of ICT in SME  
o) demonstrate the use of ICT in SME lesson plans to peers  

Module Outcomes:  
By the end of this module the teacher should be able to explain how technology can support SME pedagogy and content, identify technology resources (presentations, software, websites) to use in SME teaching, develop lesson plans and resources for applying technology in SME teaching and learning.  

Module Resources:  
This module 2 is made of the following four key resources:  
1. Module 2 Unites, Topics & Activities – the main module contains the content and activities in each unit and topic area.  
2. Module 2 Resources – the resource module contains group work templates and information briefs for every activity in the main module.  
3. E-Diary – the e-diary is a tool that you can use for reflecting on the experiences, learning and practice related to the activities in the module. The e-diary contains a teacher’s reflection template for every activity in the main module.  
4. E-Portfolio – the e-portfolio is a tool that you can use to store and review all of the documents and artifacts (PowerPoint presentations, lesson plans, concept maps etc.) that you produce in the module during the workshop. The e-portfolio contains a summary of the products and artifacts that will be produced in every activity in the main module.  

All resources can be downloaded onto teachers’ laptops to be used throughout the activities of the main module.
Unit 1: Information and Communication Technology (ICT) and the Science, Mathematics and English (SME) Curriculum

<table>
<thead>
<tr>
<th>ICT Teacher Competency</th>
<th>Domain</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers research and demonstrate the use of technology resources for basic levels of correspondence and communication</td>
<td>Curriculum: Communication and Collaboration</td>
<td>Applying ICT in SME (Technology Literacy)</td>
</tr>
</tbody>
</table>

The purpose of the unit is to provide an understanding of Information and Communication Technology (ICT) and how we can use it as a tool in education in general and for communication and collaboration in SME curriculum activities with peers.

**Unit 1: General Objectives**

By the end of this unit teachers should be able to:

- Explain the concept of information communication and technology
- Research and describe the use of new pedagogies in Science, Mathematics and English teaching
- Research and describe the potential use of ICT applications & skills to support pedagogy and content in SME
- Communicate ideas and information with peers on the use of technology to support Science, Mathematics and English content and pedagogy
**Topic 1: What is Information and Communication Technology?**

<table>
<thead>
<tr>
<th>Facilitator orientation</th>
<th>E-Diary</th>
<th>Group task 1</th>
<th>Group task 2</th>
<th>Facilitator Summary</th>
<th>E-Diary</th>
<th>Total time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 mins</td>
<td>20 mins</td>
<td>15 mins</td>
<td>20 mins</td>
<td>15 mins</td>
<td>5 mins</td>
</tr>
</tbody>
</table>

**Introduction (5 Minutes)**

The first step in planning to use ICT in teaching and learning is to understand what we mean by ‘information’, ‘communication’ and ‘technology’.

**Specific Objectives**

By the end of this topic the teacher should be able to:

- Create a concept map of what they understand by *information, communication* and *technology*
- Develop a definition of what they mean by *information, communication* and *technology*.

The activity task is divided into two parts.

- **In the first part of the task** teachers in groups will brainstorm their ideas on what ICT means and organize their ideas into concept maps on *Information* or *Communication* or *Technology*.
- For the first part of the task groups can use the *group brainstorm templates for activity 1* in the resource manual and use the *laptops and projector* to present the group work in plenary.

- **In the second part of the task** groups will provide a definition of *Information* or *Communication* or *Technology*.
- For the second part of the task groups can use the *group definition templates* and the *information briefs for activity 1* in the resource manual and use the *laptops and projector* to present the group work in plenary.

**Note:** During the brainstorm in part 1 of the task the **groups should not consult information briefs** – groups should explore their own ideas and understanding.
Activity 1: What is Information? What is Communication? What is Technology?

Activity 1: E-Diary Reflection (5 Minutes)

Before beginning the activity participants can use e-diaries (in their laptops) to record their thoughts on what they understand by Information and Communication Technology.

Group Task 1 – ICT Concept Maps and Definitions

Part 1: Concept Maps of ICT (20 Minutes)

Form 3 groups: groups can be mixed

Each group will be assigned one topic with the following questions:

- Group 1: What is Information?
- Group 2: What is Communication?
- Group 3: What is Technology?

Resources:

Key Resource 1: Group Brainstorm Templates

- Resource 1a – Brainstorm – What is Information?
- Resource 1b – Brainstorm – What is Communication?
- Resource 1c – Brainstorm – What is Technology?

Group Presentation Tools

- Laptops - word document OR in concept mapping software
- Large sheet of paper OR copybook OR a blackboard

Task Description:

Step 1: In groups brainstorm all of the ideas /concepts that come to mind to answer the question assigned to your group.

a. Group 1 – What is information?
b. Group 2 – What is communication?
c. Group 3 – What is technology?
**Step 2:** Write all of the ideas/concepts on small pieces of paper - each piece of paper contains 1 idea.

**Step 3:** Organize the ideas into groups on a large piece of paper/a blackboard/or a word document in your laptop.

The group also has the option to draw the concept maps in copybooks if pieces of paper/chart paper is not available.

**Step 4:** Connect all the ideas to the centre topic (information/communication/technology). Use arrows or branches to show the inter-relationship between the ideas/concepts.

**Step 5:** Appoint one group member to present the group concept map.

**Facilitation Orientation:**

- Groups can present their concept maps on a chart OR a blackboard OR the centre pages of a copybook OR on a laptop
- Groups presenting on their laptops can present using a word document or using concept mapping software

**Plenary Presentations (15 Minutes)**

- Each group presents concept map to the whole group.
- The group explains their choice of ideas and the links between their ideas.
Part 2: Definitions of ICT (20 Minutes)

3 groups: Continue with 3 groups organized for concept mapping

Resources:

Key Resource 2: Group Definition Templates

- Resource 2a – Definition of Information
- Resource 2b – Definition of Communication
- Resource 2c – Definition of Technology

Key Resource 3: Information Briefs

- Resource 3a – What is Information?
- Resource 3b – What is Communication?
- Resource 3c – What is Technology?

Group Presentation Tools

- Laptops
- PowerPoint presentations OR group definition template presentations

Task Description:

Step 1: In groups discuss a definition at ‘Information’ or ‘Communication’ or ‘Technology’ to fit with your concept map

For support with this task see Key Resource Sheet 3a/3b/3c – What is Information? What is Communication? What is Technology?

Step 2: Write the group’s definition in the Group Definition template (Key Resource 1a/ 1b/ 1c)

Step 3: Each group prepare a PowerPoint summary of their definitions (1-2 slides)

Plenary Discussion (15 Minutes)

- Each group presents PowerPoint of their definition and explanation of how the definition fits with the group’s concept map
- Groups discuss similarities and differences in definitions
Facilitator Summary: (5 Minutes)

- Summarize 3 definitions
- Brainstorm 1 broad definition to answer the question – what is ICT?

Activity 1: E-Diary Reflection (5 Minutes)

At the end of the task participants complete their e-diaries about the activity.
Introduction (5 Minutes)
The new Science, Mathematics and English (SME) syllabuses for ordinary level secondary education (Form I to Form IV) are revised versions of the 1997 syllabuses. In the revised syllabuses there is a paradigm shift from content to competence based curricula and give room for the learner to build skills and competences in SME.

The syllabuses encourage constructivist approaches whereby the learner participates actively in the construction and acquisition of knowledge.

Specific Objectives
By the end of this topic the teacher should be able:

- Explore what the constructivist approaches mean in the teaching of Science, Mathematics and English.
- Review information briefs for this activity in the resource manual.
- Register their ideas in the group discussion templates for this activity in the resource manual.
- Prepare a PowerPoint Presentation (1 – 2 slides) OR use the group discussion template for activity 2 for presenting their ideas in the plenary session – each group presenting with laptop and projector.
Activity 2: What are the New Pedagogies for Teaching and Learning in Science, Mathematics and English?

Activity 2: E-Diary Reflection (5 Minutes)
Before beginning the activity participants can use e-diaries (in their laptops) to record their reflections on the new approaches for teaching Mathematics, Science and English.

Group Task – New Pedagogy of Science, Mathematics and English (40 Minutes)
Form 5 groups: Each group will be assigned one topic with the following questions:

- Group 1: What is the New Pedagogy for Teaching and Learning in Chemistry?
- Group 2: What is the New Pedagogy for Teaching and Learning in Physics?
- Group 3: What is the New Pedagogy for Teaching and Learning in Biology?
- Group 4: What is the New Pedagogy for Teaching and Learning in Mathematics?
- Group 5: What is the New Pedagogy for Teaching and Learning in English?

Resources:

Key Resource 1 - Group Discussion Templates
- Resource 1a – Pedagogy in Chemistry
- Resource 1b – Pedagogy in Physics
- Resource 1c – Pedagogy in Biology
- Resource 1d – Pedagogy in Mathematics
- Resource 1e – Pedagogy in English

Key Resource 2 - Information Briefs
- Resource 2a – Science, mathematics, English Syllabuses Overview
- Resource 2b – Constructivist Approach Overview
- Resource 2c – How We Learn Overview

More resources
The following website links may help the groups in this task:

- Tanzania Physics Pedagogy Syllabus at: 
- Tanzania English Pedagogy Syllabus at: 
- Tanzania Mathematics Pedagogy Syllabus at: 

Presentation Tools
- Laptops/projector
- PowerPoint presentations OR group discussion template presentations

Task Description

Step 1: In your groups briefly review the resource briefs on SME syllabuses overview, constructive approach overview and how we learn overview

Step 2: Discuss the following questions:
- What are the group thoughts on the constructivist view of teaching and learning?
- What are the pedagogical strategies for applying the approach in Chemistry or Physics or Biology or Mathematics or English teaching?

Step 3: Prepare a PowerPoint presentation in laptop to present a short summary of Pedagogical Strategies in the group subject area (1-2 slides).

Plenary Discussion (20 Minutes)
- Each group presents PowerPoint of pedagogical strategies for SME subjects
- Groups can discuss what is common and what is different in the approaches.

Facilitator Summary (5 Minutes)
Summarize the principal pedagogical approaches that are common to all subjects.

Activity 2: E-Diary Reflection (5 Minutes)
At the end of the task participants complete their e-diaries about the activity.
**Topic 3: What are Technology, Pedagogy and Content Knowledge?**

<table>
<thead>
<tr>
<th>Introduction</th>
<th>e-Diary</th>
<th>Group work task</th>
<th>Plenary session</th>
<th>Facilitator summary</th>
<th>e-Diary: summary</th>
<th>Total time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 mins</td>
<td>5 mins</td>
<td>30 mins</td>
<td>10 mins</td>
<td>5 mins</td>
<td>5 mins</td>
<td>1:00 hr</td>
</tr>
</tbody>
</table>

**Introduction (5 Minutes)**

- Technology Pedagogical Content Knowledge (TPCK) is a framework that has been developed to assist teachers in integrating technology use to support content and pedagogy in their lesson planning.
- In this topic we will introduce a technology, pedagogy, content knowledge (TPCK) game as a guide to help you as teachers to think about the use of content, pedagogy and technology in their lesson planning.
- You will form groups and use the group discussion templates and the information briefs for activity 3 in the resource manual to carry out the activity task and use the laptops and projector to present the group work in plenary.

**Specific Objectives**

By the end of this topic the teacher should be able to:

- Use a TPCK framework to identify technologies for supporting content and pedagogy in their lesson planning
- Compare and contrast the value of technology use for lesson content and pedagogy
Activity 3: What are Technology, Pedagogy and Content Knowledge (TPCK)?
How can we apply TPCK in Science, Mathematics and English teaching and learning?

Activity 3: E-Diary Reflection (5 Minutes)
Before beginning the activity participants can use e-diaries (in their laptops) to record their thoughts on what they understand about integrating ICT in Science, Mathematics and English teaching.

Group Task – The TPCK Game (1 Hour)
Form 5 groups according to your subject area
- Group 1: Chemistry
- Group 2: Physics
- Group 3: Biology
- Group 4: Mathematics
- Group 5: English

Resources:

Key Resource 1 - Group Discussion Templates
- Resource 1a – TPCK Game in Chemistry
- Resource 1b – TPCK Game in Physics
- Resource 1c – TPCK Game in Biology
- Resource 1d – TPCK Game in Mathematics
- Resource 1e – TPCK Game in English

Key Resource 2 - Information Brief
- Resource 2 – What is Technology, Pedagogy Content Knowledge?

Presentation Tools
- Laptops/projector
- Group discussion template presentations

Task Description

Step 1: In your groups briefly review the resource brief on what are Technology, Pedagogy, and Content Knowledge?
Step 2: Pick one item from each of the 3 TPCK envelopes (Technology, Content and Pedagogy Envelopes) provided in the Group Discussion Template for your subject area

Step 3: Think of a sound classroom activity that uses that technology, content, and pedagogy

Step 4: Describe and record in the group discussion template how you see the technology supporting the content and the pedagogy.

Plenary Discussion (20 Minutes)

- Each group presents The Group Discussion Template summary for using technology, content and pedagogy in one classroom activity in their subject area
- Groups can discuss what is similar and what is different about their suggestions for using technology to support content and pedagogy.

Facilitator Summary (5 Minutes)

As facilitator of the TPCK game encourage the groups to

- present their ideas about how they see the technology skills that they have acquired can be applied to their subject area
- Listen to the ideas of others in their subject areas.

The facilitator can summarize the principal approaches that the groups present for using technology to support content and pedagogy

Activity 3: E-Diary Reflection

At the end of the task participants complete their e-diaries about the activity.
Unit Summary

This unit covered the following key areas:

- Concept mapping of meaning and understanding of information communication and technology
- Research and reflection on the use of new pedagogies in Science, Mathematics and English teaching
- Research and reflection on the potential use of ICT applications & skills to support pedagogy and content in SME
- Communication of group discourse and ideas on the use of technology to support Science, Mathematics and English content and pedagogy
Unit 2: ICT in the SME Curriculum – Planning Technology Use

### ICT Teacher Competencies

<table>
<thead>
<tr>
<th>ICT Teacher Competencies</th>
<th>Domain</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers match specific Science Mathematics and English curriculum standards to particular software applications and content and describe how these standards are supported by these applications and improvement of professional practices.</td>
<td>Curriculum: Curriculum Planning</td>
<td>Applying ICT in SME (technology literacy)</td>
</tr>
<tr>
<td>Teachers describe how didactic teaching with ICT can be used to support students’ acquisition of school subject matter and incorporate appropriate ICT activities into lesson plans so as to support students’ acquisition of school subject matter knowledge.</td>
<td>Pedagogy: Planning</td>
<td>Applying (technology literacy)</td>
</tr>
<tr>
<td>Teachers describe the internet and the World Wide Web, elaborate on their uses, and describe how a browser works and use of URL to access a website and how to use a search engine to do a keyword Boolean search.</td>
<td>ICT: Internet</td>
<td>Applying (technology literacy)</td>
</tr>
</tbody>
</table>

### Unit 2: General Objectives

By the end of this unit teachers should be able to:

a) examine the potential of Science, Mathematics and English subjects for contributing to national educational objectives

b) use a technology, pedagogy and content knowledge (TPCK) framework to evaluate technology use in SME lesson planning

c) evaluate technology resources for SME pedagogy and content planning

d) identify appropriate ICT PowerPoint resources for SME curriculum topics

e) identify ICT software resources for SME curriculum topics

f) Search information from internet for SME application

g) evaluate information from the internet

h) develop activities for using presentation software, open software and digital resources to support SME instruction
Introduction (5 Minutes)

- The first step in planning for ICT use in Science and Mathematics and English (SME) is to understand the importance of these subjects in the school curriculum.
- The task in this activity will help us to place Science, Mathematics and English (SME) teaching within the context of the national curriculum and looks at the potential of SME subjects to contribute to the achievement of curriculum outcomes.
- Groups will use the Key resource group discussion templates and information briefs for activity 4 in the resource manual on Science, Mathematics and English to discuss and record ideas on the role of SME subjects in the national curriculum.
- Group will use the laptops and projector to present the group work in plenary.

Specific Objectives

By the end of this topic teachers should be able to:

- Examine the potential of Science, Mathematics and English subjects for contributing to national educational objectives
- Develop a presentation on the significant and contribution of SME subjects for national objectives for socio-economic development

Activity 4: E-Diary Reflection (5 Minutes)
Before the activity participants use e-diaries (in their laptops) to record their feeling about teaching Science, Mathematics and English teaching.

Group Task – Why Science, Mathematics and English? (1 Hour)
Form 3 groups: Group 1 – Science teachers; Group 2 - Mathematics teachers; Group 3 - English teachers

Resources:

Key Resource 1 - Group Discussion Templates
- Resource 1a – Why Science?
- Resource 1b – Why Mathematics?
- Resource 1c – Why English?

Key Resource 2 – Information Resources
National Education Objectives, Secondary Education Objectives, SME Objectives
- Chemistry Syllabus
- Physics Syllabus
- Biology Syllabus
- Mathematics Syllabus
- English Syllabus

Presentation Tools
- Laptops/projector
- PowerPoint presentation OR group discussion template presentations

Task Description

Step 1: Examine the syllabus objectives of Education in Tanzania, Secondary Education and of the Science or Mathematics or English subject area of your group.

Step 2: Use the group discussion template to record the group’s ideas on the following questions:
Step 3: Each group prepare a PowerPoint summary of the groups ideas (2-4 slides)

**Plenary Discussion (20 Minutes)**

- Each group presents PowerPoint of main points from group discussion
- Each of the other groups in turn may point to points of agreement and disagreement.

**Facilitator Summary (5 Minutes)**

- It may be useful to discuss reasons for disagreement.
- Summarize key points form all groups on the importance of Science, Mathematics and English for achieving national education and development objectives

**Activity 4: E-Diary Reflection (5 Minutes)**

At the end of the task participants complete their e-diaries about the activity.
### Introduction (5 Minutes)

- **In this activity we introduce a case study** to show how a teacher uses technology skills that she acquired in teacher development workshops (technology knowledge) to support understanding of new concepts (content knowledge) and strategies for teaching and learning (pedagogical knowledge).

- **One participant can read aloud the classroom case study.**

- This will be followed with group work task to review the teacher’s lesson plan and see how the teacher is applying his technological, pedagogical & content knowledge in practice.

- Groups can use the **group discussion templates** and the **information briefs for activity 5** in the resource manual to carry out the activity task and use the **laptops and projector** to present the group work in plenary.

### Specific Objectives

By the end of this topic the teacher should be able to:

- Use a technology, pedagogy and content knowledge (TPCK) framework to evaluate technology use in SME case study scenarios

- Evaluate technology resources for supporting SME pedagogy and content planning
Activity 5: Introducing Technology in Science, Mathematics and English Teaching

Activity 5: E-Diary Reflection (5 Minutes)

Before the activity participants can use e-diaries (in their laptops) to record their first experiences of introducing technology (old or new) in their professional practice.

Case Study – Planning for technology use in Chemistry

Getrude in Dar-es-Salaam has learned about technology integration (i.e. acquired the technological pedagogical content knowledge - TPCK) in a workshop she is attending for introducing technology in Science, Mathematics and English teaching. She wants to introduce a lesson/topic on electrolysis to her Form II students, with ICT materials that will be used during the teaching and learning process, learning activities and student activities.

In the introduction, Getrude will introduce the basic concept of Electrolysis by posing a question to students regarding the general concept of Electrolysis. The teacher explains the concept of electrolysis through the equations describing the reactions at the electrodes. The electrolysis process is described to students by using a PowerPoint based animation showing the movement of ions between electrodes. Students will observe the presentation and take notes regarding electrolysis.

During the implementation of the lesson, Getrude will ask students to make groups of four students and arrange the apparatus in a similar way as they observed in the animation presented to them. Getrude will then guide the students to follow the procedure of the experiment as demonstrated through animation and observe the outcomes.

One of the group representative will present to other students on how the experiment relates with the animation just presented and explain why and how the two experiments relate to each other.

Getrude will close the lesson by asking the students to make a summary of the experiments in relation to the equations.

Group Task – Looking at TPCK in a Chemistry Lesson (1 Hour)

Form 3 groups:
- Group 1 – Technology & content;
- Group 2 – Technology & pedagogy;
- Group 3 – Technology, pedagogy & content
Resources:

**Key Resource 1 - Group Discussion Templates**
- Resource 1a – Technology & Science Content
- Resource 1b – Technology & Science Pedagogy
- Resource 1c – Technology & Science Content & pedagogy

**Key Resource 2 – Information Resources**
- Chemistry Lesson Plan

**Presentation Tools**
- Laptops/
- Group discussion template presentations

**Task Description**

**Step 1:** Briefly review Gertrude’s Chemistry lesson (Key Resource 2).

**Step 2:** Use the group discussion template to discuss and record the group’s review of the lesson based on the following questions:

**Group 1 – Technology & Content:** In Gertrude’s Chemistry lesson what key concepts was she introducing in her content? What technology did she use to support her content? How did the technology support content & concepts understanding? Could she have used the technology to support her lesson content / concepts in a better way? How?

**Group 2 – Pedagogy & technology:** In Gertrude’s Chemistry lesson what pedagogical approach did she use? What technology did she use to support her pedagogical approach? How did the technology support her pedagogical approach? Could she have used the technology to support her pedagogical approach in a better way? How?

**Group 3: Technology, pedagogy and content:** In Gertrude’s Chemistry lesson what key concepts was she introducing in her content? What pedagogical approach did she use to support her teaching of the content? What technology did she use to support her content and pedagogy? Could she have used the technology to support her lesson content and pedagogical approach in a better way? How?

**Step 3:** Each group prepare a PowerPoint summary or group template discussion summary of the main points from group discussions & ideas (2-4 slides)
Plenary Discussion (20 Minutes)

- Each group presents PowerPoint of main points from group discussion
- As each group completes their presentation the other groups may present questions or additional observations.

Facilitator Summary (5 Minutes)

- The facilitator can close the session with a summary of key points from presentations and discussion on blackboard or laptop & projector.

Activity 5: E-Diary Reflection (5 Minutes)

At the end of the task participants complete their e-diaries about this activity.
**Topic 6: Exploring PowerPoint Presentation Resources for Science, Mathematics and English**

<table>
<thead>
<tr>
<th>Introduction</th>
<th>E-Diary</th>
<th>Group work task</th>
<th>Plenary session</th>
<th>Facilitator summary</th>
<th>E-Diary</th>
<th>Total time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 mins</td>
<td>5 mins</td>
<td>1:20 hrs</td>
<td>20 mins</td>
<td>5 mins</td>
<td>5 mins</td>
<td>2:00 hrs</td>
</tr>
</tbody>
</table>

**Introduction (5 Minutes)**

- As you use your laptops to explore the Internet and the World Wide Web you will soon realize that there are many educational web pages and websites offering different products and services. Gertrude used PowerPoint to introduce her Chemistry topic.
- In the tasks for this activity groups will explore a website with teacher PowerPoint presentation resources for all curriculum areas.
- Each group will identify presentations that are of interest for their topic areas in SME.
- Each group will describe one classroom activity for using the presentation in their subject area.
- Groups can use the **group discussion templates** and the **resource identification templates for activity 6** in the resource manual to carry out the activity task and use the **laptops and projector** to present the group work in plenary.

**Specific Objectives**

By the end of this topic the teacher should be able to:

1. Identify appropriate ICT PowerPoint resources for SME curriculum topics
2. Demonstrate how the PPP can be used to support SME classroom activities
3. Adapt PPP materials for use in SME teaching in local teaching context
Activity 6 – Exploring PowerPoint Presentation Resources for Science, Mathematics and English teaching

Activity 6: E-Diary Reflection (5 Minutes)
Participant use e-diaries (in their laptops) to record their thoughts on how websites might help them experiences in Science, Mathematics or English teaching.

Group Task – Exploring SME PowerPoint Presentation Resources (1 Hour and 20 Minutes)
Form 5 groups:
- Group 1 – Science Chemistry Teachers;
- Group 2 – Science Physics Teachers;
- Group 3 – Science Biology Teachers;
- Group 4 - Mathematics Teachers;
- Group 5 - English Teachers

Key Resource 1 - Group Identification Templates
- Resource 1a – PowerPoint Presentation (PPP) Resources for Chemistry
- Resource 1b – PPP Resources for Physics
- Resource 1c – PPP Resources for Biology
- Resource 1d – PPP Resources for Mathematics
- Resource 1e – PPP Resources for English
- World of Teaching website with SME PowerPoint Resources
  (http://www.worldofteaching.com/photosynthesispowerpoints.html)

Key Resource 2 – Group Discussion Template
- PowerPoint TPCK Game

Presentation Tools
- Laptops/
- Group discussion template presentations
Task Description

Step 1:
- Visit the website the World of Teaching website 
  (http://www.worldofteaching.com/photosynthesispowerpoints.html) with its 
  collection of over a 1,000 PowerPoint presentations submitted by teachers in all 
  subject areas 
- Use the resource information brief on Form 1 SME topics to identify teacher 
  presentation resources on topic themes that can be found on the website 

Step 2:
- Once the group have identified presentation resources for Form 1 topics follow-up 
  with the TPCK Game: 
  - Choose one PowerPoint from the World of Teaching website related to a Form 
    1 topic of interest to the group 
  - Use the group discussion template to describe one classroom activity that 
    can use that technology to support the topic content and pedagogy 

Plenary Discussion (20 Minutes)
- Each group presents group discussion templates on classroom activity using 
  PowerPoint presentation in one of the subject topic areas 
- Groups can use some slides from the presentation they have identified to demonstrate 
  how they will use the resource 

Facilitation Summary (5 Minutes)
- Following presentations the groups can discuss how the PowerPoint presentations 
  identified can be adapted for use in Tanzanian context 

Activity 6: E-Diary Reflection (5 Minutes)
At the end of the task participants complete their e-diaries about this activity.
Introduction (5 Minutes)

- How can we explore the use of instructional software tools in SME teaching and learning?
- The ICT-SME programme will provide content materials online on a teachers’ portal and offline in the forms of CD-ROMs and DVDs.
- In the task for this activity you will visit a website offering free software and web tools for educators online and offline in the form of CD-ROMs. You will test and evaluate their potential for your teaching in Science, Mathematics and English.
- **The case study in this section** shows a teacher using a CD animation in his Biology class to introduce new concepts on genetic processes. He combines new (laptop & projector and CD animation) and traditional (pen and paper) technologies to create a learning experiences that involves students actively in the learning process.
- **One participant can read aloud the classroom case study.**
- The groups can follow this up with the group work task to review the teacher’s lesson plan. Participants will use TPCK codes to see how the teacher is integrating technology to support his pedagogy and content.
- Groups can use the [group work templates](#) and the [information brief for activity 7](#) in the resource manual to carry out the activity task and use the [laptops and projector](#) to present the group work in plenary.

### Specific Objectives

By the end of this unit teachers should be able to:

1. Use a technology, pedagogy and content knowledge (TPCK) framework to evaluate SME lessons
2. Describe how technology can changes the content and pedagogy of SME lessons
Activity 7: Using CD-ROMs in SME Teaching

Activity 7: E-Diary Reflection (5 Minutes)
Before the activity participant can use e-diaries (in their laptops) to record their thoughts on how new technologies (CD-ROMs, DVDs etc.) might help them experiences in Science, Mathematics or English teaching.

Case Study 1 – Planning for technology use in Biology Form IV

Ayoub is a science teacher working in a rural secondary school in the district of Morogoro.

Today he is introducing the topic of ‘DNA coding’ to his form IV which is part of the ‘Genetics’ syllabus in Biology. He introduces his lesson by asking his students questions about chromosomes and DNA and RNA to identify what his students already know and build on their previous knowledge.

He uses his classroom laptop and projector to introduce a CD about Genetics and DNA coding. After watching the CD presentation he encourages his students to work in groups and make maps to explain the process of DNA coding. The student groups use pen and paper to draw their maps. Ayoub allows one group to use a concept-mapping tool on the class laptop to make their map.

Ayoub asks his students to present their pen and paper and digitized maps. As one student makes the map of the process the other students listen and ask questions.

At the end of the lesson Ayoub summarizes the main points on DNA coding and key points raised by his students in their presentations.

Group Task – Coding Lesson Plans for TPCK (1 Hour)
Form 3 groups: Groups can be mixed with teachers of different subjects

Resources:

Key Resource 1 - Group Work Templates

- Resource 1a – Coding the Biology Lesson Plan
- Resource 1b – Does Technology Change the Lesson?

Key Resource 2 – Information Briefs

- Resource 2 – Applying ICT in Science, Mathematics and English teaching

Presentation Tools

- Laptops/
- Group discussion template presentations
Task Description

Step 1: In the Biology lesson the group will use a coding scheme to mark where the teacher is using technology, pedagogy and content knowledge (TPCK) in his lesson planning. Use the following codes:

- T = Technology; P = Pedagogy; C = Content;
- TP = Technology & Pedagogy; TC = Technology & Content; CP = Content & Pedagogy
- TPCK = Technology, Pedagogy, Content Knowledge

Step 2: After coding the lesson plan discuss the following questions:

- Does the teacher’s use of technology change the content that he is delivering? How?
- Does the teacher’s use of technology change his pedagogical approach? How?

Plenary Discussion (20 Minutes)

- Each group presents a group template summary of main points from group discussion on ‘how’ and ‘in what way’ technology can change the content and pedagogy of a teacher’s classroom practice
- As each group completes their presentation the other groups may present questions or additional observations.

Facilitator Summary (5 Minutes)

As facilitator of the TPCK game encourage the groups to

- present their ideas how technology can change practice and the implications this can have for planning and implementing lessons with technology
- Close the session with a summary of key points from presentations and discussion on blackboard or laptop & projector.

Activity 7: E-Diary Reflection (5 Minutes)

At the end of the task participants complete their e-diaries about this activity.
Topic 8: Exploring Software Tools in Science, Mathematics and English Teaching

<table>
<thead>
<tr>
<th>Facilitator orientation</th>
<th>e-Diary</th>
<th>Group work task</th>
<th>Plenary session</th>
<th>Facilitator summary</th>
<th>e-Diary:</th>
<th>Total time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 mins</td>
<td>5 mins</td>
<td>1:20 hrs</td>
<td>20 mins</td>
<td>5 mins</td>
<td>5 mins</td>
<td>2:00 hrs</td>
</tr>
</tbody>
</table>

Introduction (5 Minutes)

- In this activity we will explore a UNESCO CD-ROM of free and open software tools called *Collection of E-Learning Tools – Recommended for Advanced Learners.*

- The CD-ROM is one of a set of e-resources that can be accessed offline on CD-ROMS or online at the UNESCO website at: [http://www.unescobkk.org/education/ict/online-resources/e-library/elibrary-themes/teaching-and-learning/collection-of-e-learning-tools-recommended-for-advanced-learners/](http://www.unescobkk.org/education/ict/online-resources/e-library/elibrary-themes/teaching-and-learning/collection-of-e-learning-tools-recommended-for-advanced-learners/)

- The case study in this section shows a teacher using free open source software from the UNESCO collection. He is introducing a topic on graphs of linear equations with his Form 1 students. The teacher uses ‘Graph’ and ‘Hot Potatoes’ open software applications to demonstrate graphs while engaging his students with questions on the main content of the lesson theme. The teacher then uses a quick multiple choice quiz to check on student knowledge.

- One participant can read the case study aloud.

- In the following task groups will work in pairs to visit the UNESCO website or use the UNESCO CD-ROM. The teams will download, explore and evaluate the potential of the e-Learning tools for teaching in their subject areas.
• Groups can use the **group discussion template** and the **information resources for activity 8** in the resource manual to carry out the activity task and use the **laptops and projector** to present the group work in plenary.

**Specific Objectives**

By the end of this topic the teacher should be able to:

1. Access and retrieve free and open e-resources for SME curriculum topics
2. Develop instructional aids for learners to use the software
3. Demonstrate the use of software to teaching and learning
Activity 8: Exploring Free and Open Software Tools to fit SME goals

Activity 8: E-Diary Reflection (5 Minutes)

Before the activity participants can use e-diaries (in their laptops) to record their thoughts on open and free software.

Case Study – Planning for the use of open source software in a Mathematics Class in Form I

Simon is a Mathematics teacher working in a municipal secondary school in the district of Mtwara.

Today he is introducing the topic of ‘Graph drawing’ to his form I which is part of the ‘Coordinate Geometry’ syllabus in Mathematics. He introduces his lesson by illustrating a graph, x & y axis and coordinates using a ‘graph’ software application on his laptop. While he demonstrates he presents students with questions on each step of the process.

Simon uses his classroom laptop and projector to introduce the main topic themes of plotting co-ordinates using ordered pairs, plotting points on an axis and plotting points on a graph.

Simon asks his students individually to draw graphs and plot points on the axes and co-ordinate points on the graph in their copy books. He moves around the groups to support their graph drawing and plotting of points coordinates.

To check their understanding, Simon organizes the class in groups and presents a quick quiz using “Hot Potatoes’ software to present multiple choice questions of the type: Which points intersect with the y-axis? Point A, B, C or D

Each group consults its members and answers the questions through one group reporter. The group with highest score is the math champions for the day.

Group Task – Exploring Software Tools for use in SME (1 Hour and 20 minutes)

Form pairs or groups according to your subject areas:

- Pairs/ groups of Chemistry teachers
- Pairs/ groups of Physics teachers
- Pairs/ groups of Biology teachers
- Pairs/ groups of Mathematics teachers
- Pairs/ groups of English teachers

Key Resource 1 - Group Discussion Template

- Resource 1 – Exploring and Using Software in SME
Key Resource 2 – Information Resources

- Resource 2a - Mathematics Lesson Plan
- Resource 2b – Mathematics Lesson Plan – Teacher’s Notes

Presentation Tools

- Laptops/projector
- Group discussion template presentations

Task Description

Step 1:

- Visit the UNESCO e-resources website clicking on the hyperlink http://www.unescobkk.org/education/ict/online-resources/e-library/elibrary-themes/teaching-and-learning/collection-of-e-learning-tools-recommended-for-advanced-learners/ OR access the e-resources on the UNESCO CD-ROM
- Scroll down the Collection of e-Learning Tools
- Find the software applications available under your subject area.
- Download one software programme you are interested in onto your laptop.
- Install the downloaded software.

Step 2:

- In pairs explore the downloaded software to see what it can do for your Science, Mathematics or English learners.
- Use the group report template on your laptop to develop a list of instructions for your learners on how to use the software.

Plenary Discussion (20 Minutes)

- Share your learner support report document with all groups.
- Demonstrate the use of the software.
- Describe what you liked and what you didn’t like about the software.
Facilitator Notes

- As each group completes their presentation and demonstrates their software - the other groups may present questions or additional observations about the software.
- Close the session with a summary of key strategies for learner use of the software tools from presentations and discussion on blackboard or laptop & projector.

Activity 8: E-Diary Reflection

At the end of the task participants complete their e-diaries about this activity.
**Topic 9: Exploring the Use of the Internet in SME**

<table>
<thead>
<tr>
<th>Facilitator orientation</th>
<th>e-Diary</th>
<th>Group work task</th>
<th>Plenary session</th>
<th>Facilitator summary</th>
<th>e-Diary</th>
<th>Total time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 mins</td>
<td>5 mins</td>
<td>1:20 hrs</td>
<td>20 mins</td>
<td>5 mins</td>
<td>5 mins</td>
<td>2:00 hrs</td>
</tr>
</tbody>
</table>

**Introduction (5 Minutes)**

- Imagine that you want to explore the possibilities for integrating ICT in your Science, Mathematics and English lessons. What resources can you find on the internet? Will the resources be useful? How can you adapt the resources for your teaching?

- **The case study in this section** shows a teacher using resources from a Physics website to introduce a topic of Simple Electric Circuits with his Form 1I students. The teacher found a circuit construction toolkit simulation on the website. He also found lesson plans, worksheets and lots of materials to support lessons that have been contributed by teachers in the website community. In his lesson the teacher uses the simulation software for classroom demonstration on the laptop. He also arranged for his students to carry out the group activities in the school computer lab where they can access the simulation which had been downloaded from the website.

- **One participant can read the case study aloud. T**

- The groups can follow-up with group tasks for evaluating websites and finding resources that you use in your teaching for demonstration and for group work.

- Groups can use the **group website evaluation templates** and the **information resources for activity 9** in the resource manual to carry out the activity task and use the **laptops and projector** to present the group work in plenary.

**Specific Objectives**

By the end of this topic the teacher should be able to:

1. Review subject area websites
2. Evaluate the use of subject area websites resources
3. Identify website resources for introducing subject area concepts, for group work and home work
Activity 9: Sharing experiences on using the internet and WWW in SME teaching and learning

Activity 9: E-Diary Reflection (5 Minutes)
Before the activity participants can use e-diaries (in their laptops) to record their thoughts on Internet websites and resources.

Case Study – Using Websites Resources in a Physics Class in Form II

Onespho is a Science teacher working in a rural secondary school in the district of Klerruu.

Today he is introducing the topic of ‘voltage and current measurement’ to his form II which is part of the ‘Simple Electric Circuits’ syllabus in Physics.

He introduces the lesson with a demonstration of the circuit construction kit that he found and downloaded from the Physics Education Technology (PHET) project website. He also found lesson plans on the website and he is using some of the ideas for demonstration and group work in his lesson.

In the main body of the lesson, Onespho asks his students questions about ammeter and voltmeter measuring tools that he drags onto the construction kit workspace. He demonstrates measurement with the voltmeter tool and then asks his students to predict voltage measurements in different groups of batteries and record them on a table that he has prepared.

Onsepho then measures the voltages and asks students to compare the measurement against their predictions and describe what they think is happening.

Onespho has arranged for the students to go to the school lab to carry out the group task of the lesson – where students will access the construction kit that has been downloaded and create different circuits for measurement.

Onespho asks students to follow-up on their class work with homework to look for and describe different examples of voltage variation in their local environment.

Group Task – Evaluating Website Resources (1 Hour and 20 Minutes)

Form pairs according to your subject areas:

- Pairs/ groups of Chemistry teachers
- Pairs/ groups of Physics teachers
- Pairs/ groups of Biology teachers
- Pairs/ groups of Mathematics teachers
- Pairs/ groups of English teachers
Resources:

Key Resource 1 - Group Evaluation Template
- Resource 1a – Review of ICT SME Website Resources
- Resource 1b – Evaluation of Reviewed Website for Useful Resources

Key Resource 2 – Information Resources
- Resource 2a – Science, Mathematics and English Websites
- Resource 2b – Teacher’s Lesson Plan Physics
- Resource 2c - Teacher’s Lesson Notes Physics

Presentation Tools
- Laptops/
- Group discussion template presentations

Task Description

Step 1:
- Review the list of websites for your subject area (Resource 2a).
- Visit one or two of the web pages and websites listed.
- For each one use the group review table provided (Resource 1a) to summarize what Science or Mathematics or English resources can be found on the website.

Step 2:
- Review Onespho’s Physics lesson plan and the website teacher’s notes and simulation software that he used to assist him develop the different parts of his lesson plan (Resources 2b and 2c).
- In the group discussion template for evaluating the website resources (Resource 1b) provide your team evaluation on the following questions:
  - How does the team think that you can use the website resources in your subject area for:
    - Teacher demonstration activities
    - Student group work activities
    - Student homework activities
Plenary Discussion (20 Minutes)

- Share team website evaluation document with all teams

Facilitation Summary (5 Minutes)

- As each group completes their presentation the other groups may present questions or additional observations about the websites.
- At the end of the plenary discussion each team should send their website evaluation by email to other teams in their subject area

Activity 9: E-Diary Reflection (5 Minutes)

At the end of the task participants complete their e-diaries about this activity.

Unit Summary

This unit covered the following key areas:

- Examination of the importance Science, Mathematics and English subjects for contributing to national educational objectives
- Use of a technology, pedagogy and content knowledge (TPCK) framework to evaluate technology use in SME lesson planning
- Evaluation of technology resources for SME pedagogy and content planning
- Identification of appropriate ICT PowerPoint resources for SME curriculum topics
- Identification of ICT free software resources for SME curriculum topics
- Search and evaluation of internet resources for SME application
- Development of activity outlines for using presentation software, open software and digital resources to support SME instruction
UNIT 3: Learning Environment – Developing SME Plans & Resources

<table>
<thead>
<tr>
<th>ICT Teacher Competencies</th>
<th>Domain</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers select and demonstrate the use of technology resources that enable students to explore issues and key concepts and processes in SME subject areas.</td>
<td>Curriculum: Learning Environment</td>
<td>Applying (technology literacy)</td>
</tr>
<tr>
<td>Teachers engage students in the acquisition of ICT skills within the context of their SME lessons.</td>
<td>Curriculum: Student Experience</td>
<td>Applying (Technology Literacy)</td>
</tr>
</tbody>
</table>

**Unit 3: General Objectives**

By the end of this unit teachers should be able to:

- Select ICT instruction and assessment pedagogical approaches & resources to introduce and evaluate SME concepts
- Design lesson plans that include teaching on the use of ICT in SME
- Demonstrate the use of ICT in SME lesson plans to peers
Topic 10: Integrating Technology into SME Lessons

<table>
<thead>
<tr>
<th>Introduction</th>
<th>E-Diary</th>
<th>Group work task</th>
<th>Plenary session</th>
<th>Facilitator summary</th>
<th>E-Diary</th>
<th>Total time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 mins</td>
<td>5 mins</td>
<td>1 hr</td>
<td>20 mins</td>
<td>5 mins</td>
<td>5 mins</td>
<td>1:40 hrs</td>
</tr>
</tbody>
</table>

**Introduction (5 Minutes)**

- How can we integrate technology in lesson instruction and assessment? This unit presents an opportunity to explore the use of all of the resources you have collected and identified from the basic skills units in module 1 to the applying skills units in this module 2.
- **In the case study in this section** we meet a teacher selecting and demonstrating the use of technologies that he has identified for exploring in his teaching. The teacher is using an e-dictionary technology resource in an English lesson. He uses the e-dictionary in an interactive demonstration to help his students explore the meaning, pronunciation and use of new words and make sentences that will demonstrate their understanding. The teacher assesses his students’ progress through observation of their group work and the quality of the work that they produce.
- **One participant can read the case study aloud.**
- The groups should follow this up with the group work tasks to reflect on the teacher’s use of technology resources for instruction and the teacher’s follow-up assessment of the learning and of the teaching.
- In the following activities the groups will explore the selection of resources to develop lesson plans that will include procedures for assessment.
- Groups can use the **group discussion templates** and the **information resources for activity 10** in the resource manual to carry out the activity task and use the **laptops and projector** to present the group work in plenary.

**Specific Objectives**

By the end of this topic the teacher should be able to:

1. Critically review the use of technology in subject teaching lesson plan
2. Identify technology tools for supporting learning and assessment in subject teaching
### Activity 10: Integrating Technology into Lesson Instruction & Assessment

#### Activity 10: E-Diary Reflection (5 Minutes)
Before the activity, participants can use e-diaries (in their laptops) to record their thoughts on their students’ needs and how they can use ICTs identified in the workshop to make their subject more accessible for students.

#### Case Study - Integrating Technology in English Teaching
Dickson is teaching his Form I pupils in Secondary School in the rural district of Moduli. He wants to introduce the students to using dictionaries to find the meanings of words. He decides to use an online dictionary resource using the laptop and projector to introduce the use of the dictionary to his students and explore with them the different levels of explanation that a dictionary can provide (See **Resource 1: English Lesson Plan for Using a Dictionary**).

In his introduction he brainstorms with where students how they can find the meaning of difficult words. He reminds his students of words that they have been listening to in an earlier lesson where they talked about the story of the school graduation. He uses the laptop and projector to demonstrate how to find the definition of 3-4 difficult words from the story on the free online **WordSmyth** educational dictionary. He asks his students individually and in groups to read the explanations in the dictionary, to spell the words, to listen to the pronunciation and then pronounce the words and to identify the class of the word (noun, verb).

Dickson organizes his students in groups to use dictionaries to obtain the meaning of more words on the theme, to brainstorm new words and make sentences (See **Resource 2: Worksheet for using the dictionary**).

At the end of the lesson the students present the new words and the sentences. Dickson assesses the performance of his students by observing their co-operation in group work and by evaluating the words and sentences that the groups have defined, classified and produced.

In his reflection after the class Dickson wrote in his e-diary:

"The e-dictionary helped me a lot especially with my students understanding and pronunciation of word meanings because it includes many interactive activities. So using the e-dictionary helps my students in a different and useful way".
Group Task – Review Technology Use in Instruction & Assessment (1 Hour)

Form 3 groups: Groups can be mixed

Resources:

Key Resource 1 - Group Discussion Template
- Resource 1 – TPCK Review of English Lesson

Key Resource 2 – Information Resources
- Resource 2a – Teacher’s Lesson Plan English
- Resource 2c - Student’s Worksheet English

Presentation Tools
- Laptops/
- Group discussion template presentations

Task description:

Step 1: Examine Dickson’s English lesson. Use the group resource template to discuss and record the group’s review of the lesson based on the following questions:
- How did Dickson’s use of the e-dictionary support student understanding (content) and inter-active activities (pedagogy)?
- Could he have used the technology to support his lesson content and pedagogical approach in a better way? How?
- What evidence can Dickson show that his students are learning in a “different and useful” way?

Step 2: Each group prepare a template summary of the main points from group discussions & ideas

Plenary Discussion (20 Minutes)
- Each group presents template summary of main points from group discussion

Facilitator Summary (5 Minutes)
- As each group completes their presentation the other groups may present questions or additional observations on the key issues of:
  - technology use
- assessment of student learning and
- Teacher’s assessment of his/her practice.

- The facilitator can close the session with a summary of key points from presentations and discussion on blackboard or laptop & projector.

**Activity 10: E-Diary Reflection (5 Minutes)**

At the end of the task, participants complete their e-diaries about this activity.
Topic 11: Your Turn - Lesson Planning Notes for ICT Integration in SME

<table>
<thead>
<tr>
<th>Facilitator orientation</th>
<th>E-Diary</th>
<th>Group note planning task</th>
<th>Group sharing planning</th>
<th>Plenary discussion</th>
<th>Facilitator summary</th>
<th>E-Diary: Total time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 mins</td>
<td>5 mins</td>
<td>40 mins</td>
<td>40 mins</td>
<td>20 mins</td>
<td>5 mins</td>
<td>5 mins</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2:00 hrs</td>
</tr>
</tbody>
</table>

Introduction (5 Minutes)

- This activity will guide you through the planning and production of lesson plan notes where you will integrate the use of technology resources as part of your plan. In this activity you will decide for which Form (Form I or Form II) grade and which topic in Science, Mathematics or English you would like to develop your lesson.
- In subject teams you will prepare notes for their lesson plans in which they will identify topics, student competencies, learning objectives, resources for activities.
- As teams you may like to look back at some of the resources you have identified and evaluated in the previous units – the PowerPoint presentations, the software tools, the websites and learning materials. You may have found a website, a tool, a learning resource related to a topic that they would like to use and develop into a lesson plan topics.
- Teams will share and evaluate their lesson notes with other teams and present their evaluation to the whole group in the plenary session.
- Teams can use the lesson plan notes templates for activity 11 in the resource manual and the information resources of science, mathematics and English syllabuses to carry out the activity task and use the laptops and projector to present the group work in plenary.

Specific Objectives

By the end of this topic the teacher should be able to:

1. Prepare notes for their lesson plans in which they identify topics, student competencies, learning objectives for activities.
2. Write a brief summary of each of the activities that teachers and learners will do in order to achieve the lesson outcomes.
3. Identify technology resources (PowerPoint presentations, software tools, websites and learning materials) to use and develop into their lesson plan topics
4. Critically evaluate the lesson notes of peer groups
Activity 11: Now Your Turn – Let’s Develop Lesson Plan Notes

Activity 11: E-Diary Reflection (5 Minutes)
Before the activity participants can use e-diaries (in their laptops) to record their thoughts on ICT resources they may wish to use in their lesson plan topics.

Group Task – Lesson Plan Notes (40 Minutes)
Form pairs according to your subject areas:
- Pairs/ groups of Chemistry teachers
- Pairs/ groups of Physics teachers
- Pairs/ groups of Biology teachers
- Pairs/ groups of Mathematics teachers
- Pairs/ groups of English teachers

Resources:
Key Resource 1 – Lesson Planning Notes Templates
- Resource 1a – Example Lesson Planning Notes
- Resource 1b – Lesson Planning Notes Chemistry
- Resource 1c – Lesson Planning Notes Physics
- Resource 1d – Lesson Planning Notes Biology
- Resource 1e – Lesson Planning Notes Mathematics
- Resource 1f – Lesson Planning Notes English

Key Resource 2 – Information Resources
- Resource 2 – Syllabuses for Chemistry, Physics, Biology, Mathematics and English

Presentation Tools
- Subject areas teams share notes with each other teams in their subject area

Task Description
Step 1: In your teams look at your subject area syllabus for Form 1 or for Form II.
Step 2: Choose the topic and sub-topic. Think about the resources and kinds of activities you might use to develop your learners in this topic.
**Step 3:** Use the lesson plan notes template *(Key Resource 1)* for your team subject area to record your planning notes. Identify one or two student (assessment) competencies that you think can be achieved during a learning experience on this topic.

**Step 4:** Write some learning outcomes that will be achieved through the lesson. Start each learning objective with the phrase:

   By the end of the lesson learners should be able to...

**Step 5:** Identify all the "products/ artifacts" that learners will have as evidence of their competencies by the end of the lesson. Note these down with the title ‘Assessment Evidence’.

**Step 6:** Write a brief summary of each of the activities that teachers and learners will do in order to achieve the lesson outcomes.

**Step 7:** List all the resources you will need for each activity.

**Step 8:** Note down how long you think each activity will take.

**Step 7:** When you have prepared your document, **share the planning document with another team in your subject area.**

**Group Sharing (40 Minutes)**
- Each team share their planning notes with another team in their subject area
- Each team should evaluate the planning notes of the other using the following criteria:
  - What they teams like about the planning notes of the other team
  - Suggestions for improvement

**Plenary (20 Minutes)**
- Teams present their evaluation of the lesson note planning
- Team discuss suggestions for improvement of the planning notes

**Facilitation Summary (5 Minutes)**
- Facilitator summarize main points from group discussion on improvement of lesson plans

**Activity 11: E-Diary Reflection (5 Minutes)**
At the end of the task participants complete their e-diaries about this activity.
### Topic 12: Your Turn - Lesson Plans for ICT Integration in SME

<table>
<thead>
<tr>
<th>Introduction</th>
<th>E-Diary</th>
<th>Group lesson planning task</th>
<th>Group resource preparation task</th>
<th>Group sharing of plans</th>
<th>Plenary</th>
<th>Facilitator summary</th>
<th>E-Diary:</th>
<th>Total time</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 mins</td>
<td>5 mins</td>
<td>1 hr</td>
<td>1 hr</td>
<td>40 mins</td>
<td>20 mins</td>
<td>5 mins</td>
<td>5 mins</td>
<td>3:20 hrs</td>
</tr>
</tbody>
</table>

**Introduction (5 Minutes)**

- In this activity participants will be guided through the planning and production of the lesson plan where you will use your notes to develop your plans.
- In your teams you will also organize one technology resource to integrate into lesson plans.
- You will share their lesson plans and resources with other teams for review
- Teams can use the **lesson plan templates for activity 12** in the resource manual and the **information resources of science, mathematics and English syllabuses** to carry out the activity task and use the **laptops and projector** to present the group work in plenary.

**Specific Objectives**

By the end of this topic the teacher should be able to:

1. Development of lesson plans that integrate technology resources
2. Develop one technology resource for us in the lesson implementation
3. Critically evaluate the lesson plans and technology resources of peer groups
Activity 12: E-Diary Reflection (5 Minutes)
Before the activity participants can use e-diaries (in their laptops) to record their thoughts on planning a lesson for ICT integration.

Group Task – Lesson Plans and Resources (2 hours)
Form pairs according to your subject areas:

- Pairs/ groups of Chemistry teachers
- Pairs/ groups of Physics teachers
- Pairs/ groups of Biology teachers
- Pairs/ groups of Mathematics teachers
- Pairs/ groups of English teachers

Resources:

Key Resource 1 – Lesson Plan Templates

- Resource 1a – Lesson Plan ICT & Chemistry
- Resource 1b – Lesson Plan ICT & Physics
- Resource 1c – Lesson Plan ICT & Biology
- Resource 1d – Lesson Plan ICT & Mathematics
- Resource 1e – Lesson Plan ICT & English
- Resource 1f – Lesson Plan – Blank Template

Key Resource 2 – Information Resources

- Resource 2 – Syllabuses for Chemistry, Physics, Biology, Mathematics and English

Presentation Tools

- Teams share plans with each other teams in their subject area
Part 1: Producing Lesson Plans (1 Hour)

Task Description

Step 1: In your teams use your notes from activity 10 to develop a lesson plan following the lesson planning template (Key Resource 1)

Step 2: Go through your planned objectives, activities, resources, time frame one by one. Add each component to your lesson plan template.

Step 3: Follow the logic of the lesson plan template guidelines for:

- **Introduction** – review of concepts/ demonstration of software/ instructions/active involvement of students from the start
- **Activities** – guiding and monitoring the students/ preparing activity sheets/ adapting the lesson to the students level
- **Conclusion** – student demonstration of learning / teacher consolidation of lesson
- **Assessment** – pen and paper/ text book/ student follow-up with homework

Part 2: Producing ICT Resources for the Lesson (1 Hour)

In this task you will make one of your lesson resources using an ICT programme. You should be drawing on all the knowledge, skills, and ideas you have developed through the basic skills module and this module to create and identify resources for your subject area. You may choose to use a word processor, a spreadsheet, a presentation software, or open software programme.

Notes on producing the resources:

- You do not need to develop all the resources for your lesson plan. Some may be available on the Internet or some may be on CD-ROMs.
- A worksheet or any other resource can also be read by students from the class laptop and projector or used directly by your learners on a computer screen in the computer lab.

Task Description:

Step 1: Check on the resources you need in your lesson plan (ICT-resources, worksheets, models, equipment and tools for practical tasks, etc.).

Step 2: Identify a resource you will need to develop using an ICT programme – wordprocessor, spreadsheet, PowerPoint Presentation, software toolkit.
Step 3: Develop the ICT resource(s) and indicate where the resources will be used in the lesson plan.

Group Sharing (1 Hour)
- Each team shares their lesson plans with another team in their subject area
- Each team should evaluate the lesson plans of the other using the following criteria:
  - What the teams like about the lesson plans and resources
  - Suggestions for improvement

Plenary (20 Minutes)
- Teams present their evaluation of the lesson plans and resources
- Team discuss suggestions for improvement of the lesson plans

Facilitation Summary (5 Minutes)
- Facilitator summarize main points from group discussion on improvement of lesson plans

Activity 12: E-Diary Reflection (5 Minutes)
After the task participants complete their e-diaries about this activity.
**Introduction (5 Minutes)**

In this final stage of the workshop we will focus on the following three activities:

- Review of the lesson plans developed
- Lesson simulations
- Development of new lesson plan sets for each zone based on lessons learned throughout the workshop

Groups can use the TPACK lesson plan review and lesson observation templates for activity 13 in the resource manual and the information resources of Science, Mathematics and English (SME) lesson plans produced in Activity 12 and SME syllabuses to carry out the tasks in this last section of the workshop.

As these are the final activities in the workshop the facilitator can be flexible and prioritize the activities that require most attention with the time that is available.

**Specific Objectives**

By the end of this topic the teacher should be able to:

1. Demonstrate micro-teaching of lesson plans that integrate technology resources
2. Use lesson reflection template to review own lesson implementation and practice
3. Use TPCK observation tools to review the micro-teaching lessons of peers
Activity 13: E-Diary Reflection (5 Minutes)
Before the activity participants can use e-diaries (in their laptops) to record their thoughts on planning using their plans.

Group Task 1 – Lesson Review (1 Hour)
Form 4 groups: Groups can be mixed
Resources:
Key Resource 1 – Lesson Plan Review Template
  • Resource 1a – Review of 2 lesson plans in different subject areas

Key Resource 2 – Lesson Plan Resources Produced in Activity 12
  • Resource 2 – 2 Lesson Plans per group (there is no need to review all lesson plans)

Task Description:
  Step 1: Use the group and TPACK review templates to review 2 lesson plans from the group of lesson plans developed in the previous session for Chemistry, Physics, Biology, Mathematics or English
  Step 2: Assess which lesson contains a better balance of technology, pedagogy and content knowledge (TPCK). Discuss and record your assessment.
  Step 3: Suggest improvements required in each lesson to make a better balance between TPACK components based on the following questions:
    o If your team were writing the lesson what TPACK components would have been of greater priority to your team, compared to the components prioritized in the lesson and why?
    o If your team were to redesign the lesson, what would it look like?

Plenary Discussion (20 Mins)
  • Each group presents their review
Facilitator Summary (5 Minutes)
- As each group presents their review of lesson plans the other groups may present questions or additional observations
- The facilitator can close the session with a summary of key points from each review for how to improve and redesign lessons to balance technology use for supporting SME pedagogy and content

Group Task 2 – Lesson Simulations (2 Hours)
Form 3 groups: Science, Mathematics and English

Resources:
Key Resource 1 – Lesson Review Templates
- Resource 1b – TPCK Observation Checklist
- Resource 1c – Teacher Reflection Template
- Resource 1d – TPCK Self-Assessment Tool

Key Resource 2 – Lesson Resources produced in Activity 12
- Resource 2 – Subject Lesson Plans

Task Description
Step 1: Divide participants into subject groups to carry out simulations of Science, Mathematics and English lesson plans in different classrooms
Step 2: In each classroom using lesson plans and teaching materials you have just developed in the previous sessions, conduct a 20 minutes microteaching of 3-5 lessons
Step 3: Use the materials you have prepared to present the lesson in a manner similar to actual classroom teaching
Step 4: Other members in the group will play two roles:
  - the first role is observers (collecting data) and
  - The second role as students to whom the lesson is presented.

Note:
- A TPCK observation checklist (adopted from Kafyulilo 2011) can be used by the teachers observing the lesson
- The teachers who present the lesson can use the teacher reflection template to review their lesson presentation
The teachers can use a teacher self-assessment tool to gauge where they are in relation to their TPCK competencies in applying technology, pedagogy and content knowledge in their teaching.

**Plenary Discussion (20 Mins)**
- Discussion of the lesson based on the data collected through the observation checklist and/or teacher reflection template
- Discussions should focus on what worked and what suggestions teachers have for continuing to improve their use of technology to support pedagogy and content in their subject areas

**Facilitator Summary (5 Minutes)**
- The facilitator can close the session with a summary of discussions for improving the use of technology to support pedagogy and content in SME teaching

**Group Task 3 – Development of Lesson Plan Set for SME (2 - 3 Hours)**

**Form pairs according to your subject areas:**
- Pairs/ groups of Chemistry teachers
- Pairs/ groups of Physics teachers
- Pairs/ groups of Biology teachers
- Pairs/ groups of Mathematics teachers
- Pairs/ groups of English teachers

**Resources:**
**Key Resource 1 – Lesson Plan Templates**
- Resource 1f – Lesson Plan – Blank Template

**Key Resource 2 – Information Resources**
- Resource 2 – Syllabuses for Chemistry, Physics, Biology, Mathematics and English

**Task Description**

**Step 1:** In your teams choose 3 -5 topics from your subject area syllabuses (Key Resource 2) that you will be teaching in Forms 1 and/ or II in the next six months.
Step 2: Use the lesson planning template (Key Resource 1) to develop lesson plans in your subject area for the 3-5 topics that you have selected. Each team should aim to leave the workshop with a set of 3-5 lesson plans for implementation in their subject area.

Step 3: The lesson plans should be developed using subject e-content resources identified in the workshop and e-content resources that are being made available on project CD-ROMs and the project teachers’ portal.

Step 4: Teams should develop the lesson plans taking into account the lessons learned during the workshop lesson review, simulations, observations and reflections.

Plenary Presentation (20 Mins)
- Each team should present an overview of their 3-5 lesson plan set
- Each team should explain briefly what topics they have chosen and what technology resources they will use to support the content and pedagogy in the topics.

Facilitator Summary (5 Minutes)
- As each team present their lesson plan set overview, the other groups may present ideas and recommendations on how to apply the ICT in their lesson topics
- The facilitator can close the session with a summary of key points discussed for applying ICT in SME teaching and learning

Activity 13: E-Diary Reflection (5 Minutes)
- Participants complete their e-diaries about this activity.

Unit Summary
This unit covered the following key areas:
- Selection of ICT instruction and assessment pedagogical approaches & resources to introduce and evaluate SME concepts
- Design and development of lesson plan sets for implementation in the zones
- Demonstration of the use of ICT in SME lesson plans to peers
Module References

Here is a list of the key references linked to the units, topics and activities in this module:

New Syllabuses


New Pedagogy


Open and Free Software

UNESCO Collection of E-Resources

- Directory of ICT Resources for Mathematics, Science and English Teachers;
- E-Learning Tools for Advanced Learners;
- Web Tools for Educators;
- Free Software for Educators;
- Multimedia Resources;

Subject Specific References:

ICT
http://www.livestrong.com/article/67317-definition-effective-communication-skills/#ixzz1cYVeZXBZ
http://en.wikipedia.org/wiki/Information
http://www.saasta.ac.za/links/teachers.shtml

CHEMISTRY
http://www.worldofteaching.com/chemistrypowerpoints.html
http://www.uwplatt.edu/chemep/chem/chemscape/labdocs/catofp/bunsbur/bunsbur2.htm

PHYSICS
http://www.worldofteaching.com/physicspowerpoints.html
http://phet.colorado.edu/en/simulation/circuit-construction-kit-ac#software-requirements
http://phet.colorado.edu/en/simulations/category/new
http://physics.bu.edu

BIOLOGY
http://www.worldofteaching.com/biologypowerpoints.html

MATHEMATICS
http://www.worldofteaching.com/mathematicspowerpoints.html
http://www.padowan.dk/graph
http://mathforum.org/
http://www.sun.ac.za/mathed/MALATI/
http://www.mathsnet.net
http://www.comap.com
http://www.shodor.org/interactivate/tools/
http://www.mathsisfun.com/link_to_maths_is_fun.html
http://www.tsm-resources.com/mlink.html
http://www.linkslearning.org/Kids/1_Math/1_Introduction/index.html
http://www.pisa.gc.ca/eng/math.shtml

ENGLISH

http://www.worldofteaching.com/englishpowerpoints.html
http://www.pisa.gc.ca/eng/science.shtml
http://www.bbc.co.uk/worldservice/learningenglish/
http://english-lesson-plan.com/
http://www.englishclub.com/listening/index.htm
http://www.linkslearning.org/Kids/2_Reading/1_Introduction/index.html
http://www.teachit.co.uk/
http://www.usingenglish.com/handouts/
http://www.webenglishteacher.com/grammar.html
http://www.pisa.gc.ca/eng/reading.shtml
http://www.wartoft.nu/software/selingua