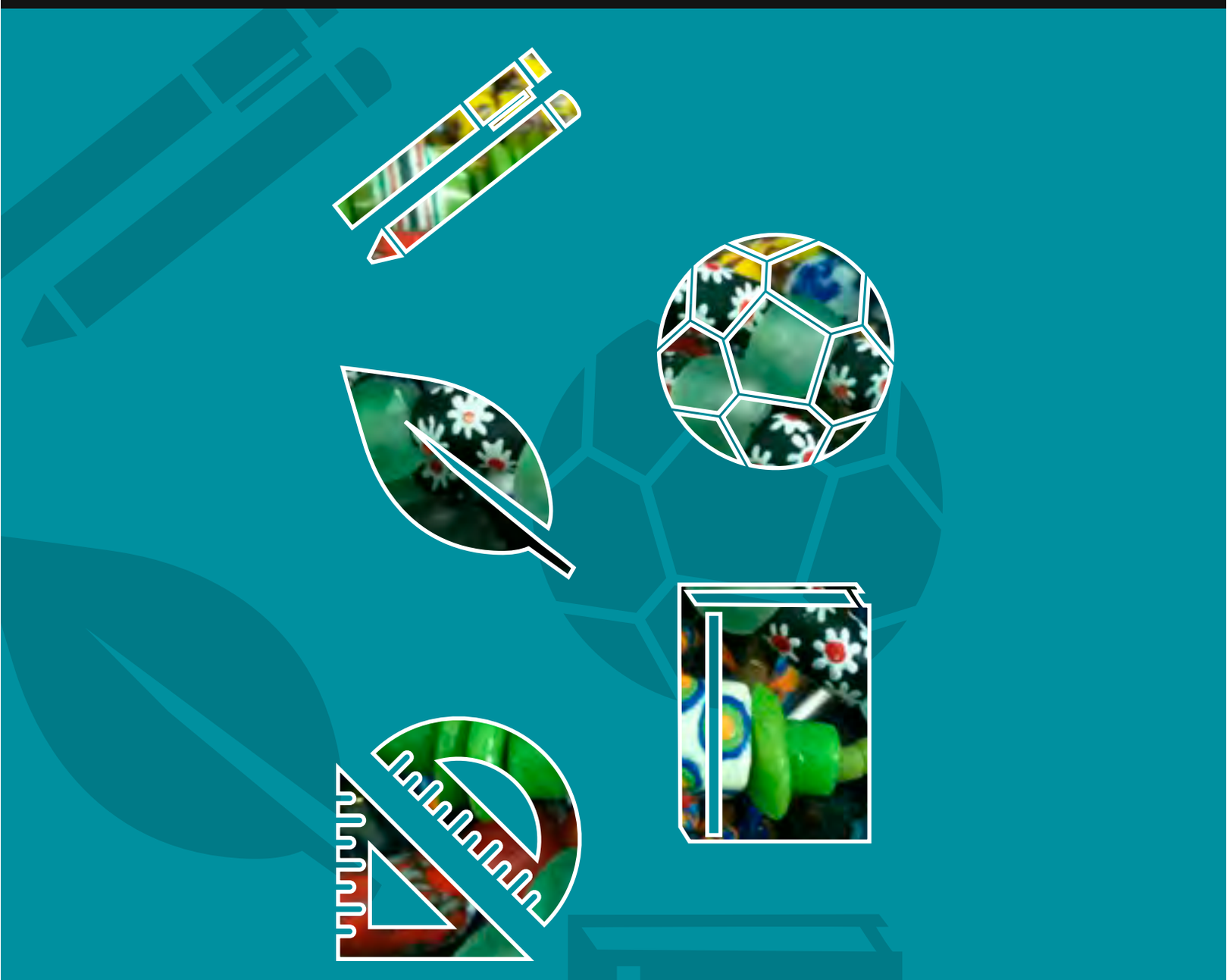
PROFESSIONAL DEVELOPMENT PROGRAMME

THEME 5

Teaching and Learning Materials

PROFESSIONAL DEVELOPMENT GUIDE FOR **TUTORS**



Transforming Teacher Education and Learning

Teaching and Learning Materials

PROFESSIONAL DEVELOPMENT GUIDE FOR **TUTORS**

Transforming Teacher Education and Learning

T-TEL Professional Development Programme

Theme 5: Teaching and Learning Materials
Professional Development Guide for Tutors

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About These Resources

Welcome to the *Transforming Teacher Education and Learning* Professional Development Guide for Tutors.

Transforming Teacher Education and Learning (T-TEL) is a Government of Ghana programme seeking to improve learning outcomes for tutors in Colleges of Education, (student) teachers, and above all for pupils in school. To that end, we are creating a set of professional development resources for use by you, the tutor, to enhance college-based and school-based teacher education.

The present set of resources is organised into twelve themes focusing on pedagogy and effective college classroom practice, such as creative approaches, questioning, group work, Assessment for Learning, Leadership for Learning, enquiry-based learning, gender, inclusion, and many more (see table below). The themes have been chosen because of their relevance to improving learning outcomes through the use of active pedagogies. In each of the twelve themes there are a number of different teaching strategies (or teaching approaches). For instance, the teaching strategies in the present Theme 5 "Teaching and Learning Materials" include using low-cost materials, using books, and using the outdoors and the environment.

Figure 1. A sign welcoming tutors and student teachers to the TLM room.

The materials are designed so that they can be used with peer facilitation. In the T-TEL model, the tutor professional development programme is facilitated by professional development coordinators (PDCs). In addition to the PD Guide for Tutors, a Handbook for Professional Development Coordinators is available.

Theme number	Theme
1	Creative Approaches
2	Questioning
3	Talk for Learning
4	Group work
5	**Teaching and Learning Materials**
6	Leadership for Learning
7	Assessment for Learning
8	Gender and inclusion
9	Project work and investigation
10	Teaching reading, writing, and numeracy across the curriculum
11	Using digital and mobile technology for effective teaching and learning
12	The tutor as a researcher

Figure 2. The themes covered in the professional development programme.

Key Elements of the Tutor Professional Development Programme

The tutor professional development programme is designed as a contemporary programme, heeding the insights of many decades of tutor (and teacher) professional development. The following table contrasts some of these approaches.

Previous approaches	Contemporary approaches
Training focuses on content.	Participants' own sense-making of existing knowledge, as well as adapting knowledge to their own setting.
Tutors are "improved" through short-term training.	Tutors are seen as capable professionals, and are offered longer-term professional development opportunities.
Tutors are trained in subject groups.	Tutors undertake professional development together as a "community of practice".
Training separates content from teaching methods.	Professional development integrates content and teaching methods.

Training is delivered through lectures.	Professional development is participatory, with everybody playing an active role.
Training focuses on theoretical aspects of education, presented in generic ways.	Professional development values the practical exploration of new ideas in the classroom and within specific cultural contexts.

The above ideas about contemporary professional development are embodied in our materials. Each of the teaching strategies within this theme is explored through a shared professional development session. The materials support this session through the following sections (for each teaching strategy):

- an introduction to the teaching strategy as pre-reading for the session;
- a detailed professional development session outline, with many group activities;
- a section with teaching ideas, for you to use during the "Plan and Practise Together" part of the session; and
- activity plan templates (at the end of the book).

The Plan - Teach - Reflect cycle

The practical exploration of ideas is embodied in the Plan-Teach-Reflect cycle. As you read the introduction, and do the shared activities in the PD session, look out for **examples** that illustrate the teaching strategy at hand. In the **Plan and Practise Together** section, you then plan your own activity using the strategy (e.g. planning the use of modelling in mathematics, or planning the use of role-play to illustrate an idea in science). You then try out your activity (by **teaching** it to your students). After your teaching (individually or with a college) and at the next PD sessions you then have the opportunity to **reflect**, prompting you to think about your own experience of teaching. For example: *Did the song achieve the intended learning outcomes? Did everybody (including female and male* students*) participate in the activity? What can I do to involve learners with special needs?*

The Plan-Teach-Reflect cycle is indicated by these symbols:

You should note that the **Teach and Observe** section as well as notes and tasks for reflection are presented within the PD session outline. The shared reflection takes place at the start of the next session, and you should refer back to your own notes. The reflection should bring up some interesting and perhaps even surprising issues. However, do not be despondent if the reflection does not always go well: continue with it. Being a reflective practitioner takes time to develop, and this will all fall into place eventually.

The Activity Plan

There are activity plan templates at the end of the book, that are intended to be cut out. Perhaps some participants do not not want to "spoil" their books, by writing in them. However, your own additions are important, and part of your learning journey. They are more important than what is written in the books, so just cut out the plans, and use them. Remember also that the activity plan has a section for post-lesson observation. Please fill this in, and use it during the reflection.

The activity plan does not replace your overall lesson plan (or your own lesson notes). Rather, it is incorporated as part of a larger lesson plan. You could see the activity plan as a spotlight on a particular aspect of your lesson, related to the teaching strategy that you are exploring.

Figure 3. Student teachers are learning.

The Benefits of Interactive Teaching

While you should be able to develop activities right within the session, we do acknowledge that creating new activities can take time, and can be challenging. However, there are benefits. Some of the tutors have expressed the benefits as follows:

- *"Incorporating interactive activities means that I do not have to stand and lecture for two hours. Now the students actively do work, and I as the tutor have more variety during the lesson: rather than lecturing, I can engage with groups, and support students better."*
- *"Students are more engaged and will enjoy the class more. This also makes the class more enjoyable for me."*
- *"Students actually learn better when they are engaged, and even do better in their exams. We have actually seen improved exam scores!"*

You might also recall that the 2014 DBE curriculum states that *"Teaching strategies, which give priority to problem-solving, decision making, critical and reflective thinking will be adopted"* and that *"In very few cases, the lecture method or unilateral interaction approach will be adopted"*. Lecturing is simply *not* the recommended (or even most effective) way to educate student teachers, to get through the course outline or help students prepare for exams. There are many tutors who have used the TPD strategies to get through their course outline in the same amount of time. Students enjoy being taught with the new teaching strategies, and remember the content more thoroughly. Many student teachers have also said that they prepare for lessons better. They know they may be asked a question in the lesson, so it is better to be prepared, and dozing during the lesson is not an option. Many tutors have also been very creative to implement teaching strategies in challenging circumstances, such as large class sizes or inadequate resources. They were surprised by the positive results.

The Curriculum and the TPD Programme

The TPD materials (such as the PD Guide for Tutors) addresses the **methods** through which the DBE curriculum is to be taught, presenting these methods in the context of curriculum content. Because of the focus on methods, the materials do not cover the DBE curriculum content (course by course). The methods presented are teaching methods for the tutor (in all teaching), and the TPD materials should be seen as an implementation guide to the curriculum.

While these methods model teaching methods that student teachers should adopt in schools, student teachers are currently not assessed on these exact methods. At present, the methods are tools that tutors can use to deliver DBE curriculum content in an engaging and effective way. However, you should also note that the DBE curriculum is under revision, and the emphasis on tutors using interactive methods is likely to increase further. Moreover, the new curriculum is very likely to focus on student teachers understanding and implementing interactive methods, as well as being assessed on those methods.

Figure 4. A tutor engaged in teaching.

Lesson Notes and Schemes of Work

As we have just noted, the TPD materials do not cover the entire DBE curriculum content lesson by lesson. In fact, the present materials cannot possibly do this: There are many hours taught every week, compared to one PD session of 90 minutes in each week. As the new curriculum is developed, new schemes of work (and corresponding lesson notes) will need to be developed, that can provide much more detail about how to apply specific teaching strategies to particular lessons.

However, this does not render the TPD programme obsolete. While having more interactive schemes of work and lesson notes will be beneficial, and will support tutors in teaching more interactively, you will always have to tailor the activities to your particular students, from year to year. Developing your own skills in interactive teaching (and devising activities accordingly) is essential to being an effective tutor.

Your Learning Journey and the Learning Journal

The TPD programme is a learning journey for all tutors, and we hope that it is an interesting and exciting one. The learning journal is an important tool for you to chart this journey, and all participants are encouraged to keep one. It is very easy to overlook your own progress. Through your own notes, you can look back to earlier sessions and classroom teaching, to see how your thinking and practice have developed. You will be surprised by your own progress.

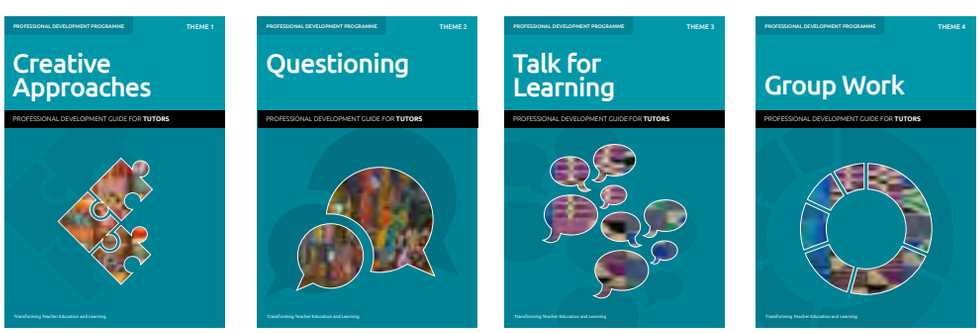
Figure 5. A tutor engaged in teaching

The T-TEL Resources and Their Uses

Our resources are available in a range for formats. For example, each theme in the TPD programme is available in print for all tutors. However, all materials are also available online on the T-TEL website in various formats (such as ePub, Word, PDF, see oer.t-tel.org) alongside supporting information. This section provides an overview of some available materials.

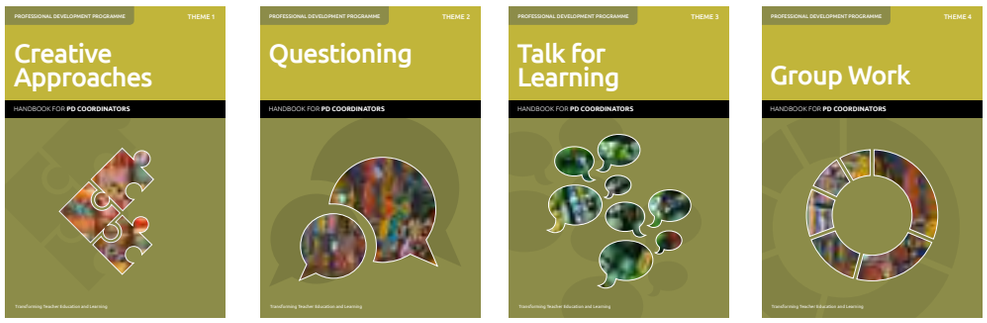
The PD Guide for Tutors

The PD Guide for Tutors are materials for tutors in Colleges of Education, to explore interactive approaches to subject teaching.



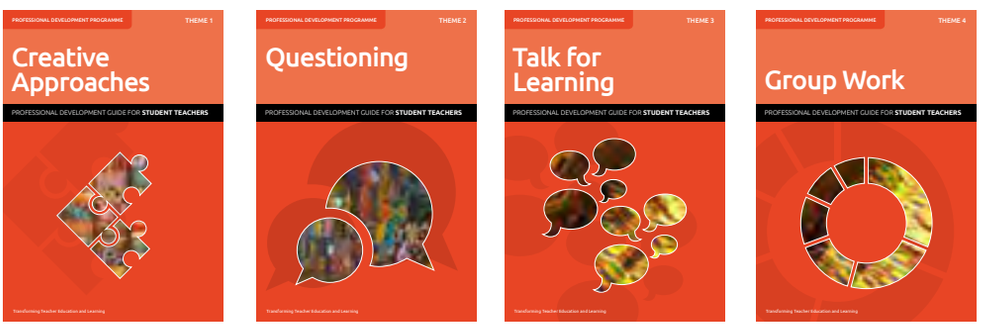
The Handbook for PDCs

The PD Guide for Tutors is accompanied by the Handbook for PDCs, which provides further details on running professional development sessions.



The Student Teacher Versions, Methodology Lessons, and Teaching Practice

In addition to the PD Guide for Tutors, there is a student teacher version available: The PD Guide for Student Teachers.



The PD Guide for Student Teachers follows the PD Guide for Tutors very closely. However, while the PD Guide for Tutors is aimed at tutors teaching student teachers in college, the PD Guide for Student Teachers is aimed at student teachers teaching pupils in school (primary or JHS). The PD Guide for Student Teachers may be of interest to methodology tutors, and could easily be used as a textbook for practice-oriented methodology lessons. You may want to make student teachers aware that these versions are available digitally.

	Participants in professional development sessions	Focus	Professional development sessions led by
PD Guide for Tutors	Tutors	Teaching at college (in particular subject teaching)	PDCs
PD Guide for Student Teachers	Student Teachers	Teaching in primary or JHS	Tutors, school-based mentors, other teachers (peer facilitation)
Teaching Practice Materials	Student Teachers	Teaching Practice in college (Years 1-3)	Tutors and mentors

Figure 6. Overview of materials relating to tutor professional development, student teacher education, and teaching practice.

Also note that a separate series of books is available focusing on teaching practice. They focus on similar pedagogical approaches, but approach these in the setting of the teaching practice within colleges.

The Student Teacher Versions and Local Teachers

The PD Guide for Student Teachers could also be used for self-study by (groups of) in-service teachers. Research shows that such extended professional development programmes are an effective means of achieving improved learning outcomes, and we encourage you to review the additional materials available, detailing the elements of the professional development programme itself. If you happen to be reading these materials as a teacher, already working in a school, we hope that you will find these materials useful. We do use the terms 'student teacher' and 'teacher' interchangeably - please simply substitute 'teacher' for 'student teacher' - and the materials should make sense to you.

If no college-wide or school-wide programme is available to you, we recommend that, at the very least, you work together with other (student) teachers in self-organised study groups. There is good evidence for the

importance of learning together in 'communities of practice', and you will be able to gain the most from the materials in that way.

Figure 7. Student teachers learning with a Geoboard

Using and Re-Using T-TEL Resources

All T-TEL resources are Open Educational Resources (OER), available under a Creative Commons Attribution Share-Alike licence. This means that you are free to use and adapt them as long as you attribute T-TEL and retain the same licence. In fact, we have used that same process to develop these materials from other OER that are available, such as the OER4Schools programme (www.oer4schools.org), the TESSA Ghana materials (www.tessafrica.net), and even materials originally developed for India (www.tess-india.edu.in).

One of the most important aspects of using Open Educational Resources is that you, the tutor, have full ownership of the materials. With a traditional textbook, you cannot easily change the book for use in a new college year, because you do not have permission, and you do not have access to an editable version. With Open Educational Resources, you have both the permission, as well as access to editable files. If there is something you wish to change, to improve, to adapt: You are welcome, and empowered to do so.

Introduction to Theme 5
Teaching and Learning Materials

Teaching and Learning Materials (TLMs) refer to any kind of materials used in your teaching, including chalk, blackboard, paper, pens, books, bottle tops, everyday objects, technology of any kind, and much, much more — even the natural or built-up environment, as well as our own body.

There are some closely related terms that draw out different aspects. For example, the term "learning aid" is very similar to a TLM. The term resource-based learning is sometimes used for learning with TLMs. "Manipulatives" refer to TLMs that can be handled or made by students, such as plastic bottles, beads, sticks, and objects made by folding paper. The term "Open Educational Resources" (OER) refers to a particular type of TLMs, namely those that are "open" — freely available for use and distribution.

Figure 8. The door to the teacher resource centre at OLA

Pause for a moment, and make a short list of a few TLMs that you can think of. Try to think of some less obvious ones.

My list of TLMs
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

T5 i 1 Why Use Teaching and Learning Materials in Your Teaching?

Teaching and Learning Materials are an important part of many learning experiences. Indeed, education research in Ghana and across sub-Saharan Africa provides evidence that TLMs are an important part of a productive learning environment: The use of TLMs helps students learn better.

While the use of TLMs is an integral part of effective teaching and learning, we note that TLMs **on their own** do not lead to improved learning outcomes. Obviously there is a great shortage of TLMs across schools and colleges. TLMs are effective when used in conjunction with other effective teaching practices, such as talk for learning, questioning, and collaborative learning (including group work and pair work). It is therefore no surprise that such practices were covered in our previous themes.

Pause for a moment, and review your own activity plans as well as the books for the other themes, including Theme 1 (Creative Approaches), Theme 2 (Questioning), Theme 3 (Talk for Learning), and Theme 4 (Group Work). You will find many examples of TLMs, such as cards for ordering and matching and concept cartoons. Which other TLMs can you find? What value did they add to student learning? Briefly complete the table below, noting down the theme, teaching strategy and strand if applicable (e.g. “T3-4B”).

Theme and Teaching Strategy	Teaching and Learning Material	What value did they add to student learning? What observations did you make about the TLM use.

Figure 9. Student teachers using pens and paper. Note: You may remember this picture from an earlier theme.

T5 i 2 What is the Benefit of TLMs?

What are the benefits, aims and characteristics of TLMs? You may instinctively know that TLMs are important, but let us draw out some reasons:

1. **TLMs attract the attention/interest of students**: TLMs can provide something new for students to see and touch. TLMs can make the classroom lively and active, and can add variety and excitement to a subject. Students will learn better when they are motivated and interested.

2. **TLMs clarify abstract ideas**: Tutors can clarify abstract or conceptual subject matter more easily through a model or picture/diagram. By making abstract ideas more concrete, students' understanding and learning will improve.
3. **TLMs allow students to practise and apply new skills:** TLMs that require students to 'do' something (eg., playing a game, making something, interacting with the environment) requires students to take new knowledge/skills and apply it/them. The process of 'doing' (as opposed to simply memorising facts) makes learning interesting and meaningful.
4. **TLMs help students remember more**: Every individual has the tendency to forget, but the proper use of TLMs helps students to retain content by allowing them to relate new ideas to their environment or through a memorable experience of 'doing'.
5. **TLMs make tutors' work easier**: By using TLMs, Tutors do not have to stand and lecture for two hours. Instead, TLMs allow students to do interactive and independent learning. They supplement and reinforce content that Tutors provide, and they encourage a healthy classroom environment.

Can you think of other benefits and aims of TLMs?

Figure 10. Some TLMs stored in the TLM room.

T5 i 3 Characteristics of Good TLMs

You may also wonder what the characteristics of effective TLMs are. Here are some points for your consideration.

Good TLMs have these characteristics:

- The TLM is relevant and helps in the realisation of learning objectives.

- The TLM is used strategically within a game or activity to facilitate participation and interactive learning. (Simply showing students an object or map will not enhance learning in itself.)
- The TLM is prepared and planned in advance.
- The TLM can be accessed (seen or used) equally by *all* students in the class .
- The TLM is interesting, informative and accurate.
- The TLM is gender responsive – it does not reinforce traditional gender roles or stereotypes.

Can you think of other characteristics?

T5 i 4 Effective Teachers

We may say that being an effective teacher means employing a variety of instructional strategies that encourage learner participation and critical thinking. Moreover, such teachers should produces and uses a variety of teaching and learning resources that enhance learning, including resources are made from local materials including story books, flash cards; bottle tops, stones, sticks, pens; charts, maps, and images. Such resources are integral to the teaching of new concepts or their consolidation, supplement and go beyond the textbook. Learner should also make resources as part of their learning such as clay letters and numbers, story books, and displays. Secure storage ensures sustainable use of resources.

T5 i 5 The DBE Syllabus

The purpose of the activities and investigations in the PD sessions, as well as the teaching ideas suggested is to inspire tutors. We are inviting you to make connections with the DBE syllabus, and to think “outside the box” in terms of connecting the ideas to your classroom activities.

Bear in mind that the focus on “how to teach a topic” is equally important as “what you are teaching (the topic)”. Many ideas in this book may give you ideas on “how to teach a topic”, with the intention of adapting the idea to your own requirements in terms of the topic that you are teaching.

Nevertheless, we have incorporated links to the DBE Syllabus (2014) throughout the materials. A reference to the syllabus **does not mean** that the idea only applies there. The references are meant to show that you can easily find areas in the syllabus where ideas can be applied. Moreover, the ideas could easily be applied to any reasonable syllabus.

Here are some direct connections between the present materials, and the current DBE Syllabus (2014):

- Teaching and Learning Materials: ECE 122, ECE 314, FDC 211, FDC 214, PRA 223.

You can also find many links at the level of individual teaching strategies, such as for **activity-based learning:**

- Discovery learning, discovery method: EPS 211, FDC 214, FVA 211;
- Activity method: EPS 211, FDC 214.

To provide another example, the syllabus contains rich references to **the outdoors and the environment**:

- Outdoors: ECE 121, ECE 213, ECE 223, PRA 215;
- Art in the environment: ECE 222;
- Environmental protection: EPS 311;
- Environmental pollution: TEC 122;
- Physical environment: ECE 214, ECE 221, FDC 118;
- Environmental problems: FDC 118;
- Outdoor equipment and materials: ECE 223.

With the syllabus references provided (e.g. for the teaching ideas), you should be able to make linkages very quickly. However, do not use the syllabus references to identify teaching ideas that apply to your course: You may find that there are many teaching ideas that you can adapt in unforeseen ways.

Figure 11. Some TLMs in the TLM room.

T5 i 6

Theme Overview: Teaching and Learning Materials

- Like our other themes, this theme is divided into a number of 'teaching strategies'. As before, the five strategies discussed in this theme aim to give you practical guidance to develop and use Teaching and Learning

Materials effectively in your college practice. The five are: **Teaching Strategy 1. Using low/no-cost materials** (finding and making low/no-cost materials);

- **Teaching Strategy 2. Using books and other written materials** (different types of books; newspapers);
- **Teaching Strategy 3. Activity-based learning** (includes materials needed for investigations and to conduct specific experiments);
- **Teaching Strategy 4. Using the Outdoors and the Environment** (using the environment as a resource; field trips, the community as a resource);
- **Teaching Strategy 5. Using TLMs Effectively** (a review session on the use of TLMs together with the teaching strategies we have previously met)
- **Teaching Strategy 6. Using Open Educational Resources** (using and re-using digital and printed documents).

You should note that from here on we often refer to these teaching strategies in the shortened form. For example, by "Low/no-cost materials" we mean "Using low/no-cost materials for teaching and learning in college".

Also note that TLMs can be digital, and include computers, laptops, tablets, phones, eBook readers, software applications, etc. However, this theme primarily covers materials that can be used in printed form, and the only digital materials covered are digital documents (in T5-6 on Open Educational Resources). Other digital tools, including software applications and simulations, form part of a later theme on digital technology.

T5 i 7 Overarching Learning Objectives

There are a number of overarching learning objectives for this theme. They are:

- **Understanding the importance of TLMs**, including:
  - Assessment of your teaching practice/teaching environment regarding TLMs;
  - How students learn with TLMs.
- **Developing your own approaches and guidelines for making TLMs**, including:
  - Basic techniques and materials;
  - Re-using/recycling TLMs;
  - Creating a TLM-rich classroom;
  - Storing TLMs;
  - Student-teachers building up a TLM kit, that they can use post-college.
- **Using TLMs effectively for student learning**, including:

- Using TLMs in conjunction with the teaching strategies explored already (talk, questioning, collaborative learning);
- Using TLMs to explain and summarise complex concepts;
- Task/activity-based TLMs to enhance learning;
- Using TLMs for display purposes: projects and assessment.

- **Understanding the broad range of settings where TLMs can enhance learning**, including:
  - TLMs that support professional learning of tutors;
  - Use of TLMs during formal instruction hours *compared to* TLMs used in your own time;
  - Tutor-made TLMs *compared to* student-made TLMs;
  - Teacher-made TLMs *compared to* pupil-made TLMs.

Figure 12. Perhaps some TLMs will surprise you.

T5 i 8

Using This Book for Professional Development Sessions

In this theme, you will find the following three sections for each teaching strategy:

1. the **introduction to the teaching strategy** (e.g. "T5-3 i"), to be read in advance of the session;
2. a **plan for the professional development session** (e.g. "T5-3 P") including the activities undertaken during the session, which include

- **reflection** on your teaching of the activities developed in the previous session;
- **whole group activities** to become familiar with the teaching strategy;
- the **"Plan and Practise Together"** section during which you develop activity plans;
- the **"Teach and Observe"** section, as a reminder to teach the activities that you have developed;
- the **"Reflect Together"** section, which you will refer to at the start of the next session;

3. a section with **teaching ideas** (e.g. "T5-3 T") that you can use during the "Plan and Practise Together" section.

Activity plans. As before, there are activity plans at the end of this book. Please cut them out, and use them in the "Plan and Practise Together" parts of the session.

Figure 13. A tutor cuts out an activity plan and uses it side-by-side with the PD Guide for Tutors.

T5 i 9 Reflection

Reflection on Classroom Teaching

As with all previous activities, reflection on your classroom teaching experience should be done at the start of all PD sessions. It is important for all tutors to note that there is the need for them to share their reflection on the lessons that you prepared at the PD session the previous week and taught in class. In sharing your teaching experiences from the class lesson, let your reflection focus on the following questions:

- Was the lesson interactive and participatory?
- What did you, as a tutor, do to involve your student teachers in the lesson?
- What were the contributions of your student teachers in the lesson?
- How did the teaching strategy/activities support student teachers' learning?

- What went well in the lesson?
- What did your student teachers enjoy about your lesson that improved their learning?
- What did you enjoy about your lesson?
- What did not go well with the lesson and why?
- What could you have done differently to improve the lesson?

Reflect Together After PD Sessions

There are other opportunities for reflective learning, for instance after the PD session. After a PD session, tutors may wish to reflect in their own time (or with colleagues, e.g. over lunch), bearing in mind the following questions:

- What progress have I made in my learning (as a tutor)?
- What activities helped me to achieve progress in my learning?
- How did the group activities support my learning?
- What did not go well with my learning and why?
- What could I have done differently to contribute more to my learning?
- What could the facilitator have done differently to support my learning?

For those facilitating sessions (including PDCs), you can also use the above questions for your own post-session reflections.

Reflection With Colleagues Following Lessons

All reflective tutors valued being appraised on their performance on the lessons that they teach. This opportunity could be difficult to carry out when you have tight professional schedules. Nevertheless, many colleges do find the time to do lesson observation and support on departmental and subject basis.

In your discussion with your colleagues after a lesson, talk about three things that you would like to change about the way you taught the lesson. Furthermore, reflect on the following:

- What were the contributions of the student teachers either before, during, or after the lesson?
- How did these contributions make the lesson interactive and participatory?
- How did you facilitate the lesson to make it interactive and participatory?
- How did the use of Teaching and Learning Resources (or TLM) enhance learning in your student teachers?
- How did the teaching resources improve the pace of your lesson?

- How were your student teachers motivated to use the teaching resources during the lesson?

As professionals, you can add more questions to bring out the strengths and weaknesses/desired strengths from lessons that you support.

T5 i 10 Focus on Gender

Given the many benefits of teaching and learning materials, it is extremely important to use them in a gender responsive way in order to ensure that all students benefit, especially female students. For example, male students are often the first to take possession of and use any books or TLMs offered to the class. As discussed in the previous themes, this is usually because female students (unlike males) have been socialised to **not** be assertive or speak their mind, which means that male students end up benefiting from the TLMs to an unfair and unequal degree. That said, the teaching strategies discussed in this theme will not only help you to successfully apply teaching and learning materials to your lessons, but they will do so in a way that encourages, supports and gets the best out of your female student teachers.

When making (and using) TLMs, your classroom can sometimes get a bit messy and students should be encouraged to tidy up after themselves as they go along. Make sure that all students take an active role in the tidying process and that it does not fall to the girls to tidy up after the boys.

Figure 14. A musical instrument

T5 i 11 Cultural Considerations

It is the aim of every tutor to make his/her lesson interesting by motivating the student teacher's learning through the use of TLMs. One way of doing this is to bring real objects into the classroom. However, tutors need to find

out which objects are considered taboo and/or sacred to their students based on their cultural affiliations.

Real objects. Live animals such as goats and dogs are forbidden in Enchi and Anum towns respectively. Snails are considered taboo among the Krobos and some foodstuffs like a full bunch of plantain and palm oil fruits are forbidden in Manfe town. In many Akan speaking areas, the new yam is eaten and offered for sale in communities only after customary rites have been performed.

Visits. There are many places of educational interest that could be visited by students to stimulate learning outdoors. However, visits could be restricted due to some days of the week being considered sacred in the traditional calendar. For instance, this might affect visits to sacred burial places for chiefs, ancestral worship places, forest groves, rivers and the beaches of the sea.

Tutors should do a thorough investigation to find out which TLMs might be offensive to their student teachers. Outdoor activities should be guided by the traditional character and taboos of places of educational interest.

Figure 15. A boat.

T5 i 12 Preparation for This Theme

Please find yourself a box (any medium to large box will do), and collect items that could be useful for teaching and learning. As you collect items, make a note here to remind yourself what you have found.

TLM materials that I have collected

Below you can read about Vuyiswa (a South African teacher); her story will give you some ideas of the kinds of things to collect for your TLM box.

> Vuyiswa encourages her learners to help in collecting and bringing materials like empty boxes, newspapers, seeds, sticks, containers, bottle tops, wire, tins, old clothes and many other things that could be used for learning. There is a big box behind the door labeled 'ZISA'. Learners put the materials that they bring into this box. At a certain stage, when the box is fairly full, it is taken to the middle of the classroom. The learners begin to sort the materials into various categories, and talk about how they can use the material. A number of suggestions come out of these discussions.
>
> Sometimes, learners go outside and observe things around the classroom, collect leaves and any other materials that might be useful.
>
> The 'ZISA' box is always behind the door and this process is repeated at various times of the year
>
> Vuyiswa draws on these materials to make resources for learning. She uses some for whole-class teaching and learning, but spends a lot of time developing independent learning resources from them. Learners often help with this kind of activity: cutting out letters and pictures, covering some of the materials with plastic, and packing them into containers. Learners enjoy this kind of activity very much.

T5 i 13 Sources

Vuyiswa's ZISA box, minor adaptations, from: University of Fort Hare Distance Education Project. *Core Education Studies Course: Helping Learners Learn. Umthamo 4: Independent Learning in a 'Resourceful' Classroom,* http://www.oerafrica.org/FTPFolder/Teachered/UFH/helpinglearnerslearn.umthamo4-independent-learning.pdf. Used with permission. For more resources from Fort Hare, see http://www.oerafrica.org/resource/university-fort-hare-distance-education-project-core-education-studies-course-helping-3.

Theme 5: Teaching and Learning Materials (TLMs) Teaching Strategies		
Teaching Strategy		**Main points**
T5-1	Using low/no-cost materials	This teaching strategy explores developing activities that make use of materials that are free or cost very little. For example: recycling plastic bottles to make toys for learning, making items for use and display (e.g. models) from inexpensive recycled card.
T5-2	Using Books and Other Written Materials	This teaching strategy explores different ways to use often neglected textbooks to enhance learning. For example using them to write quizzes and to analyse question types. How to use other printed material such as magazine articles and novels as TLMs is also considered.
T5-3	Activity-Based Learning	This teaching strategy looks at how to develop TLMs for use in activity-based learning, includng investigations, experiments and other activity-based learning tasks. For example using toy cars to investigate forces, classifying polygons using cardboard tubes.
T5-4	Using the Outdoors and Environment	This teaching strategy introduces activities that can be used outside the classroom to enhance learning. For example using the outdoors to work with bigger dimensions in maths, observing earthworms, water retention in soil. In this strategy the outside itself becomes the TLM.
T5-5	Using TLMs Effectively	In this session, we review our journey so far, and link TLMs with the teaching strategies from previous themes.
T5-6	Using Open Educational Resources	This teaching strategy introduces a range of freely available or 'open' education resources that can be used as TLMs. For example using online textbooks such as Siyavula, Wikipedia for Schools and ideas for use with an online image library.

Teaching Strategy 1 — Introduction
Using Low/No-Cost TLMs

T5-1 i 1 Learning Objectives

In this teaching strategy, you will learn to

- Assess what TLMs you have and/or use;
- Appraise TLMs in terms of their potential to improve learning and learning outcomes for student teachers;
- Build a TLM (such as simple model car);
- Develop and execute a planned activity featuring a low cost/no cost TLM.

The remainder of this section is pre-reading for the PD session. As you read through this introductory section, and as you work through the activities in the following PD sessions, relate them back to the above learning objectives.

T5-1 i 2 Introduction to Using Low/No-Cost TLMs

By interacting with TLMs, students can become more connected to the topic that they are learning about. For example if students are learning about characters in a novel, they can 'build' models of the characters and add new information to their model as they find things out. The 'model' can be as simple as a line drawing on a piece of A4 card with character details around the outside and these can be passed around to groups when they are working on tracing character development.

If the TLMs that students are interacting with are ones that they have made themselves then a whole new level of engagement can happen. Students will work diligently to make a TLM if they can see the purpose of using it in their learning. The actual act of making the TLM is quite often a learning process in itself too.

Figure 16. You can build many different types of objects out of clay: A sofa, a figure, a pen holder. Can you tell a story?

T5-1 i 3 TLMs Can Represent Real-life Objects

Sometimes a TLM represents a real-life object. Making models is a relatively low cost way to to bring the real word into the classroom, in order provide prompts for stories, to explore science, mathematics, art and many other subject areas. For example, one of the activities in the PD session for this teaching strategy involves making a toy car from a plastic water bottle. This car can be used, for example, in science lessons to investigate friction or air resistance (T5-3T). After making the model car by following instructions, it could also be used in an English class as a vessel into which students put words/vocab relating to vehicles (e.g. steering wheel, tyre, windscreen, axle, etc.). Making and using such TLMs can lead to increased enjoyment and deeper learning for students across the curriculum.

Think about the kinds of things that students could make models of in your subject area using low cost materials such as plastic bottles/cartons, plastic bags, string, newspaper and cardboard. List them in the following table:

What could be built using low cost materials?

T5-1 i 4 Models in Mathematics and Science

We already encountered the idea of models in T1-5. When students design and build models of, for example, biological systems, they can move beyond memorising facts about what they are learning, towards an understanding of how different aspects of the system affect each other dynamically.

By forming mental pictures of how organs are arranged in their bodies, students can explore cause and effect relationships during a sequence of events in a concrete rather than an abstract way. For example, to answer the question 'What happens to air flow in the lungs when the chest cavity increases in volume?' students need only manipulate their model in a way that increases the volume of the chest cavity and observe the results. You can read more about how to make a model lung and ideas for how to use it in the Teaching Activities section.

Models (like analogies) have their limitations and students should be encouraged to consider the strengths and weaknesses of their model compared to what they know about the 'real-life' scenario. Textbooks and other printed TLMs can help with this aspect of working with models by providing relevant factual information.

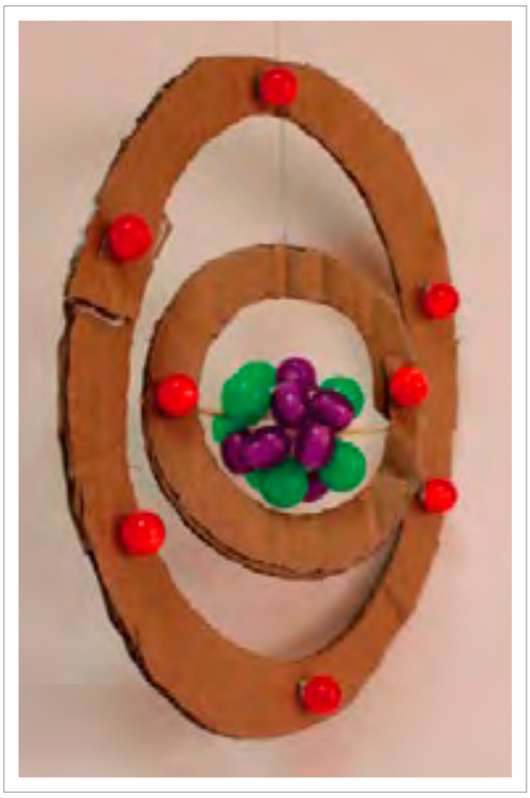


Figure 17. A model of the atom.

T5-1 i 5 Teaching Ideas

Each teaching strategy will give you plenty of teaching ideas to inspire you to create TLMs for activities that you will do with your students after the sessions. The TLMs that you design/prepare will be based around the teaching strategy that you have been learning about in the various sessions. So, for example, in this session you will plan an activity that makes use of a low-cost/no-cost TLM which you will also design during the session if possible (or part of the activity might be that the students design it themselves).

There is a table like this at the start of each teaching ideas section (T5-1 T in this case) that lists the teaching ideas covered. It also gives a brief description of how the activity/idea works.

Theme 5: Teaching and Learning Materials PD Session 1: Low/no-cost materials	
Teaching Idea	**How it works**

T5-1 i 6 The TLM Tools

There are three tools, two in this session and and one in the next session, that will help you to assess the current TLM situation in your classroom, and to get the most from using TLMs in your lessons.

TLM Tool 1: This is a quiz that aims to help you in determining how resourceful your college/classroom is. Questions range from one about TLMs bridging the gap between the 'real world' and the classroom to another about community members sharing their skills and experience with students. The questions encourage you to think analytically about why you are using certain TLMs in your classroom and they cover many aspects of the purpose of using TLMs.

You can continue to use Tool 1 throughout the theme as you design, make and use TLMs in your classroom. It can act as a general check that your TLMs are designed to fulfil their purpose of enhancing students' learning. Not all of the questions will be relevant to each TLM that you make but some of them will be.

TLM Tool 2: This is an observation tool that you can use after teaching your planned TLM lesson with your students. It will remind you how your TLM activity went so that you are well prepared to share your reflections on it at the beginning of the next session.

You can continue to use Tool 2 throughout the theme after each planned lesson/activity that you teach.

TLM Tool 3: This is a TLM audit questionnaire to help you to systematically review your TLM provision. You can read more about Tool 3 in the introduction to T5.2.

TLM gender audit. You will also find a TLM gender audit tool in T5-2.

Teaching Strategy 1 — PD Session
Using Low/No-Cost TLMs

T5-1 S 1 Start of Session

Housekeeping

Welcome each other to the session, and undertake the necessary housekeeping (such as circulating the register).

Timekeeping. As usual, spend the time during the session roughly as follows:

- About 15 minutes for introductory activities, including the "three Rs";
- About 30-35 minutes for the shared session activities;
- About 30-35 minutes for planning classroom activities (using the section with teaching ideas);
- About 5-10 minutes at the end of the session to review any issues that have arisen during planning.

When?	0 – 5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
What?	**Reflect, Review, Recap**			**PD Session Activities**							**Plan and Practise Together**						**Close**	
Section	T5-1 S 1 – 3			T5-1 S 4 – 7							T5-1 S 8 and T5-1 T						T5-1 S 9	

Figure 18. Outline of Session 1

T5-1 S 2 Reflect Together

What Has Changed so far?

Start the session with three Rs: Reflect, Review pre-reading and Recap learning objectives.

For the reflection spend a few minutes discussing some examples from earlier on in this semester, where you have implemented ideas from our Themes. Or, if you have not taught yet, recall some examples from last semester.

T5-1 S 3 Review and Recap

Introducing the New Theme and This Session

Review pre-reading. Now turn to the pre-reading. We are starting a new theme. Do you have any questions about the introduction? Spend a few minutes discussing any issues with your colleagues.

Recap learning objective. Finally, recall the specific learning objectives for this teaching strategy (found in your pre-reading, **T5-1 i**). Are there any questions?

T5-1 S 4 Activity 1 — Whole Class Brainstorm

What TLMs Do we Use in our Classrooms?

Learning objective: Establish what TLMs we have all made use of.

You will need: A flip chart/white board and a pen, or a blackboard and some chalk.

Use the following question as a prompt to begin sharing your ideas:

- *What TLMs do we use in our classrooms?*

Remember, all ideas relevant to the question are accepted uncritically in a brainstorm. Everyone should try to participate so that we can have lots of suggestions for TLMs. You can build on each other's ideas e.g. if someone suggests something that you have used/seen used in a slightly different way it is good to say that. You can mention any TLMs that you have used or seen used in your college.

Tutor Discussion

Discuss the following questions:

- Is a flip chart/blackboard a TLM? Explain your answer.
- Can you classify the list of TLMs on the chart/board? How?

Figure 19. A PDC records the TLMs and their use.

T5-1 S 5 Activity 2

Tool 1: TLM Appraisal

Do a think-pair-share activity using the following questionnaire to help you assess/appraise the resourcefulness of your classroom and to learn about the types of TLMs that your colleagues are using.

- Working on your own, answer Question one. *(think)*
- Working with a partner, answer yes or no (by putting a circle around your answer) to the rest of the question. Use your own list but discuss your answers with your partner. *(pair)*
- Working as a group of 6 or so, take turns to talk about the TLM that you use. Try to find out about as many different but useful TLMs as possible from each other in this way. *(share)*

Tool 1: TLM Appraisal

Quiz: Is your classroom resourceful?
1. Make a list of the learning resources you use in your classroom.
2. Do these resources encourage students to think and ask questions about what they are learning? Yes/No
3. Do they bridge the gap between the classroom and the 'real world'? Yes/No

4.	Do they allow for individual differences, giving certain students an opportunity to work on tasks that suit them? Yes/No
5.	Do they develop in your students the skills of observing accurately, collecting data, writing up their own observations? Yes/No
6.	Do they allow community members to share their knowledge skills and life experiences with students. Yes/No
7.	Do they promote an awareness that the earth's resources are scarce and should be carefully used and re-used? Yes/No
8.	Do they encourage the development of hands-on, practical skills? Yes/No
9.	Can the resources be used for different learning areas at different times, across the curriculum? Yes/No
10.	Do they promote interactive collaborative group work? Yes/No
11.	Do the students enjoy working with the resources? Yes/No
12.	Are there any more questions that you can think of?

Tutor Discussion

Here are some questions for discussion after you have completed the think-pair-share activity:

- How resourceful is your classroom? (Count up how many yes answers you have out of 10.)
- What could you do to make your classroom more resourceful?
- What sort of resources/TLMs promote interactive, collaborative group work?
- Is it important for TLMs to bridge the gap between the 'real world' and the classroom. Why?
- Many of the questions are about how your TLMs enhance learning/improve learning outcomes. What other questions could you ask in order to fully appraise your TLMs in terms of their ability to enhance learning/improve learning outcomes? Add your ideas to the questions above.

T5-1 S 6 Video

Students Create a Water Filter

The video in this section shows students discussing with the rest of their class a water filter they made. Whilst watching, think about the following questions (drawn from the TLM observation questions):

How motivated were the students to engage with the TLM?	Very	Not very	Not at all
Were there enough TLMs for all the students to interact with?	Yes	No	Not sure
Did the TLM enhance learning?	Yes	No	Not sure

Figure 20. Students Create a Water Filter, http://tiny.cc/tpdvideo

Now that you have watched the paid, pair up and compare your answers with a colleague.

Then discuss together:

- What, if any, changes would you make to the TLM in this example? Why?

T5-1 S 7 Activity 3 — Make Something

Wacky Races: Make a Plastic Bottle Car

For this activity, divide into small groups of 2–3 tutors per group. Make a toy car using a plastic bottle. Other materials provided include four bottle tops and two thin sticks, and (optional) a balloon and straw. You may also need some simple tools, such as a nail (for making holes). Note that there deliberately are no instructions provided.

Figure 21. Tutors improvising using a pen and a key ring.

T5-1 S 8 Plan and Practise Together

Plan an Activity on Low/No-Cost TLMs

It is now time to plan an activity. Each tutor should plan their own activity using the activity plans provided. To provide some inspiration, please consult the 'Teaching Ideas' section of this teaching strategy (T5-1 T), which has ideas for activities with low/no-cost TLMs. Please read the instructions for the activity plan template.

Re**member: W**hen planning and executing activities, always ensure that female students have equal opportunities to participate, try first and to take leadership roles. Often we forget about being gender responsive and male students end up unfairly dominating and benefiting more.

T5-1 S 9 End of Session

Agreeing Follow-up Activities

This is now the end of the session. Decide when you will teach your planned activity and make arrangements with a colleague for them to observe you (see the Teach and Observe section below). In the next PD session we will return to the Reflect Together section.

T5-1 S 10 After the Session: Teach and Observe

It is important for your professional learning that you actually teach the activity that you have planned.

Please make sure that you have your activity plan available when you teach. Any issues that arise during the lesson should be written down immediately after you have taught and remember to complete the TLM observation tool.

If possible arrange with a colleague to observe each other when you each do the activity with your student teachers during the week.

T5-1 S 11 Reflect on Your Teaching

Low/No-Cost TLMs

Make sure you fill in this tool as soon as possible after you have taught your planned activity with your students. It will be used as a starting point for reflection during the next session.

Tool 2: TLM observation questions

Brief description of your TLM:				**Notes/ reflections**
1.How long did it take you to prepare your TLM for the activty?	Less than 10 min	10-30 min	More than 30 min	
2. How easy was it to get hold of the resources you needed for your TLM?	Very easy	Not very easy	Hard	
3. How motivated were the students to engage with the TLM?	Very	Not very	Not at all	
4. Did you have enough TLMs for all the students to interact with?	Yes	No	Not sure	
5. Did you ensure that female and male students had equal opportunities to interact with the TLM?	Yes	No	Not sure	
6. Did your TLM enhance learning?	Yes	No	Not sure	
7. How was the pace of the lesson compared to normal?	Faster	Same	Slower	
8. Will you use this TLM again?	Yes	No	Not sure	
9. If 'Yes' where will you store it in the meantime?				
10. Will you make any modifications to your TLM?	Yes	No	Not sure	
11. If 'Yes' what will you change?				

T5-1 S 12 Further Resources

Make a toy car using a plastic bottle. https://www.tes.com/teaching-resource/make-a-toy-car-re-use-a-plastic-bottle-africa-6164266

Teaching Strategy 1 - Teaching Ideas
Using Low/No-Cost TLMs

T5-1 T 1 Plan and Practise Together

Writing an Activity Plan

As usual, you should use an activity plan template to guide your planning, in which you record the learning objective, the resources used, and the steps for the activity. There is guidance available near the activity plan templates, but here is a brief reminder.

Syllabus reference. Enter the syllabus reference and add the specific topic you will teach, e.g. "DBE Syllabus, FDC 128 Governance, Unit 5, Constitution, Human Rights Abuse (p. 291)". The topic should be for the lesson that is to be taken for the particular period or day for which you are planning the activity.

Learning objective(s) of the activity. Record the specific learning objectives of this activity: What is it that you want your students to learn? Imagine continuing the sentence: "*My students will learn …"*, e.g. *"... that there are many different ways in which human rights are abused"*. An activity objective (or lesson objective) is simply a description of what you want your students to know, understand or be able to do by the end of a lesson. **What** will your students have achieved? This is not about "How?" they have achieved it, or "Why?" they should achieve it. Activity objectives relate to knowledge or factual information, understanding such as concepts, reasons and processes, skills or abilities acquired through training or experience. Note: this is not the list of the content that the teacher wishes to teach, but the objectives for the activity, according to the definition above.

Activity focus. This is the focus of your activity, expressed in one sentence, e.g. "A brainstorm on human rights abuses in our communities". It answers the question: "What will your students do?" (in order to achieve the learning objective). As you see, the activity focus can combine the teaching strategy above, with an aspect of the topic you will teach. Keep it to one sentence.

Activity description. These are specific activities you and your students perform during the activity (for that part of the lesson). This also answers the question "What will your students do?", but you describe it step-by-step, so that another tutor could follow this. E.g. describe what questions you will ask to initiate the brainstorm. Will this be a whole-class brainstorm, or will it be in groups? Will students record their ideas on paper, or perhaps on the board? What will you be doing during the activity? What questions will you ask your students if the discussion gets stuck? If there are several parts to the activity, record them as **Part 1, Part 2, Part 3,** etc.

Textbook title and pages (if available). If you are picking the lesson content from a particular textbook, or you are using a textbook in the course

of the activity or preparation, you can name the textbook and the page numbers here. This is especially relevant for T5-2 if you are using books.

Materials/resources. Any teaching and learning materials (TLMs) that you are planning to use for the activity (e.g. pieces of paper, scissors, dictionary, computer lab, …). This is obviously highly relevant for this Theme, and would, for example, focus on low/no-cost materials (T5-1), printed materials (T5-2), the outdoor areas or environmental features used (T5-4), as well as any Open Educational Resources that you are building on (T5-5).

As you go through the teaching ideas presented below, make sure that you think about those areas, and fill in the respective sections in the activity plan.

Theme 5: Teaching and Learning Materials **PD Session 1: Using Low/no-cost materials**	
Teaching Idea	**How it works**
T5-1 T 2. Answers, answers	Students provide answers to a question while another student has to guess what the original question was.
T5-1 T 3. Sentence star	Students write sentences using prompts given to them by their teacher/tutor.
T5-1 T 4. Backs to the board	Students practise defining key words and concepts.
T5-1 T 5. What's the link?	Students look for, and explain, relationships between a list of words given to them by their teacher/tutor.
T5-1 T 6. Using flashcards	Students ask questions and make sentences using visuals as prompts.
T5-1 T 7. Concept cartoons	Use these to probe your student teachers' subject knowledge and conceptual understanding. Each cartoon character 'says' something about the concept/topic that students might typically say and students take on (and argue) the statement that they agree with.
T5-1 T 8. Model filter	Make an improvised filter funnel using the top of a plastic bottle and use this to explore purifying water by filtration using stones and sand.
T5-1 T 9. Human bar chart	Students use their own bodies to represent different data as they construct life-sized bar charts. Everyone is involved in this simple but effective activity.
T5-1 T 10. Embodiment of a coordinate system	Students form a regular x,y grid and raise their hands to represent points on the grid in response to questions like 'raise your hand if you are standing in the position of y = 5'.

T5-1 T 11. Paper folding	Use old newspapers to construct and explore angles.
T5-1 T 12. Lung capacity	A fun experiment that makes use of plastic bottles filled with water and the displacement of that water by the air in your lungs.
T5-1 T 13. Model lung	Another great use for a plastic bottle: by cutting the bottom off and replacing it with a flexible membrane (plastic bag or balloon) the job of the diaphragm is brought to life.
T5-1 T 14. Modelling physical changes	By using themselves to represent the particles that make up solids, liquids and gases, students can explore physical changes like condensation and boiling.
T5-1 T 15. Action dice	Put a different spin on things in your English language lessons by introducing dice. Students need to stay focused and be prepared for a range of challenges.

T5-1 T 2 Teaching Idea

Answers, Answers

This is a fun activity that involves the whole class. It can be used for different subjects, at different levels and with different age groups for practising or revising any curriculum topic.

Clarify learning objectives. You can do this activity in any subject, so you will have to clarify the learning objectives you would like your students to achieve. For example, you could focus on aspects of grammar such as question forms and tenses (e.g. for English grammar: past and present simple tense, present and past continuous tense, etc).

For example, DBE Syllabus (2014), grammar: FDC 111, FDC 121, FDC 211, FDC 213, FDC 311.

Steps for this activity:

1. Send a student out of the room.
2. Write a question on the board relevant to your chosen topic. For our English example, you could use the target grammar, e.g. *What did you do last night?*
3. Students remaining in the classroom think of an answer to the question, e.g. *I played computer games. I watched TV. I visited a friend.* In pairs, students ask and answer the question. Teacher monitors for correct grammar.

4. Rub the question off the board. Invite the student to come back into the classroom.
5. He or she must call on a minimum of five students in the class to give their answers.
6. He or she then guesses the question. If the question is correct, the student sits down and another student leaves the classroom. If the question is incorrect, the student must ask five other people before trying again.

Other possible questions are *What are your plans for the weekend? What is the most expensive thing you've ever bought? What would you do if you found a smartphone on the road? etc.*

T5-1 T 3 Teaching Idea

Sentence Star

This activity is a fun way for students to get to know each other at the beginning of the year. It also provides a good sample of language to help the tutor or teacher make an initial assessment of the students' abilities and needs.

Clarify learning objectives. You can use this activity to review grammar structures in the syllabus. For example, you can write the names of tenses such as present simple, present perfect, second conditional, or functions, such as make a request, ask permission, make an apology, on the star points. As you read the steps below, decide on what your syllabus-related learning objective will be.

For example, DBE Syllabus (2014), grammar: FDC 111, FDC 121, FDC 211, FDC 213, FDC 311.

Steps for this activity:

1. Ask students to draw a five pointed star in their notebooks or on a piece of paper. On the top of the first point they write 'can', on the second point 'like', on the third point 'have', on the fourth point 'used to' and on the fifth point 'going to'.
2. Students individually write a true sentence about themselves using each of the five words on their star. Give at least one example, such as 'I can speak a little Arabic'.
3. In pairs students take turns to read out their sentences to their partner. Their partner has to ask five questions about each of the sentences, for example 'Where did you learn Arabic?' 'Can you write it?' 'Why did you study Arabic?' etc. (Monitor this stage carefully and make notes of common errors for an error correction activity later or possibly for a grammar presentation session.)
4. In a final open class stage students report on interesting things they have learned about their classmates.

5. Optional: Write 6-8 sentences containing common errors heard during step 3 on the board. Students work in pairs to identify and correct the errors.

T5-1 T 4 Teaching Idea

Backs to the Board

In Theme 3 Talk for Learning you were introduced to the game Backs to the Board. It can be used in any subject. For example, this is a very useful activity for revising important terms, as well as vocabulary for English language lessons.

Clarify learning objectives: The activity can be used in any subject. Think about the learning objectives you would like your student teachers to achieve, and note those in your activity plan.

Steps for this activity:

1. Choose a number of words that you want the class to revise. For example, in a maths class you might choose scalene, area, congruent, 180 degrees, acute. In a music class you might choose rhythm, stave, clef, pitch, melody.
2. Place a chair in front of the board facing the class (that is, so that it faces away from the board).
3. Invite a student to sit in the chair (with their back to the board). Explain that they must not turn around and look at the board.
4. Write one of the words on the board.
5. The other students in the class explain the word on the board using English and without using the actual word itself (or any other form of it).
6. The student with his or her back to the board must guess the word.
7. Repeat the activity with the other words choosing a different student to sit in the chair each time.

Think of 5-6 words related to the subject you teach and try out the activity.

Figure 22. Backs to the board in GNS 211. A video is available at http://tiny.cc/tpdvideo

T5-1 T 5 Teaching Idea

What's the Link?

This activity is a good way of checking students' understanding of processes and their ability to use words and vocabulary that is specific to their subject. It is also a useful revision activity. It works well with mixed groups as weaker students can make very basic links and stronger students can elaborate on the connections.

Clarify learning objectives: The activity can be used in any subject. Think about the learning objectives you would like your student teachers to achieve, and note those in your activity plan.

DBE Syllabus (2014), key vocabulary: ECE 122.

Steps for this activity:

1. Write 4-5 words or phrases that are connected in some way, for example, *aerobic exercise, heart, blood cells, oxygen, health or plant, light, sun, grow, oxygen*. This activity could also be used to revise historical events, for example, 1*900, Golden Stool, Asante, Kumasi, Yaa Asantewaa*. How can you apply this activity to the topic that you will teach?
2. In small groups students discuss links between the words, for example: 'Aerobic exercise is good for your health because it makes your heart stronger. If your heart is stronger it will be more efficient at delivering oxygen - which is carried in blood cells - to all parts of your body.' Encourage students to add as much information about the process as possible.
3. Invite 2-3 groups to share their ideas with the rest of the class.

T5-1 T 6 Teaching Idea

Using Flashcards

Flashcards (including word cards and picture cards) are very useful for introducing and practising new words, new vocabulary and new structures. The best flashcards are clear and simple so that your students understand them easily. They should be large enough for everyone to see - for example, if you are using them with a whole class they should be A4 size.

The activity can be used in any subject. Also see DBE Syllabus (2014), word cards, picture cards, picture-word cards: ECE 122.

Look at how these pictures can be used to practise asking and answering questions about past experiences:

Example:

> Student A: Have you ever seen an elephant?
> Student B: Yes, I have./No, I haven't.
> Student A: Have you ever been to Akosombo Dam?
> Student B: Yes, I have./No, I haven't.

Figure 23. Some Flashcards

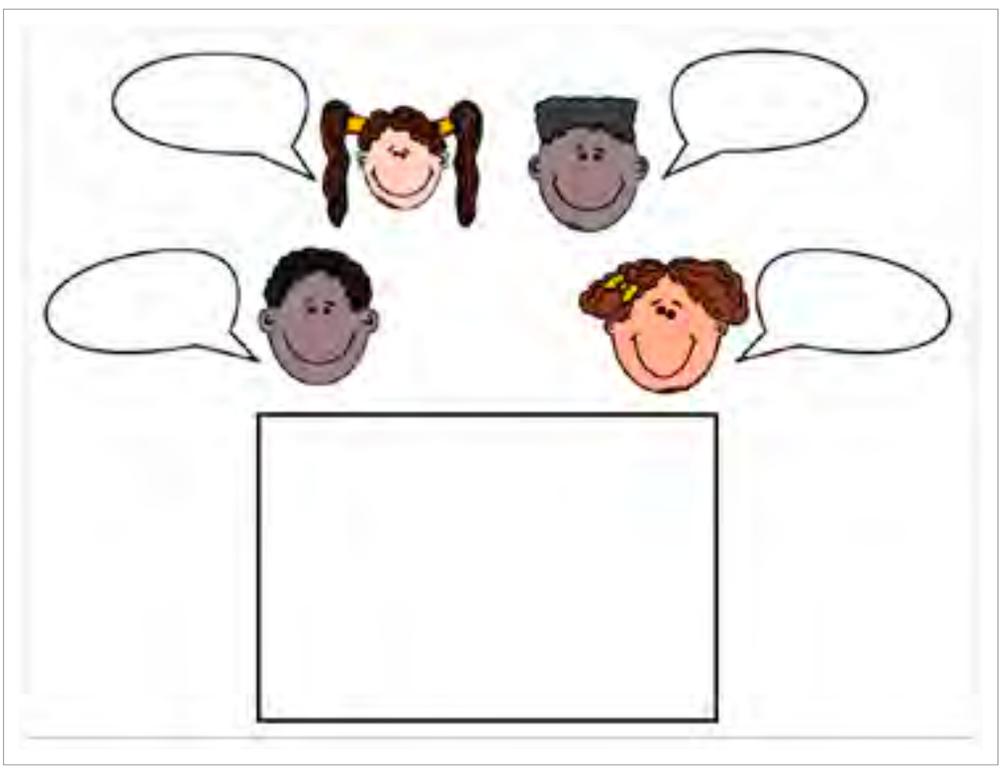
If possible, use card to make your own flashcards and think about how to store them so that they will last a long time.

Figure 24. Other visuals

T5-1 T 7 Teaching Idea

Concept Cartoons

As we saw in T3-2C, you can use cartoons in various subjects as a tool to improve your student teachers' engagement in lessons. If the statements are well thought out, you can also use them to probe your student teachers' subject knowledge and conceptual understanding. These well-designed cartoons are referred to as 'Concept Cartoons' and they have been used in classrooms all around the world since the late 1990s. Research into their impact shows that they really do support learning.



As long as you have some pens and paper (or a blackboard and chalk), you can use these. If you draw them on a large sheet, you can stick them up in the classroom for students to refer to. Refer to T3-2C to remind yourself.

Curriculum reference: See T3-2C for a number of curriculum topics where you can use concept cartoons.

T5-1 T 8 Teaching Idea

Make a Model Filter to Purify Water

How will you draw on the images below to develop your own classroom activity? No further written instructions are provided for this teaching idea.

DBE Syllabus (2014), water: ECE 123, ECE 214, ECE 225, EPS 222, EPS 311, FDC 114, FDC 118, FDC 124, FDC 214, FDC 224, FVA 223, PRA 125, PRA 215;

purification: FDC 124; pollution: EPS 311, FDC 118, TEC 112, TEC 122. DBE Syllabus (2014), sanitation: ECE 213, EPS 311.

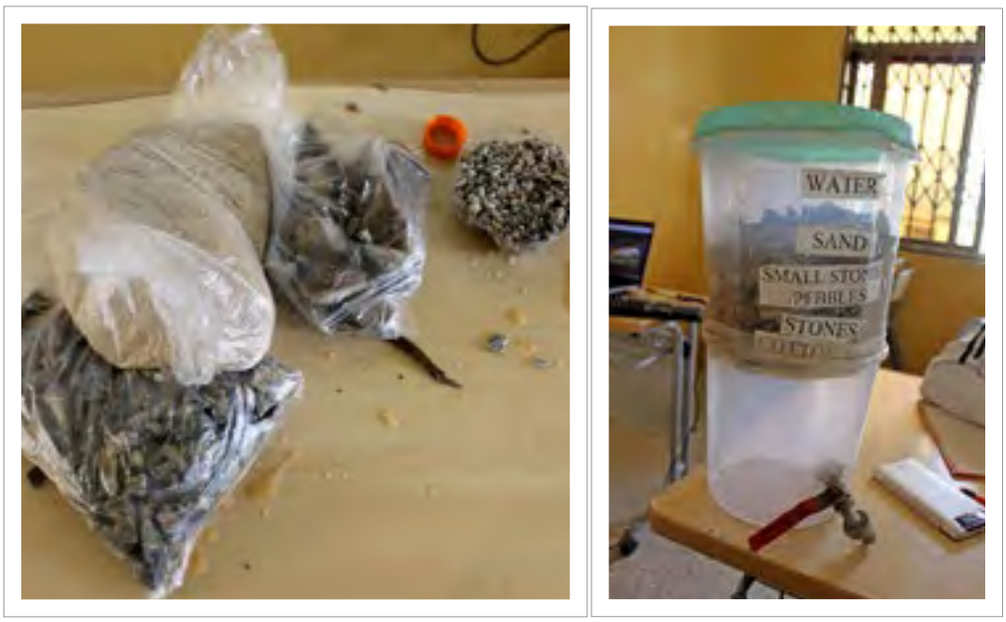


Figure 25. Building a filter.

T5-1 T 9 Teaching Idea

The Human Bar Chart

A no-cost learning method is using embodiment: using your own body physically to enact learning concepts, for example in any subject drawing on mathematics or mathematical reasoning. Embodiment in mathematics or 'body mathematics' uses both our own bodies as well as our natural environment as a TLM. It requires participants to become totally involved in the mathematics they are learning by physically experiencing and *being* the mathematics that they are learning about. It gives concrete form to an abstract concept. Another benefit is that participants experience mathematics on a larger scale than when working from books and on paper. In addition,the outdoors can be used as a mathematical arena.

Here is an example of an embodiment activity.

Constructing bar charts: How many sisters?

Lesson objectives: to develop an understanding of representation of data using bar charts/graphs; to calculate mean, mode, median and decide on their appropriateness in different contexts; to develop a mental model of bar charts; to understand distribution of data such as range.

The activity is directly related to DBE Syllabus (2014), bar graphs: FDC 312, FDC 312S. However, you can use it to visualise quantities for many different topics, see "Using this activity in another subject" below.

Preparation. Your will need a lot of space for this activity, so you will probably need to do the activity outside or in an assembly room.

Prior to the activity find a suitable space, it needs to have a floor or wall surface that can be used for drawing axes. If you have access to an area that has paving stones (or other regular markings on the floor) this would be useful, but it is not essential. If you are in a sports field, you could place sticks into the ground at regular intervals.

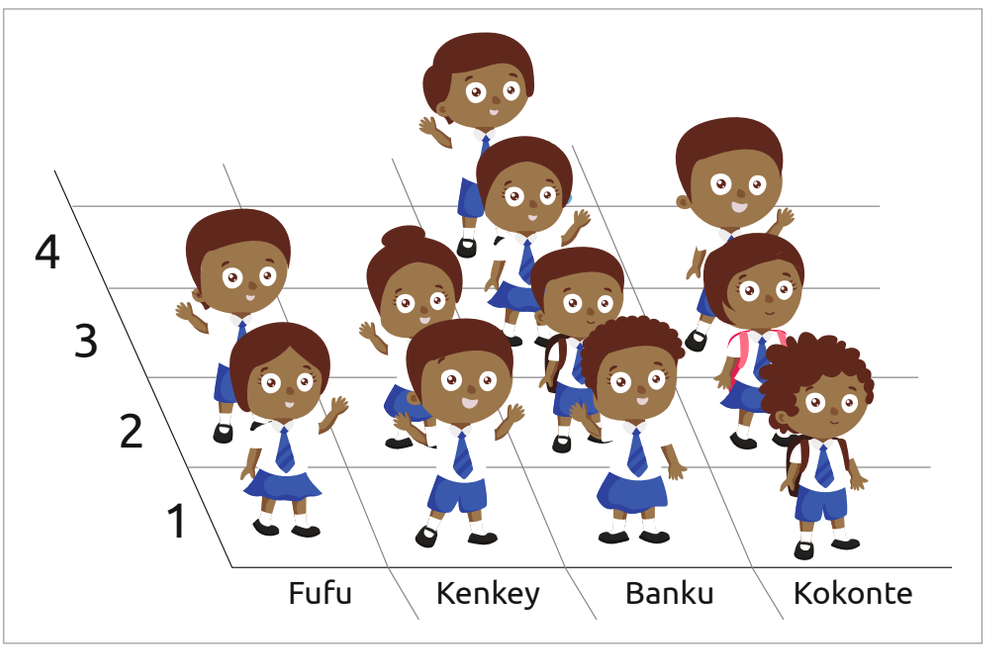


Figure 26. Students forming a bar chart, showing their preferred food.

Also think about how you can minimise disturbance to your class. If the activity does not take the whole lesson, you could conduct it at the beginning or end of a lesson to avoid going outside in the middle of the lesson.

The activity. You will need to give clear instructions, so explain to the student teachers what they will do: Teachers are going to form a bar chart showing the number of sisters of each individual within the group. Ask the participants to stand in lines, according to the number of sisters they have.

- Ask the student teachers how many sisters they each have.
- All those who have no sisters to form a straight line going out from your “zero line” (see diagram).
- All those who have one sister now form a line next to the first line.
- Continue with two sisters, three sisters and so on. Leave a space where there are gaps in the number of sisters. There may be those with four sisters but not five and then perhaps some with six.

Are the student teachers standing in line, with regular spacing? If not, discuss the issue — why is it important? However, discuss this only after the student teachers have discovered this for themselves; start by asking the following questions:

- How many people have three sisters?
- How many do not have sisters?
- What is the most popular number of sisters? What do you call this (the mode)?
- Can you work out other averages (mean, median)?
- Which average would you use when?
- What would be an efficient way of working out how many sisters the whole class has?
- Are there particular reasons for this distribution? You could also ask everybody to record the bar chart on paper (while standing in position), and interpret the data later.
- **Practising more graphs:** Finally, ask the student teachers what other values could be represented in this way. This might include: Number of brothers, number of older/younger sisters, number of family members, your position among your siblings (first born, second born, …), the day of the week you were born, your age etc. Your group of students should re-arrange themselves for these new questions, and you can discuss and interpret the data.

Variation. Rather than doing this as a whole class activity, you could also split your class into smaller groups.

Using this activity in another subject. Mathematics is relevant to other subjects too. Rather than focusing the lesson objective for mathematics ("bar charts") you can use this tool to help students learn about other topics. For example, you can make this relevant to education and social issues, by asking how far student teachers had to travel to their primary and then to their secondary school. Ask students to provide reasons for the difference in travel distance. (One possible answer: Because many primary pupils do not continue to secondary, there are fewer secondary schools. You might see a split, between those students who had to travel every day to their secondary school vs. those who were boarding.)

Sources

TESS-India, "Physical representation in mathematics: handling data", http://www.tess-india.edu.in/sites/default/files/imported/57313/EM11_AIE_Final.pdf, available under Creative Commons Attribution-ShareAlike (http://creativecommons.org/licenses/by-sa/3.0/; unless identified otherwise).

TESS-India, "Hands-on learning and embodiment: constructions in geometry", http://www.tess-india.edu.in/sites/default/files/imported/57364/SM09_AIE_Final.pdf, available under Creative Commons Attribution-ShareAlike (http://creativecommons.org/licenses/by-sa/3.0/; unless identified otherwise).

T5-1 T 10 Teaching Idea

Embodiment of a Coordinate System

Similar to the teaching idea on bar charts/graphs, you can also embody a coordinate system.

DBE Syllabus (2014), straight line: FDC 112M, FDC 122, FDC 222V, PFC 222; coordinate geometry: FDC 112M; graph: EPS 111, EPS 311, FDC 111, FDC 112, FDC 112M, FDC 113, FDC 122T, FDC 124, FDC 214, FDC 312, FDC 312S, FVA 223, FVA 224, GNS 211, GNS 221, ION 184, PFC 222, PRA 114, TEC 111, TEC 121, TEC 122, TEC 211, TEC 212, TEC 221, TEC 222, TEC 311.

Materials: Apart from paper, no materials are needed. However, you do need enough participants to be able to represent a coordinate system. This activity works especially well in large classes.

Steps for this activity:

- Ask student teachers to stand in a regular grid, one dimension being the x axis, the other dimension being the y axis. (They will need to have a piece of paper and a pencil with them for the next part of the activity.)
- Each student will have a unique (x,y) coordinate depending on their place in the grid. Have them write this on their piece of paper and hold it up for all to see.
- Start the activity by asking all those students whose coordinates satisfy the equation x=1 to raise their hands. The vertical line of students that raise their hands represents the straight line equation x=1. Make sure that all the students can see this.
- Continue the activity by asking the students to raise their hands according to other simple equations (eg y=2, x=y, x=y+1, x=2y, etc).

Increasing the level of challenge:

- You can make the activity more challenging by getting students to raise their hands according to two equations to determine points of intersection (raise hands for x=y and for y=3 at the same time).
- You can even use your human coordinate system to 'plot' inequalities: Get students to raise hands for inequalities (y<4). The students who raise their hands (those with a y-coordinate less than 4) represent the shaded area on a traditional pencil and paper plot. How might you adapt your human co-ordinate system to cope with something like 'x is greater than or equal to 3'?
- When your students get used to the idea of embodying a coordinate system they can do the activity without writing down their coordinates.

T5-1 T 11 Teaching Idea

Paper Folding Activities

Using paper folding activities can be an excellent way to build understanding of mathematical concepts. Instead of paper sheets which can be costly, you can use old newspapers for this, making it a low-cost resource.

Paper folding can help in learning about angles. Angles play an important role in life. However, people often do not see these angles around them or associate them with the angles that they work with in the classroom. When learners think of angles, they often restrict their thoughts to intersecting lines drawn on paper that can only be measured and constructed by using a protractor and a pair of compasses.

The following activity aims to introduce learners to how they can 'construct' angles through paper-folding using nothing but a rectangular piece of paper. This hands-on experience of manipulating angles can help to explore the meaning of symbols, representations and concepts related to angle.

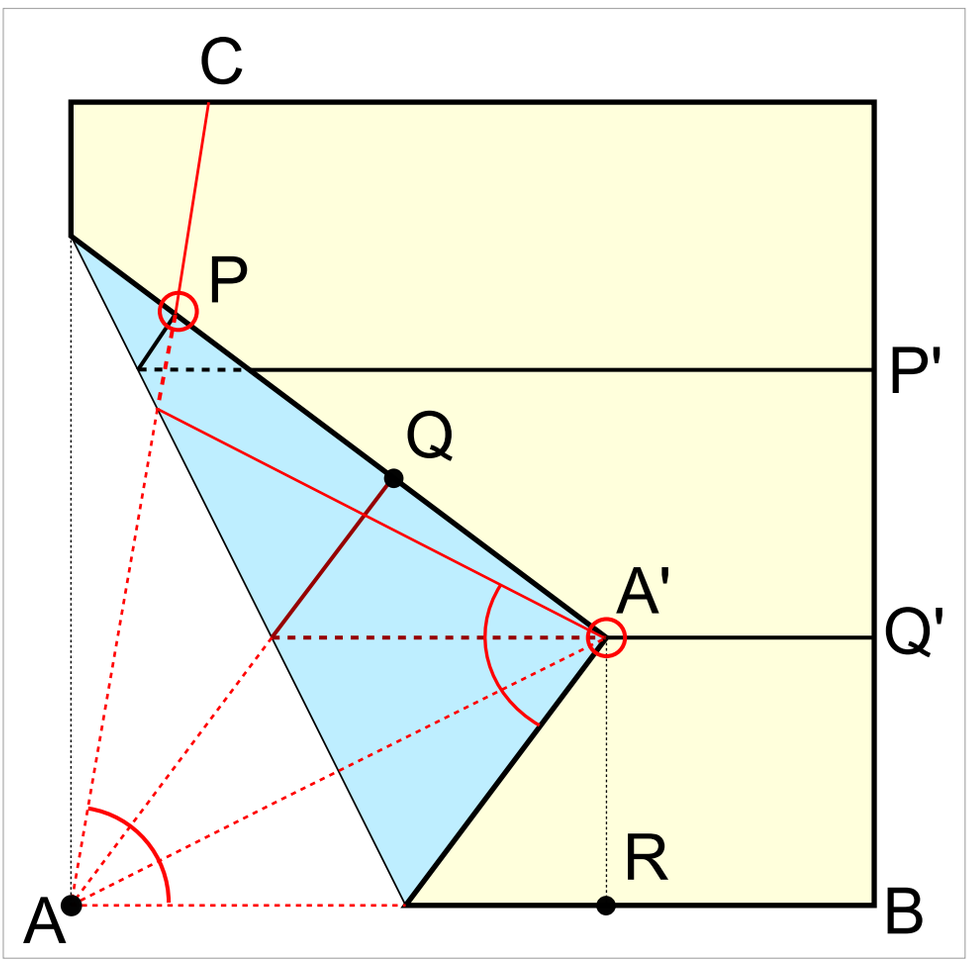


Figure 27. Mathematics of paper folding: Trisecting an angle

Constructing Angles by Folding Paper

Learning objectives: developing understanding about the size and magnitude of angles; visualising angles; finding relationships between angles.

DBE Syllabus (2014), angles: FDC 112M, FDC 122, FDC 122T, FDC 222V, ION 184, PFC 222, TEC 211, TEC 222.

Materials needed: paper to fold. This can be old newspapers, used paper bags.

The activity: Tell your student teachers:

- Any straight edge represents a straight angle of 180°. By folding the paper, try to construct the angles that measure 180°, 90°, 77.5°, 50°, 45°, 30°, 22.5° and 11.25°

Now answer these questions:

- Which angles were easy to fold?
- Which angles difficult or impossible to fold?

Sources

TESS-India, "Hands-on learning and embodiment: constructions in geometry", http://www.tess-india.edu.in/sites/default/files/imported/57364/SM09_AIE_Final.pdf, available under Creative Commons Attribution-ShareAlike (http://creativecommons.org/licenses/by-sa/3.0/; unless identified otherwise).

Mathematics of paper folding: Trisecting an angle, image by: Dmcq - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=17450465

T5-1 T 12 Teaching Idea

Lung Capacity Using a Plastic Bottle

This activity is about using a plastic bottle with water to measure a volume of air, such as the volume of air stored in the lungs. However, you can adapt this activity to other areas.

Clarify learning objectives: Will your activity focus on lung capacity (physiology)? Are there broader objectives to do with the respiratory system? You could also focus on the experimental process. Or are you conducting this activity as part of a methodology lesson, where the focus is on pupil learning? Decide on the learning objectives for the activity, and record them in your activity plan.

DBE Syllabus (2014), lung: PRA 125; physiology: PRA 124, PRA 125, PRA 212, PRA 222; respiration: FDC 114, PRA 125; respiratory tract: ECE 213, PRA 125; discovery learning, discovery method: EPS 211, FDC 214, FVA 211.

Decide which materials to use: You need some large plastic bottles, straws, and a water-basin, such as a bucket. If you want to measure lung volume accurately, you need to also mark the bottles: so you will need pens, and a way to measure water.

Steps for this activity: The basic steps are to fill a plastic bottle and bucket with water, and then to place the bottle upside down into the water. You observe that the water stays in the bottle (why?). Place one end of the straw above the water, and the other end in or below the plastic bottle. Exhale into the straw and observe the bottle filling with air.

Depending on the learning objectives, decide what the detailed steps are. For example, student teachers can predict and then measure e.g. lung capacity and tidal volume. They could investigate their variability for things like height, gender, chest circumference.

Figure 28. Pupils in Zambia are measuring their lung volume

Further Resources

You can watch the clip of Zambian students measuring their lung volume here: http://oer.educ.cam.ac.uk/wiki/Video/Aggie_lung_capacity.m4v.

Sources

Image from: OER4Schools, “Aggie and class explore lung capacity with a hands-on demonstration using a water bottle”, www.oer4schools.org, http://oer.educ.cam.ac.uk/wiki/Video/Aggie_lung_capacity.m4v. Creative Commons Attribution ShareAlike.

T5-1 T 13 Teaching Idea

Make a Simple Model Lung

In this activity, you will make a simply model lung.

DBE Syllabus (2014), lung: PRA 125; physiology: PRA 124, PRA 125, PRA 212, PRA 222; respiration: FDC 114, PRA 125; respiratory tract: ECE 213, PRA 125; discovery learning, discovery method: EPS 211, FDC 214, FVA 211.

Materials needed: This activity uses a plastic bottle, a balloon, some plastic (from a plastic bag) and an elastic band. Depending on the resources available, you can make a simplified version (just one lung) or a more anatomically correct one (two lungs).

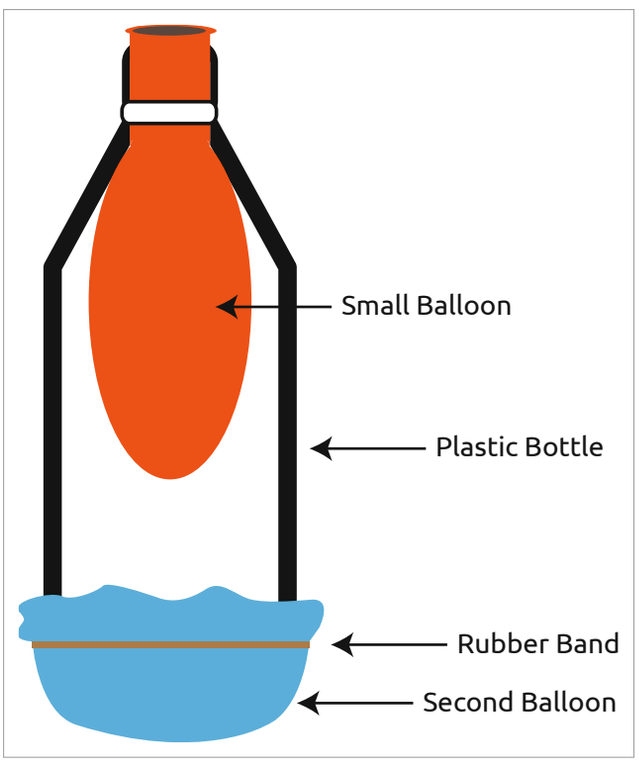


Figure 29. A simple model lung

Steps for this activity: The images show how the model lung is assembled. Cut the bottle in half, and discard the bottom. Place one balloon inside the bottle, folding it over the spout of the bottle, so that it hangs inside the bottle. Use the other balloon to create the diaphragm.

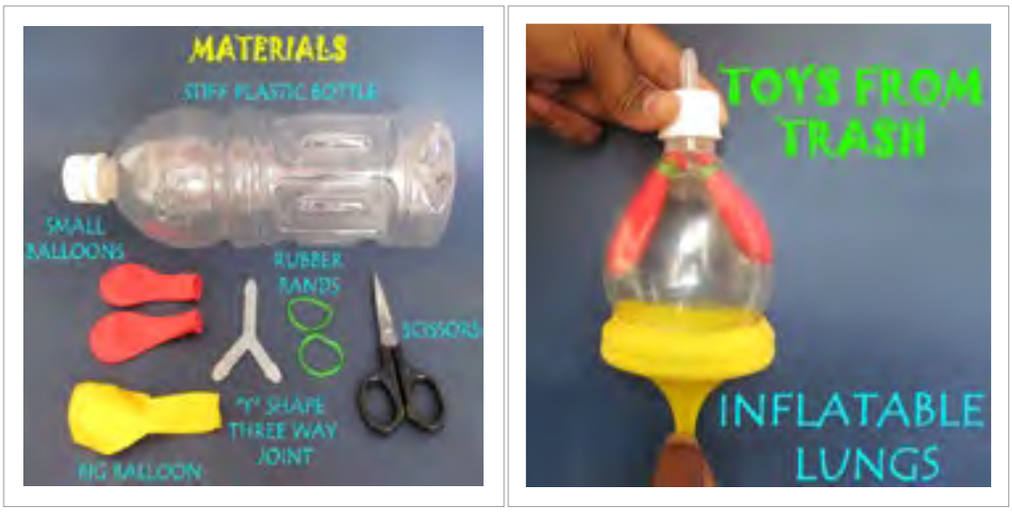


Figure 30. A more complex model lung, including the resources needed (Arvind Gupta, Toys from Trash).

Further Reading

You may like to look this up on Arvid Gupta's site, here http://www.arvindguptatoys.com/toys/Inflatablelungs.html or watch a video here https://www.youtube.com/watch?v=P_Cah94kYEs.

The Science Museum of Minnesota also has a lesson available where students make a model lung, avaialable here https://www.smm.org/heart/lessons/lesson7.htm. The lesson is presented in the context of other lessons on the circulatory system.

Sources

Images from Arvind Gupta, http://www.arvindguptatoys.com. Permission granted for non-commercial use.

T5-1 T 14 Teaching Idea

Modelling Physical Changes and Chemical Reactions

Students can represent particles and arrange themselves to resemble, for example, the arrangement of particles in solids/liquids/gases or elements/molecules/compounds.

The aim of this activity is not to give student instructions on what to do. Instead, ask them to come up with a way of modelling the states of matter using themselves as particles. Their models should satisfy the physical properties of the state of matter that they are representing. Larger groups of up to 12 students work well for this activity and a bit of space is required.

For solids: Students arrange themselves into a regular pattern of rows and 'vibrate' in their position (they can do this by shifting from one foot to the other).

For liquids: Students stand close together but not in rows. They should be touching and are free to move around in a cluster like the particles in a liquid do when it is poured.

For gases: Each student gas particle can move around freely and quickly as gas particles do when they diffuse.

DBE Syllabus (2014), diffusion: FDC 124.

T5-1 T 15 Teaching Idea

Action Dice

You can use random selection in the classroom to introduce an element of fun that keeps students engaged in the task or activity. The activity can be implemented in many different ways. For example, you could create cardboard cubes (dice) with different 'prompts' on each face.

Figure 31. The idea of making a dice with character traits is similar to creating story boxes like the one shown.

For example:

- In an English language lesson, have different action verbs on each face and students take turns to roll the dice and act out their verb or use it in a sentence etc.
- Dice with different character traits on each face could be used when studying characters in a novel. Students could then be asked to give an

example from the story where certain characters express these traits. They roll the dice to determine which trait their response should be about.

- Students can also make dice by deciding for themselves which prompts are necessary to allow them to delve deeper into the topic that they are studying.

The random nature of the activity due to rolling the dice increases students' motivation and helps to develop their improvisation skills. This type of activity is very inclusive and allows all students to make a contribution to the activity based on their own understanding and knowledge.

You could also implement this activity by using a spinning wheel, or simply let students pick prompts written on paper out of a bag.

Figure 32. Another way to introduce randomness is through a spinning wheel, as shown here.

Teaching Strategy 2 - Introduction
Books and Printed Materials

T5-2 i 1 Learning Objectives

In this teaching strategy, you will learn to appraise the TLMs you already use by

- Conducting a TLM audit, and prepare a TLM inventory, that lists college and personal TLMs;
- Conducting a gender audit of your TLMs.

You will also have the opportunity to learn more about the

- Management of TLMs, especially for maintenance and storage.

You will also learn about textbooks and other printed materials as TLMs, and

- Plan activities that make good use of textbooks and other printed materials for teaching and learning.

The remainder of this section is pre-reading for the PD session. As you read through this introductory section, and as you work through the activities in the following PD sessions, relate them back to the above learning objectives.

T5-2 i 2 Ms Motumo's Story: Where Were These Materials?

Read Ms Motumo's story before doing an audit (a systematic review) of what TLMs there are in your college that you may be able to make use of.

> **The Missing Materials**
>
> The following story is based on actual events in a number of schools in different countries.
>
> Ms. Motumo had just been appointed a school inspector in her district after 10 years as a Grade 3 teacher and another 7 years as a school principal. One of her first tasks as an inspector was to find out what types of teaching and learning materials were available at the schools in her district. The district office needed to know this information in order to prepare a budget and place orders for the coming school year. What she found was truly surprising.

In school after school that she visited, the teachers said that they had no teaching and learning materials. They said that they didn't have textbooks or they did not have enough textbooks to let the learners use them. They could only use one copy for their own lesson preparations. When Ms. Motumo went to the classrooms she noted that the teachers truly did not have many teaching and learning materials in their classrooms. Walls of classrooms were bare, learners desks contained only exercise books, and if bookshelves and cabinets were in the classroom, they were usually empty.

Ms. Motumo knew from her experience as a principal that teaching and learning materials were indeed scarce. But she knew that the district had provided schools with materials over the past few years. Where were these materials? On her tour around the schools with the principals she came across a similar situation at each of the schools. The materials were indeed at the school, but in almost all of the schools piles of books sat unused and dusty on bookshelves and cabinets in the principal's office or staff room. Equipment and materials were in boxes under desks, and beakers and science equipment were used for drinking glasses and pencil holders.

At Ms. Motumo's former school she had her teachers develop a system for storing, using, and maintaining the teaching and learning materials. As a result, her teachers were very familiar with the materials and used them often. She also knew that some damage of the materials was inevitable but that is the price to pay for learners gaining a deeper understanding of the things they were learning. She also knew that the use of these books and materials in her school made the learners very interested in learning.

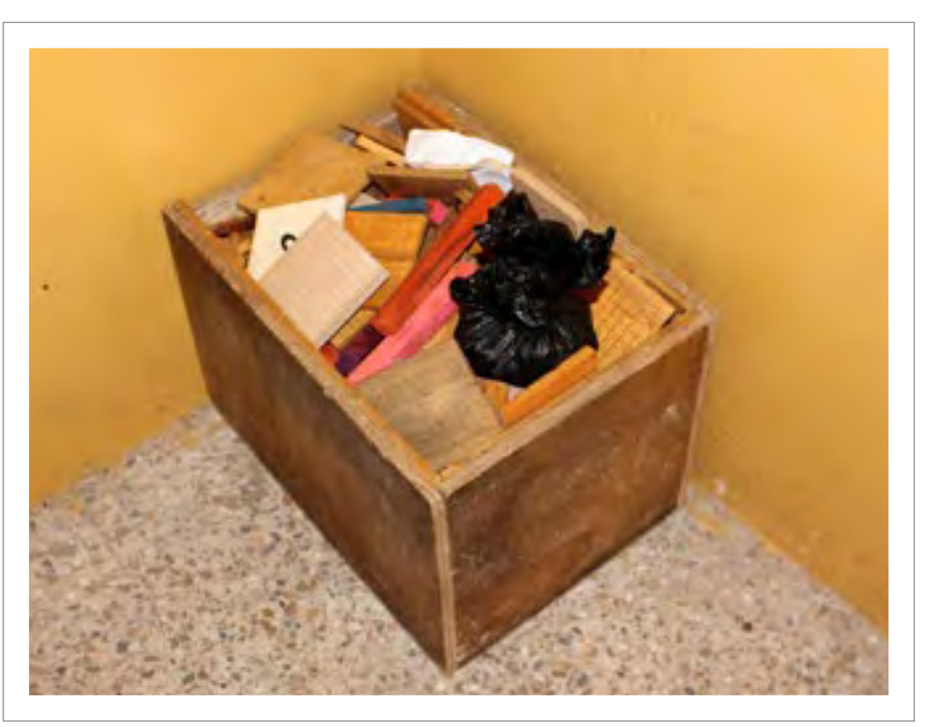


Figure 33. Storing TLMs in the corner of a classroom.

T5-2 i 3 Do a TLM Audit

If you have been sorting through your TLMs in preparation for these professional development sessions, the following questionnaire should be relatively quick and straightforward to complete. In light of the following story, you should make a special point of checking around to see where things could be hiding before using the tool/questionnaire so that your audit is as comprehensive as possible.

So, thinking again about your own TLM use, take a few moments to complete the following TLM tool. Put a circle around the option that applies to you eg circle 'yes' or circle 'no'.

If a question does not seem relevant to you or your subject area, just place n/a (for not applicable) next to it. Do you use other TLMs that are not on the list? If you do then add these to the bottom of the questionnaire.

We will use the completed questionnaires during the PD session to address issues of TLM usage, storage and maintenance so make sure you answer the questions honestly. You might want to take some pictures of TLMs that you have made to share with your colleagues during the session.

Tool 3: TLM audit questionnaire

Text-related TLMs	**Do you use these in your classes?**	**Are they homemade (HM) or manufactured (M)?**	**Where are they stored? (classroom, resource room, tutor's house etc.)**
Story books	yes/no	HM/M	
Games	yes/no	HM/M	
Posters	yes/no	HM/M	
Non-fiction books	yes/no	HM/M	
Magazines	yes/no	HM/M	
Newspapers	yes/no	HM/M	
Charts/maps	yes/no	HM/M	
Flashcards/ vocabulary cards	yes/no	HM/M	
Other TLMs	**Do you have these?**	**Are there enough of them?**	**Where are they stored?**
Blocks	yes/no	yes/no	
Plastic cubes	yes/no	yes/no	
Bottle tops	yes/no	yes/no	

Subject-related equipment	yes/no	yes/no	
Clay	yes/no	yes/no	
Crayons or coloured pencils	yes/no	yes/no	
Activity books	yes/no	yes/no	
Activity sheets	yes/no	yes/no	

T5-2 i 4 Where Are You Storing TLMs

Spend a few minutes thinking about where the TLMs may be stored, and write down a few locations in the following table.

Where do we store our TLMS?

Figure 34. A cupboard in the TLM room.

T5-2 i 5 Books and Printed Materials

It is widely accepted that textbooks and other TLMs can be used to enhance the quality of learning. In this teaching strategy we aim to show you new ways of using textbooks and other printed material to encourage greater student engagement in your lessons. You will be introduced to teaching ideas that promote the kind of deep learning that was discussed in other themes, such as Talk for Learning and Group Work. By using textbooks alongside these other teaching strategies and integrating their use with interactive teaching methods they can be a very powerful tool for learning.

Figure 35. Student teachers discuss a passage from the text set for the semester.

T5-2 i 6 Conducting a Gender Audit of Your Books and Printed Materials

Textbooks, storybooks, pictures, newspapers and posters are often the biggest culprits of portraying gender stereotypes of women and girls. For example, take a look at the following textbook illustration.

Figure 36. A textbook illustration

Now consider the following questions:

1. How many men and how many women do you see?
2. What roles are men playing?
3. What roles are women playing?
4. What underlying message is being communicated?
5. Do you think these messages are fair?

If you look at the illustration critically, you might notice that it is communicating the message that only men are capable of having professional careers and that women are only expected to be mothers in charge of domestic duties. This type of subtle messaging, when repeated in textbooks and reinforced in society and the media, can significantly affect female students' aspirations and preferences. After seeing such images for 12+ years of schooling, many females will unconsciously accept these roles; this very much limits their goals and their confidence in what they are capable of doing. Do you think that is fair? If the illustration showed only white people in professional roles, what sort of message would non-white people take away?

Most stereotypes are extremely unfair — whether they are based on gender or race — because they perpetuate false assumptions about what a group of people are capable of. We need to remember that the intelligence we are born with is not affected by our gender or race. However, the unfair treatment we receive in society and school (based on our gender or race) can affect the extent to which we can use our intelligence to our fullest potential. This unfair treatment can be very subtle (such as the illustration above), and as educators we have to do our best to address it and prevent it.

Since tutors do not often have a choice about the textbooks or materials available at their colleges, it is important to do a gender analysis of the textbooks, books, posters, charts or any other TLM that you have recorded in your audit. Ask the following questions with regard to any images, characters, stories or exercises in the materials you plan to use in class:

1. **How many men/boys and how many women/girls are featured?** If it is unbalanced, ask yourself why?
2. **What roles are men/boys playing?** Are the roles professional? Prestigious? Heroic? Positions of power? Do they show the positive things that men/boys can do?
3. **What roles are women/girls playing?** Are the roles domestic/in the home? Are they positions that are low-status or subordinate to men? Are females portrayed as less brave, less capable or less successful than males?
4. **What underlying message is being communicated?** Is the subtle message that men/boys are more important? More powerful? Braver? Smarter or better?

5. **Do you think these messages are fair?** What if these messages were based on race instead – that one race is more important, more powerful, braver, smarter or better. Is that fair, accurate or just?
6. **If the underlying message is unfair, how might this affect the female students in your class?** Messages based on false assumptions about ability or intelligence are extremely unfair, and reduce female students' confidence, limit their goals in life and cause them to achieve less.
7. **How could we improve this TLM to make the message more fair and give females more confidence?** Would it be to increase the number of females? To change the roles they are playing? Show males doing typically 'female' jobs or females doing typically 'male' jobs?

If you find that your TLM portrays equal (or higher) numbers of females and that the roles they play are *equal* to that of males, then the TLM is likely to be gender sensitive. However, if your TLM (or portions of it) contain unfair assumptions and portrayals of women/girls, it is *not* gender sensitive. That said, you can still use the TLM in class; **however, you need to make students aware of the stereotypes and unfair messages that are being portrayed**. In order to do this, you should ask the same seven questions of your students while using the TLM so that they too become more conscious of unfair assumptions and portrayals of women/girls.

Figure 37. Posters stored in a box.

T5-2 i 7 Further Reading

Reports

Christine Adu-Yeboah (2011), *Teacher Preparation and Continuing Professional Development in Africa (TPA) — Learning to Teach Reading and Mathematics and its Influence on Practice in Ghana.* Available at https://www.sussex.ac.uk/webteam/gateway/file.php?name=report-ghana-1july2011.pdf&site=320

Tony Read (2015), Where Have All the Textbooks Gone? Toward Sustainable Provision of Teaching and Learning Materials in Sub-Saharan Africa. World Bank. Available at https://openknowledge.worldbank.org/bitstream/handle/10986/22123/9781464805721.pdf?sequence=1

T5-2 i 8 Sources

Ms Motumo's story, minor adaptations, from page 47 in: du Plessis, J., Habib, M., Haddy Sey, B. G., Baranick, A., & Rugh, A. (2002). *In my classroom: a guide to reflective practice.* Washington DC: USAID and AIR. Available at http://www.air.org/sites/default/files/downloads/report/In_My_Classroom_0.pdf.

Textbook illustration, from: EQUIP-T (2014), *Education Quality Improvement Programme in Tanzania, Teacher In-Service Training Module 4: Increasing Gender Equity and Participation.* Dar es Salaam: EQUIP-T.

Teaching Strategy 2 — PD Session
Books and Printed Materials

T5-2 S 1 Start of Session

Housekeeping

Welcome each other to the session, and undertake the necessary housekeeping (such as circulating the register).

Timekeeping. As usual, spend the time during the session roughly as follows:

- About 15 minutes for introductory activities, including the "three Rs";
- About 30-35 minutes for the shared session activities;
- About 30-35 minutes for planning classroom activities (using the section with teaching ideas);
- About 5-10 minutes at the end of the session to review any issues that have arisen during planning.

T5-2 S 2 Reflect Together

Your Teaching and Learning Since the Last Session

For the reflection, turn back to T5-1 S, "Reflect After Your Teaching", where you will have filled out TLM Tool 2. Your PDC will guide you through the reflection.

Figure 38. During reflection, a tutor shows some of the TLMs used in class.

T5-2 S 3 Review and Recap

Introducing This Session

Review pre-reading. Now turn to the pre-reading. Does anyone have any questions about the introduction? Spend a few minutes discussing any issues with your colleagues.

Recap learning objective. Finally, recall the specific learning objectives for this teaching strategy. Are there any questions?

T5-2 S 4 Activity 1 — Talking Points

Ten Talking Points on Textbook Use

There are a lot of misconceptions in schools and colleges surrounding textbook use. This activity aims to air these misconceptions by encouraging you to talk with your tutor colleagues.

The talking points technique is introduced in the Talk for Learning theme (T3). Talking points are short statements about a topical issue that can even be wrong. The point is to get everyone talking about a particular subject, in this case *textbooks*. They allow us to find out what others think.

Do the following talking points activity in groups and before you start, give your group a name that can be used when you are giving your feedback.

Everyone takes their turn to say what their opinion is on a particular point and the rest of the group agree or disagree with them or add further comments. Any challenges to what someone says should be sensible and respectful. If you all agree on a particular point you can move quickly on to the next one.

1. You must work through a textbook in order and make sure to cover every topic in the book.
2. Textbooks are never wrong and should not be questioned.
3. Using an out-of-date textbook is worse than using no textbook at all.
4. It is always the responsibility of the tutor/teacher to keep textbooks well maintained/looked after.
5. It is fine to write notes in the margins of textbooks.
6. The main use of a textbook is to provide factual information.
7. Students do not need to take notes in their books if the information they need is already in the texbook.
8. Giving students a copy of your notes means they don't need a textbook.
9. Using a textbook too much can be boring for students.

10. It is useful to keep back a few copies of a textbook (i.e. not issue them) in case others get lost.
11. You must fully understand all the subject content in any textbook that you use.
12. Using a textbook may mean that students come to know as much as (or even more than) the teachers.
13. Textbooks should only be used if there are enough for each student to have one.
14. Sharing textbooks between students (eg 1 textbook per 3 students) is always a negative scenario with very few benefits.
15. Poor readers find textbooks difficult to understand.

Figure 39. Two students are discussing a text.

T5-2 S 5 Activity 2

Looking at the Big Picture: How to Make Sure Your TLMs Are Gender Sensitive

The purpose of this activity is to practise conducting a gender analysis on a TLM and then using this analysis to inform a discussion with your students. To do this activity:

- Split into groups.
- Use the seven questions that you read in T5-2 i (reproduced below) to guide your gender analysis of the **textbox "ICT in Education" (see box below)**. Imagine that this textbox comes from a textbook or other TLM used by tutors or teachers.
- As a group, discuss your answers and make a note of your answers.

The seven questions for the gender analysis were:

1. **How many men/boys and how many women/girls are featured?** If it is unbalanced, ask yourself why?
2. **What roles are men/boys playing?** Are the roles professional? Prestigious? Heroic? Positions of power? Do they show the positive things that men/boys can do?
3. **What roles are women/girls playing?** Are the roles domestic/in the home? Are they positions that are low-status or subordinate to men? Are females portrayed as less brave, less capable or less successful than males?
4. **What underlying message is being communicated?** Is the subtle message that men/boys are more important? More powerful? Braver? Smarter or better?
5. **Do you think these messages are fair?** What if these messages were based on race instead – that one race is more important, more powerful, braver, smarter or better. Is that fair, accurate or just?
6. **If the underlying message is unfair, how might this affect the female students in your class?** Messages based on false assumptions about ability or intelligence are extremely unfair, and reduce female students' confidence, limit their goals in life and cause them to achieve less.
7. **How could we improve this TLM to make the message more fair and give females more confidence?** Would it be to increase the number of females? To change the roles they are playing? Show males doing typically 'female' jobs or females doing typically 'male' jobs?

ICT in Education

Information and communication technology (ICT) plays an important role in increasing economic productivity, enhancing the delivery of public and private services and achieving broad goals in education, healthcare and employment. As a result, many countries are bringing ICT into their classrooms and schools.

Figure 40. Children in ICT lab, Dangme News, June 2016. Used with permission.

Tutor Discussion

After finishing your gender analysis, discuss the outcomes. What are the implications for your classroom practice? How could you conduct a similar activity in the classroom with your student teachers?

T5-2 S 6 Activity 3 — PMI

What Do We Think of Textbooks/ Printed Material as TLMs?

A useful tool for organising thinking is the "Plus, Minus and Interesting" chart (devised by Edward DeBono) that was introduced in Theme 3, "Talk for Learning". Using the tool is also known as "doing a PMI". We are going to do a PMI after a brief discussion on textbooks as TLMs.

- In groups spend a few minutes sharing your thoughts about the use of textbooks and other printed material as TLMs in schools and colleges.
- Summarise the group's thinking in a PMI chart like this one, working through the *positives* **(P)** first before moving on to the *negatives* **(M)**. After recording the negatives then move on to the *interesting* **(I)** things:

P	**M**	**I**
What are the good/ positive things about textbooks/printed material? Or what good things have you done/seen done with them? Are they gender sensitive?	What are the bad/minus things about textbooks/ printed material? Or what problems have you had with them? Are they **not** gender sensitive?	What interesting things about textbooks/printed material have you noticed?
1. 2. 3.	1. 2. 3.	1. 2. 3.

Tutor Discussion

- Spend a few minutes looking at other groups' charts and notice things that others have noted that you may not have thought of. This is your opportunity to find out if anyone else is using textbooks in a way that you have not thought of.
- Note useful points or new ideas that you might like to try out with your students in the previous chart for future reference.

Figure 41. A student is using graph paper.

T5-2 S 7 Activity 4

TLM Audit

Work in groups of 4-5 (the groups should be made up of members of different departments if possible). Spend a few minutes sharing your completed TLM audit questionnaire (from the introduction to this teaching strategy) with each other.

- Notice what is the same in your responses.
- What are the reasons for the similarities?
- Notice what is different in your responses
- What are the reasons for the differences?

If you have taken any pictures of your TLMs (or brought any) you can share theses now too.

Here is a copy of the TLM Audit questionnaire from the introduction. If you have not already completed it you can do so now.

Tool 3: TLM Audit Questionnaire

Text-related TLMs	Do you use these in your classes?	Are they homemade (HM) or manufactured (M)?	Where are they stored? (classroom, resource room, tutor's house etc.)
Story books	Yes/No	HM/M	
Games	Yes/No	HM/M	
Posters	Yes/No	HM/M	
Non-fiction books	Yes/No	HM/M	
Magazines	Yes/No	HM/M	
Newspapers	Yes/No	HM/M	
Charts/maps	Yes/No	HM/M	
Flashcards/ vocabulary cards	Yes/No	HM/M	
Other TLMs	**Do you have these?**	**Are there enough of them?**	**Where are they stored?**
Blocks	Yes/No	Yes/No	
Plastic cubes	Yes/No	Yes/No	
Bottle tops	Yes/No	Yes/No	
Subject-related equipment	Yes/No	Yes/No	
Clay	Yes/No	Yes/No	
Crayons or coloured pencils	Yes/No	Yes/No	
Activity books	Yes/No	Yes/No	
Activity sheets	Yes/No	Yes/No	

Tutor Discussion

This can be done as a whole class.

- What do you know now that you did not know before this activity?
- Do you have any questions about the maintenance and storage of TLMs?
- Do you have a regular schedule of checking and refreshing your TLMs, making sure that they are as useful as they could be and enjoyable to use? Why might this be a good idea?

T5-2 S 8 Plan and Practise Together

Plan an Activity on Books and Printed Materials

It is now time to plan an activity. Each tutor should plan their own activity using the activity plans provided. To find some inspiration, please consult the 'Teaching Ideas' section of this teaching strategy.

Remember: when planning and executing activities, always ensure that female students have equal opportunities to participate, to try first and to take leadership roles. Often we forget about being gender responsive and male students end up unfairly dominating and benefiting more.

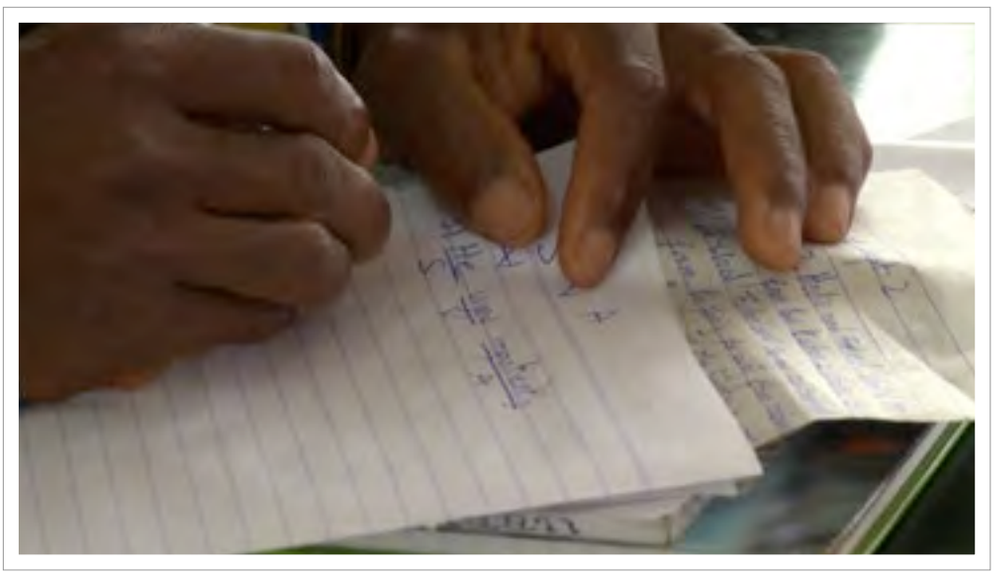


Figure 42. A student teacher records a sentence pattern in their notebook.

T5-2 S 9 End of Session

Agreeing Follow-up Activities

This is now the end of the session. Decide when you will teach your planned activity and make arrangements with a colleague for them to observe you (see the Teach and Observe section below). In the next PD session we will return to the Reflect Together section.

T5-2 S 10 After the Session: Teach and Observe

Using Books and Printed Materials

It is important for your professional learning that you actually teach the activity that you have planned. Please make sure that you have your activity plan available when you teach.

Any issues that arose during the lesson should be written down immediately after you have taught, and remember to fill in your observations section of the tools after you have taught.

If possible arrange with a colleague to observe each other when you each do the activity with your student teachers during the week.

T5-2 S 11 Reflect on Your Teaching

Books and Printed Materials

Make sure to fill in this observation tool as soon as possible after you have taught your planned activity with your students. It will be used as a starting point for reflection during the next session.

Tool 2: TLM Observation Questions

Brief description of your TLM:				**Notes/reflections**
1.How long did it take you to prepare your TLM for the activty?	Less than 10 min	10-30 min	More than 30 min	
2. How easy was it to get hold of the resources you needed for your TLM?	Very easy	Not very easy	Hard	
3. How motivated were the students to engage with the TLM?	Very	Not very	Not at all	
4. Did you have enough TLMs for all the students to interact with?	Yes	No	Not sure	
5. Did you ensure that female and male students had equal opportunities to interact with the TLM?	Yes	No	Not sure	
6. Did your TLM enhance learning?	Yes	No	Not sure	
7. How was the pace of the lesson compared to normal?	Faster	Same	Slower	
8. Will you use this TLM again?	Yes	No	Not sure	
9. If Yes, where will you store it in the meantime?				

10. Will you make any modifications to your TLM?	Yes	No	Not sure	
11. If 'Yes' what will you change?				

T5-2 S 12 Further Reading

Tony Read (2015), Where Have All the Textbooks Gone? Toward Sustainable Provision of Teaching and Learning Materials in Sub-Saharan Africa. World Bank. Available at https://openknowledge.worldbank.org/bitstream/handle/10986/22123/9781464805721.pdf?sequence=1

Teaching Strategy 2 — Teaching Ideas
Books and Printed Materials

T5-2 T 1 Plan and Practise Together

Writing an Activity Plan

As usual, you should use an activity plan template to guide your planning, in which you record the learning objective, the resources used, and the steps for the activity as usual. There is guidance available near the activity plan templates, as well as in T5-1T. Please refer back to this in case you are unsure what to do.

Theme 5: Teaching and Learning Materials PD Session 2: Books and Printed Materials	
Teaching Idea	**How it works**
T5-2 T 2. Using a textbook for (a) listening and speaking practice and (b) revision	Change details in a text that students have already studied and have them identify the 'mistakes'.
T5-2 T 3. Using a KWL table to get students engaged with information in a textbook	Find out what students already know about a topic and motivate them to read/study more by using a simple table.
T5-2 T 4. Using newspapers for English language practice	Use local English language newspapers as a resource for reading and speaking activities.
T5-2 T 5. Using brochures and flyers for language practice	Practise the reading skills of skimming and scanning by asking questions about information and publicity brochures.
T5-2 T 6. Using a textbook to identify what students do not understand	Use the textbook interactively as a whole class (in any subject) to identify the things that students have difficulty with. Work through the issues, inviting students to make contributions based on their knowledge and understanding.

T5-2 T 7. Using a textbook to develop students' own mathematical dictionaries	Encourage students to use the information in their textbooks (in any subject) to make a dictionary or glossary of useful terms. Use the opportunity to work on improving explanations and extending them as more information becomes available.
T5-2 T 8. Using a textbook cleverly to tackle more difficult questions with less anxiety	Students analyse questions in the textbook (in any subject area) and come up with strategies to help with tackling them.
T5-2 T 9. Using newspaper content as a rich learning resource	Ideas for how to use the data in old newspapers as a source around which to build rich learning experiences.
T5-2 T 10. Enlarging activity	Students use a grid to resize printed material in any subject. Careful measuring and copying is required. You can also make TLMs for the classroom using this technique.
T5-2 T 11. Write and share talking points using a textbook as a source of information	Make use of the textbook (in any subject) as a source of information that students can use to write their own talking points. Groups can discuss both their own and other groups' talking points to enrich their understanding of any topic.
T5-2 T 12. Make and share crosswords using a textbook as a source of information	Writing crosswords is more challenging than you might think. Students can make sure they have their facts straight by using a textbook but they will still need to think about the best way to phrase questions and what the key terms and their meanings are.
T5-2 T 13. Make and share graphic organisers on the topic of circulation using a textbook	Students create mind maps and concept maps on different topics (in any subject) using textbooks and other printed material as a source of information. Large versions of these can be displayed on the classroom wall.
T5-2 T 14. Creating lapbooks using information from other sources	Lapbooks are a tailor-made interactive resource that students create. They can be made for any subject or topic and generally contain a summary of pertinent information.
T5-2 T 15. Punctuation Police	Remove the punctuation from any printed material and ask students to complete with the correct punctuation. This can be done in any subject as a good understanding of the subject matter is required to punctuate correctly.

T5-2 T 16. Filling in the blanks ("cloze procedure")	Use printed material as a source of information. Copy out a paragraph leaving out the key words and task students to fill in the missing words.
T5-2 T 17. Using students own writing as a TLM	Students critique each other's written work and look at ways of improving it.
T5-2 T 18. Find the nouns and verbs	Use newspapers or other printed material to identify different parts of language. This idea of classifying what is written can be used in any subject and encourages students to engage with content on a deeper level.

T5-2 T 2 Teaching Idea

Using a Textbook for (a) Listening and Speaking Practice and (b) Revision

This activity provides useful practice in listening and speaking for an English language class. It can also be used in other subjects to revise a topic.

1. Choose a text (e.g. a report of an incident, a short story or a description of a process) that the students have already studied.
2. Decide on 6-8 changes that you will make to the content. Be sure to keep a record of the changes by underlining or highlighting the words that you change.
3. Dictate your version of the text to the students. Ask them to listen and see how many 'mistakes' they can notice.
4. Have the students discuss the 'mistakes' with a partner. If necessary dictate the text a second time so that students can identify more mistakes.
5. Have students reconstruct the text in their own words.

Look for a suitable text in the coursebook for your subject and try out this idea.

T5-2 T 3 Teaching Idea

Using a KWL Table to Get Students Engaged With Information in a Textbook

In Theme 3: Talk for Learning you were introduced to KWL tables (DBE Syllabus (2014), KWL: ECE 122, FDC 211, GNS 221). This activity can be used

in any subject, e.g. an English language class to arouse students' interest in a topic before they read about it. It can also be used in other subjects before a new unit of study.

- The first step (K - know) draws on what students already **know** about the topic. This provides an opportunity for the teacher or tutor to introduce key vocabulary that students will need to understand and discuss the topic.
- In the second step (W - what/want) students think about **what** they **want** to find out about the topic. This arouses their curiosity and gives them a reason for reading.
- In the final step (L - learnt) students reflect on what they have **learnt** from the reading or unit of study.

Steps for this activity:

1. Students draw a table with three columns in their notebooks (see the example below).
2. In the first column students write what they know about the topic.
3. The teacher/tutor elicits what students want to know more about, specific to the topic. They record their questions in the second column.
4. After reading the text (or studying the unit), the teacher/tutor elicits what new information students have learnt from the reading (or from the unit of study). They record this in the third column.
5. Optional: if the students have a lot of unanswered questions, the class could discuss how or where they might find the answers (e.g. the college library, the Internet, asking local experts, etc.).

The table can be done individually, in pairs or small groups, or the teacher/tutor can draw one table for the whole class on the board or on a poster.

What I know	What I want to know	What I have learnt
Bees: Bees can fly. They can sting. They make honey. They like flowers.	Why do bees buzz? How do bees make honey? How long does a bee live?	The wings beat together very fast and create vibrations which make the buzzing sound. Bees make honey from the nectar they collect from flowers. Only one kind of bee makes honey. Bees are very important because they pollinate flowers, vegetables and fruit trees.

Figure 43. Sample KWL table - Topic: Bees

T5-2 T 4 Teaching Idea

Using Newspapers for English Language Practice

Newspapers are a great resource for pictures and text. Also, if you can get your students to regularly dip into an English newspaper their reading skills, writing skills and vocabulary will improve.

DBE Syllabus (2014), listening, speaking, reading and writing: ECE 122, ECE 314, FDC 211; writing skills: ECE 122, ECE 225, FDC 111, FDC 121, FDC 223, FDC 311; vocabulary: ECE 122, FDC 211; extract/interpret relevant information: FDC 111.

Here are three classroom activities using newspapers.

A newspaper quiz. This activity is good for practising the reading skill of scanning for information. You need one page of a newspaper for each group.

1. Divide students into groups of four or five. Give each group a page from a newspaper and a piece of paper.
2. Tell students they have 15 minutes to make a quiz based on their page. They must use different question words for each question. Suggest some kinds of questions, e.g. Where is …? How long has X been …? Why did …? How many people …? What happened in …? Who won …? How much did ...pay/cost …?
3. In groups, learners write 5 questions. Monitor, checking the grammar and spelling in the questions. Also, make sure that the questions are not too difficult!
4. When the groups have finished, they pass the paper and the questions to another group. Set a time limit for the new groups to do the quiz.

5. When the groups are finished check the answers to the quizzes and then go over the main mistakes (and corrections) in grammar that you saw over the course of the game.

Headlines. This activity provides speaking and reading practice. You need some recent articles with interesting headlines.

1. Divide the students into groups.
2. Prepare a newspaper article for each group. Remove the headline.
3. Groups read the article and guess the headline.
4. Groups summarise the article for the rest of the class and present the headline that they guessed.
5. Reveal the actual headlines. The group that was closest to their actual headline, wins.

Roleplay. This activity provides reading and speaking practice. It addresses the curriculum objective to 'give coherent narration and description of events, personalities, etc.'

You need an interesting article or story from the newspaper and a copy for each student. There are often "human interest" stories that can be developed into roleplays, e.g. "Man spends five days stuck in well", "Ghanaian student climbs Mt. Afadja").

1. Students read the newspaper article and complete comprehension activities.
2. Divide the class into two groups - A and B. Explain that students in Group A are going to take the role of the main character of the news story. They are going to be interviewed by a TV journalist (members of Group B).
3. Group B students work in small groups to prepare some questions to ask Group A students. Group A students predict the questions and elaborate the story.
4. Pair one student from Group A with one from Group B and have them conduct the roleplay.
5. Monitor and record common errors for a correction activity later.

Figure 44. Newspaper stand - Kumasi - Ghana

Sources

Image: Daily News. By Rachel Strohm, https://www.flickr.com/photos/rachelstrohm/6099675690, Creative Commons Creative Commons Attribution-NoDerivs License, https://creativecommons.org/licenses/by-nd/2.0/.

T5-2 T 5 Teaching Idea

Using Brochures and Flyers for Language Practice

Brochures, flyers and all forms of advertisement offer great, real information that your students can practise with. Some brochures may not be appropriate for all levels but you can always target the information you need like addresses and phone numbers, hours, etc.

Planning a social activity. Collect some flyers for local attractions (e.g. the museum, craft market) or for cultural activities (e.g. theatre, music concerts). In small groups students read the flyers and plan a day out. First they must agree on where they will go. Then they must arrange the date and time, decide who else is coming and whether they will do anything afterwards like going out for dinner.

Information hunt. Collect a variety of different brochures (e.g. public information brochures, hotel and/or holiday brochures, etc.). Write 2-3 questions about the content of each brochure on a piece of paper. Photocopy the questions and give each pair of students a copy. Display the brochures on tables around the room. Students work in pairs. They scan each brochure to find the answers to the questions. The first pair to finish is the winner.

This activity can be used in any subject. Also see DBE Syllabus (2014), extract/interpret relevant information: FDC 111.

Figure 45. Flyers stuck to a wall

Sources

Image: Flyers. By Sonny Abesamis, https://www.flickr.com/photos/enerva/16816734702, Creative Commons Attribution License, https://creativecommons.org/licenses/by/2.0/.

T5-2 T 6 Teaching Idea

Using a Textbook to Identify What Students Do not Understand

A textbook can be an effective resource to quickly assess what students understand of the topic that has been taught and to address misunderstandings.

Clarify learning objectives: Can you develop a learning objective (according to the syllabus) that fits with this activity? Learning objectives can come from any subjects. For example maths (developing understanding of maths vocabulary relating to geometry), in science (learning vocabulary about classification of animals), and many others.

Decide which materials to use: You need to decide which textbook or other printed materials to use, and what sections or pages you will want your student teachers to refer to.

Record steps for this activity: When you have decided on the learning objective and which materials to use, the following are the steps of the activity:

- Tell your students to look at the chapter in their textbook relating to the topic they are working on and identify any unfamiliar words or expressions, or things that they are not sure they fully understand.
- Ask the students to shout out these words and record these on the board. You will now know what concepts the learners are struggling with and require more attention.
- Ask who thinks that they know what these words mean, and invite them to explain to the whole group. Encourage the students to ask for clarification if they do not understand, or if anything is still not clear.
- Keep inviting explanations until all, or nearly all, students in the class understand what the words mean. Make sure you talk to any students who still do not understand after the lesson.

At the end of this activity the students will have a better understanding of the topic, misconceptions will have been aired and addressed and you will know what students are struggling with and what needs to be addressed in future lessons. This idea can also be used with any subject and terminology/ concepts that students may be struggling with.

Sources

TESS-India, "Tackling mathematical anxiety: combination shapes and solids", http://www.tess-india.edu.in/sites/default/files/imported/57355/SM10_AIE_Final.pdf, available under Creative Commons Attribution-ShareAlike (http://creativecommons.org/licenses/by-sa/3.0/; unless identified otherwise).

TESS-India, "Physical representation in mathematics: handling data", http://www.tess-india.edu.in/sites/default/files/imported/57313/EM11_AIE_Final.

pdf, available under Creative Commons Attribution-ShareAlike (http://creativecommons.org/licenses/by-sa/3.0/; unless identified otherwise).

T5-2 T 7 Teaching Idea

Using a Textbook to Develop Students' Own Subject Dictionaries

You could extend the above activity so that the textbook becomes a source for student teachers to write their own dictionaries. This is an excellent way for them to become aware of what they do know and what they do not, and to become more articulate in expressing their understanding.

The activity: following on from the previous activity you ask the student teachers to:

- Discuss what would be a good explanation that would make sense to them.
- Write down an explanation that makes sense to them. It does not have to be complete yet, or entirely correct, as they will be able to make changes to it as their understanding grows
- Draw a sketch of what the word means in such a way that it makes sense to the individual learner.

This idea can also be used with any subject and terminology/concepts that students may be struggling with.

Figure 46. A miniature dictionary. Can you make one yourself, and carry it with you to learn difficult words?

Sources

TESS-India, "Tackling mathematical anxiety: combination shapes and solids", http://www.tess-india.edu.in/sites/default/files/imported/57355/SM10_AIE_Final.pdf, available under Creative Commons Attribution-ShareAlike (http://creativecommons.org/licenses/by-sa/3.0/; unless identified otherwise).

Image: Photograph by Tomasz Sienicki (Own work), CC BY 3.0, https://commons.wikimedia.org/w/index.php?curid=14570114

T5-2 T 8 Teaching Idea

Using a Textbook Cleverly to Tackle More Difficult Questions With Less Anxiety

You can use a textbook to ask learners to try identifying, characterising and devising easy and difficult examples. This approach works well for many subjects but particularly in mathematics where textbook questions often increase in difficulty. It can help in dealing with maths anxiety as well.

Activity: What Makes a Question Easy, Average or Difficult?

Clarify learning objectives: Can you develop a learning objective (according to the syllabus) that fits with this activity? Learning objectives can come from any subjects. For example maths (doing harder maths questions about solving equations), in science (doing harder questions about electricity), and many others.

Decide which materials to use: You need to decide which materials you are going to use for your student teachers to explore. This could for example be textbooks or past exam questions.

Record steps for this activity: When you have decided on the learning objective and which materials to use, decide on the steps, such as:

Organise your class into groups of three. Tell groups to look at the questions in their textbook and to:

- Identify and agree on one easy, one average and one difficult question.
- Think about what is the same and what is different between an easy, an average and a difficult question. What is it that makes a question easy or difficult? Make a note of your thoughts.
- Look at your difficult question. Work together to make it even harder by adding or changing something.

As a class, discuss the last two points to find out how the learners have been able to articulate what factors make an example easy or difficult, and what inventive ideas they have about making an example even harder. You could

get the class to vote on which question is the most difficult and then ask them to solve it in their groups.

Sources

TESS-India, "Tackling mathematical anxiety: combination shapes and solids", http://www.tess-india.edu.in/sites/default/files/imported/57355/SM10_AIE_Final.pdf, available under Creative Commons Attribution-ShareAlike (http://creativecommons.org/licenses/by-sa/3.0/; unless identified otherwise).

T5-2 T 9 Teaching Idea

Using Newspaper Content as a Rich Learning Resource

Another helpful resource is using the content of old newspapers to provide rich information for use in the classroom. The other benefit is that it links what is learned in a college or school environment to 'real-life', showing the relevance and value of subject knowledge and understanding.

An example is using newspaper articles and adverts in mathematics for developing understanding of the ways in which data can be represented and summarised graphically. A good understanding of how diagrams are constructed to show data is an important life skill. Newspapers and TV programmes use diagrams to back up points. Being able to understand and analyse a diagram is one way in which mathematics can empower students to act knowledgeably in the real world. Here is an example of using newspaper articles and adverts to (a) find out what makes interpreting graphs so hard, and (b) assess current understanding and knowledge.

Figure 47. Discussing a problem related to a graphs

Finding out What the Problem is With Graphs

Lesson objectives: reading and interpreting graphs; types of graphs and charts to represent data.

Preparation. This activity works well if done in groups of four, because more examples are then available for them to examine. Collect charts or graphs that you come across over the course of the semester. When you have got a sufficient number of these, share them amongst the groups. Alternatively, if you think this would work, ask your student teachers to collect and bring to college examples of graphs that they have seen from different contexts: newspapers, adverts, brochures, etc. While newspapers may be available, they are still a comparatively rare resource, and sometimes are kept, rather than discarded. You should therefore collect the examples again at the end of the activity so you can re-use them another time.

The activity. Explain to your student teachers what they are required to do in this activity using the following prompts:

1. You were asked to bring in examples of graphs that you have seen. Put these on a pile within your group.
2. Sort quickly through the graphs and decide which ones you think you understand without much examination (putting these in an 'easier' pile) and which ones you think you will need to examine very carefully to understand (which go in a 'harder' pile).
3. Examine the harder pile and discuss in your group what it is about these graphs that makes them more difficult. Write down your thoughts about this.
4. Now examine the easier pile and discuss in your group what it is about these graphs that makes them easier. Write down your thoughts about this.
5. Compare the two lists. What is the same and what is different about these two lists?
6. Now use your answers to steps 3 and 4 above to write a list of 'good things to do when constructing graphs'.

As a class , develop a list of 'good things to do when constructing graphs' from the groups' ideas.

DBE Syllabus (2014), graph: EPS 111, EPS 311, FDC 111, FDC 112, FDC 112M, FDC 113, FDC 122T, FDC 124, FDC 214, FDC 312, FDC 312S, FVA 223, FVA 224, GNS 211, GNS 221, ION 184, PFC 222, PRA 114, TEC 111, TEC 121, TEC 122, TEC 211, TEC 212, TEC 221, TEC 222, TEC 311.

Sources

TESS-India, "Developing stories: understanding graphs", http://www.tess-india.edu.in/sites/default/files/imported/57360/SM15_AIE_Final.pdf, available under Creative Commons Attribution-ShareAlike (http://creativecommons.org/licenses/by-sa/3.0/; unless identified otherwise).

Image: 3D Bar Graph Meeting. By Scott Maxwell (http:/thegoldguys.blogspot.com/ or www.lumaxart.com/), https://www.flickr.com/photos/lumaxart/2136954043, Creative Commons Attribution-ShareAlike License, https://creativecommons.org/licenses/by-sa/2.0/

T5-2 T 10 Teaching Idea

Enlarging Activity

By using a grid, students can enlarge any image that they need a bigger version of. Polygons can be enlarged and displayed on the walls of the mathematics classroom. Maps can be enlarged and used for display. There are many other drawings that it would be useful to have a bigger version of and with some paper, a ruler, a pencil and some careful measuring and copying these can be obtained. A grid can also be used to make a same-sized copy, and you could start your activity by making same-size copies before enlarging. Use a pencil for your grid and carefully rub it out afterwards.

DBE Syllabus (2014), enlargement: FDC 122, FDC 222V, PFC 222.

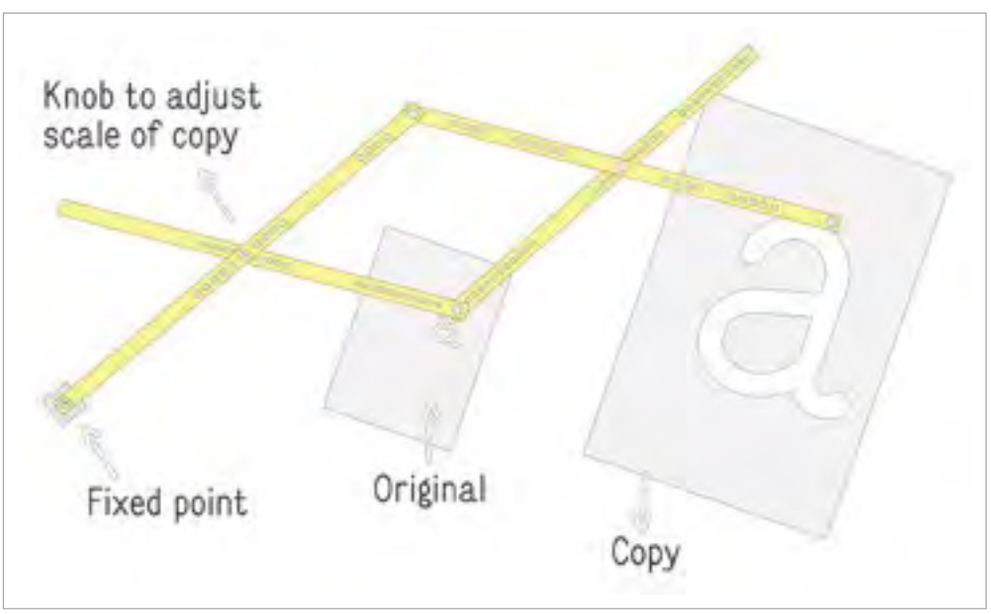


Figure 48. Pantograph. A mechanical tool that can be used for scaling images.

Further Reading

If you would like to find out more about scale drawings, see “How to Scale Drawings Using the Grid Method” on WikiHow. http://www.wikihow.com/Scale-Drawings-Using-the-Grid-Method

You may also be interested in “How to Draw a Floor Plan to Scale” on WikiHow. http://www.wikihow.com/Draw-a-Floor-Plan-to-Scale

Sources

Image: Pantograph, By Inigolv - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=39762932

T5-2 T 11 Teaching Idea

Write and Share Talking Points Using a Textbook as a Source of Information

Talking points are short statements about a topical issue that can even be wrong. The point is to get everyone talking about a particular subject, thus finding out what others think. The activity could be run like this:

1. Students all read the same piece of text from the textbook.
2. In pairs, students write talking points about the text, trying to create talking points that will incite discussion.

Once all groups have written their talking points, each group reads a talking point in turn, and others respond. It is important to structure the discussion, so that all students (including female students) have an equal voice.

Everyone takes their turn to say what their opinion is on a particular point and the group agree or disagree with them or add further comments. Any challenges to what someone says should be sensible and respectful.

T5-2 T 12 Teaching Idea

Make and Share Crosswords Using a Textbook as a Source of Information

In this idea, student teachers make their own crossword puzzle.

Materials needed: Pen, (squared) paper.

Steps for this activity: Start by making a list of words first. To meet specific learning objectives, decide whether the words should be general (any words are allowed) or whether you restrict it to a certain subject or topic. Your learning objective could be the review of vocabulary for a certain subject or topic.

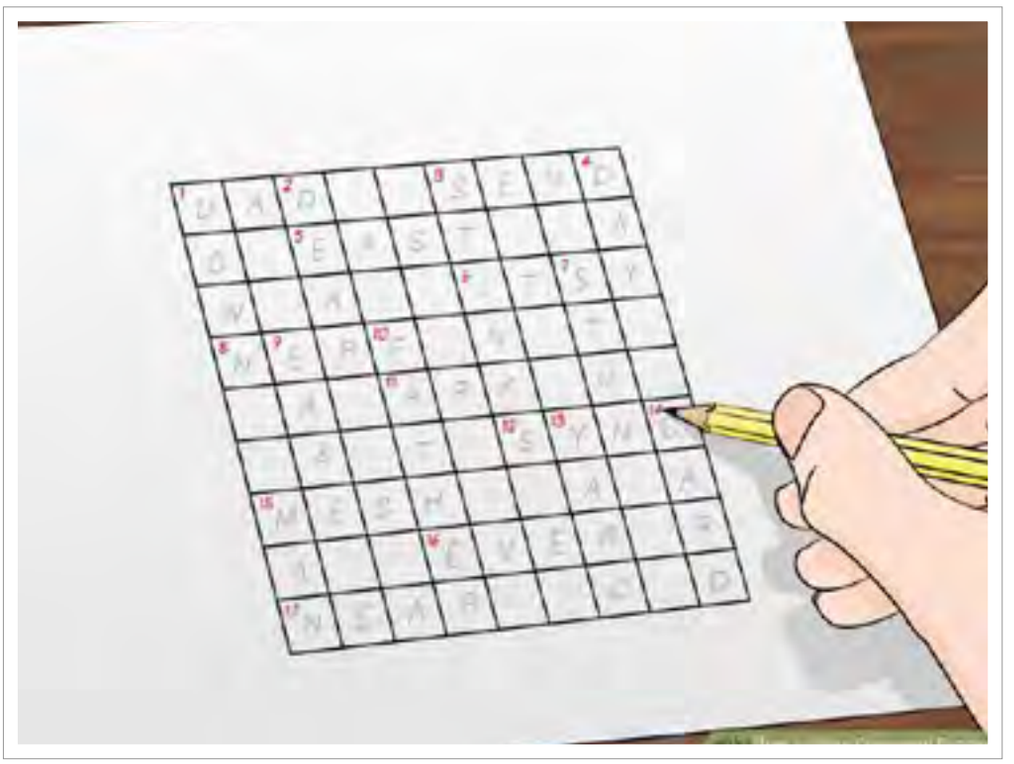


Figure 49. How to make a crossword puzzle

When students have their list of words, they write the crossword first (i.e. the answers) using keywords horizontally and vertically (interlinking them). They then reproduce a numbered empty box version (number the start of each word) with clues to the words. Swap these between groups for students to try each others.

Sources

Image from: How to make a crossword puzzle. http://www.wikihow.com/Make-Crossword-Puzzles. Creative Commons Attribution Non-Commercial ShareAlike, https://creativecommons.org/licenses/by-nc-sa/3.0/.

T5-2 T 13 Teaching Idea

Make Mind Maps Using a Textbook

Students construct their own personal mind map (individually or in small groups) using the information in their textbooks or from other printed material. They then make use of their mind map to answer questions that encourage them to think more deeply about the links between ideas. Students can also make a cardboard model of this for display.

Example 1: The circulatory system. Use your mind map to explore, for example, the metaphor: *'How is a school/college like a body?'*. Students should relate parts of the body and circulatory system (blood/organs etc.) to parts of a school and justify their metaphors with detailed explanations.

DBE Syllabus (2014), respiration: FDC 114, PRA 125; respiratory system: ECE 213, FDC 114, FDC 124B, PRA 125; circulatory system: FDC 124, FDC 124B, PRA 125; organs: FDC 111, FDC 114B, FDC 124B, FVA 223.

Example 2: A polygon tree. Here is another example of that students can create, for example using a mathematics textbook to find different types of polygons. Students should discuss the distinguishing features of the different polygons.

DBE Syllabus (2014), polygon: FDC 112M, FDC 122, ION 184, PFC 222, TEC 222.

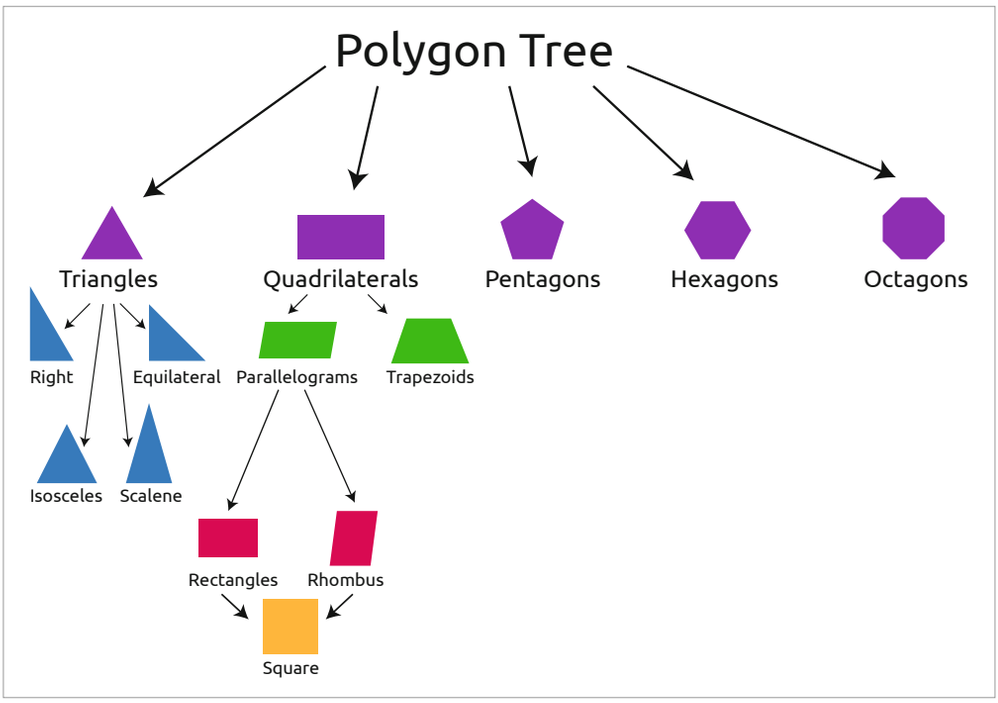


Figure 50. Polygon tree

T5-2 T 14 Teaching Idea

Creating Lapbooks Using Information From Other Sources

Students work in a group to create the lapbook (a foldable book that opens out to fill your lap) with each person creating a different section. Each section should aim to provide information that the student has obtained by researching a particular subset of a topic.

For example, if the lapbook topic was English grammar, there would be sections on nouns, verbs, conjunctions etc. You can make the lapbook more engaging and colourful if you have some coloured card but it is not necessary. What is important is the content.

If students are able to work on the lapbooks in their own time it is possible to create a very useful and stimulating resource that will be a pleasure to read.

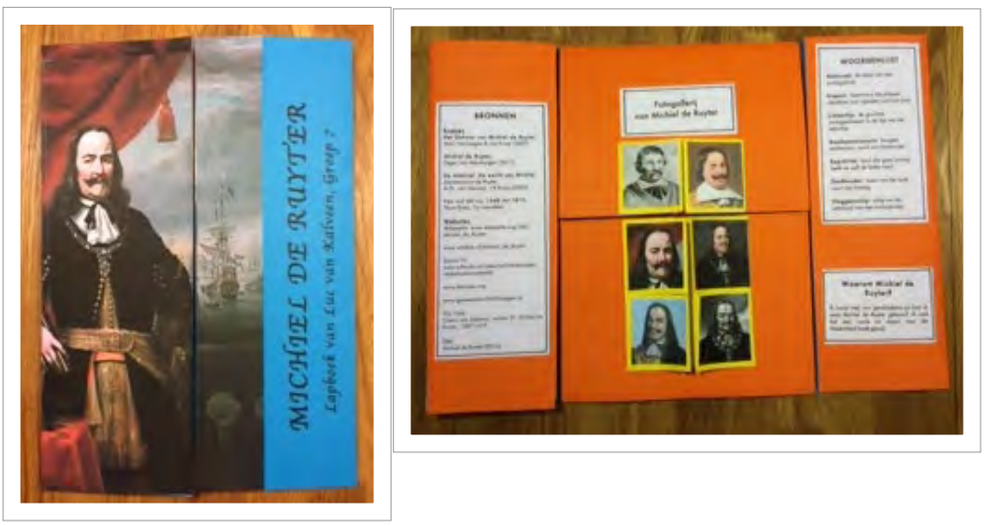


Figure 51. Front cover/inside cover of lapbook

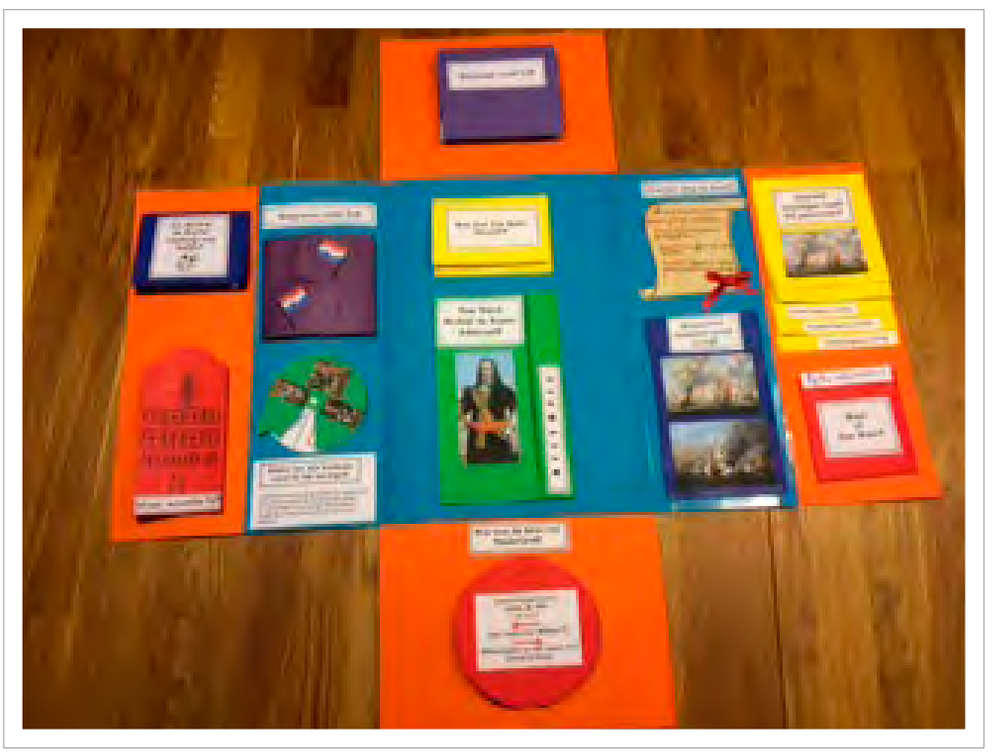


Figure 52. Lapbook fully opened out

Further Reading

Many more examples of lapbooks: https://uk.pinterest.com/emmaesmith/foldables-and-lapbooks/

T5-2 T 15 Teaching Idea

Punctuation Police

This example relates to an English lesson on punctuating direct speech. The whole exercise is done in a very collaborative way and the tutor's use of questioning is what draws out the correct responses from the students. Questions like 'Do we all agree with that?', 'Is there anything missing from the end of that sentence?', "Who agrees that the comma is in the right place?' etc. help to keep all students on task and working together.

DBE Syllabus (2014), punctuation: FDC 121.

Steps for this activity:

- Copy a piece of dialogue (a few lines will be enough) from a book your students are reading in class.
- Do not include any punctuation in the piece, so leave out capital letters, commas, full stops etc.
- Work through the first sentence on the board as a whole class, asking students if they know what is missing from the piece.
- Students then work in pairs to try and recreate the correct version of the dialogue (i.e. fully punctuated), writing it down in their books or on mini boards.

Extend this activity:

- Ask students to make up their own dialogue to continue the story in a direction that they think it might go.
- They write this in their books and punctuate it fully.

Figure 53. Students are comparng how they have marked each others work ("moderation").

T5-2 T 16 Teaching Idea

Filling in the Blanks ("Cloze Procedure")

This activity makes use of the "cloze procedure" and can be effective in eliciting students' prior knowledge about a topic. It can also be used to check students' understanding of new material. It can be used in any subject.

Preparation for this activity:

- Copy out a piece of text from a textbook (e.g. a textbook or any other subject-relevant book).
- Leave out the important/pivotal words and just put a blank line in their place. Alternatively leave out every fifth word, whichever works better.
- After you have written the piece list the missing words randomly by the side of the main text on the board.
- Students work in pairs to place the words in the correct places so that the text makes sense.

If the aim is to elicit students' prior understanding it might not be necessary to include a list of the missing words as students may be able to come up with these themselves.

You can also do a version of this with mathematics and equations. To make sure that the lesson is interactive and that the students can move beyond remembering to deeper learning, they should be asked to explain their reasoning. For example, by asking a student 'Why do you think that it's mass divided by area for pressure?' you can begin to probe their actual understanding of the topic.

Figure 54. A text with missing words

T5-2 T 17 Teaching Idea

Using Students' Own Writing as a TLM

Here is an English-based example but the idea can be used in any other subjects too.

Steps for this activity:

- Ask students to work in pairs and write a short paragraph about what they did at the weekend (or something else that is relevant).
- They should include lots of adjectives and adverbs in their piece of writing.
- One pair comes to the board and writes their short piece.
- Whilst they are doing this the other students swap books and read each other's paragraphs.
- Read the paragraph on the board out loud to the class and ask them to raise their hands every time you read out an adjective.
- You can re-read the paragraph, this time asking them to raise their hands when you read out an adverb.

This is a good way of finding out if students have grasped what they have been learning about and can be used for other aspects of grammar.

T5-2 T 18 Teaching Idea

Find the Nouns and Verbs

This activity can be done individually or as pair work.

DBE Syllabus (2014), noun, verb: ECE 122, FDC 111, FDC 113, FDC 121.

Materials needed: newspaper or other printed materials.

Steps for this activity:

- Pass around some newspapers or other printed material to the students and ask them to pick a paragraph that they are going to work on.
- Ask them to circle all the nouns in their chosen paragraph.
- They should also mark the verbs in the paragraph (perhaps with a line underneath or a different coloured pen or highlighter).
- Select students at random to tell you some of the words they have circled/underlined.
- Ask questions as you go along e.g. 'Why do you think it is a verb?' and 'How do you know it is a noun?' etc.

Have an empty table on the board with one column headed 'nouns' and the other column headed 'verbs' to record any words that the students are

unsure of or have incorrectly classified. Have a whole class discussion about how to classify the words that students are unsure of and write them in the correct column.

Extension: As an extension to this task students could further classify their nouns into proper nouns and common nouns by writing two lists in their books or using mini whiteboards. They could also identify words that could go into either of the noun or verb category if used in a different context (e.g light may be used as a noun in one context, 'The light came through the window' and as a verb in another context, 'Light the candle as it is getting dark'.

Interesting vocabulary that students come across, for example when doing activities like the one above, can be written in a large font on some card and displayed on the classroom wall. You can dedicate some space as a word wall and encourage students to use the words in their writing.

Using a Text Book to Review Sentence Structures

Another way you could use the teaching idea above is to investigate sentence structures, for example by making use of your textbooks.

DBE Syllabus (2014), sentence patterns, structure, types: FDC 111, FDC 113, FDC 121, FDC 213, FDC 311.

The video below shows how tutor Davida used this activity with her class to review and reinforce a previous lesson point on sentence structures. While you are watching, think about the following questions:

- How does tutor Davida organise the activity?
- What extension activities did she do?
- How could you adapt and implement this activity in your subject?

Figure 55. Using textbooks to review sentence structures, http://tiny.cc/tpdvideo

Teaching Strategy 3 — Introduction
Activity-Based Learning

T5-3 i 1 Learning Objectives

In this teaching strategy, you will learn to

- Identify the key ideas behind activity based-learning;
- Understand reasons for doing investigations in the classroom;
- Suggest ideas for investigations and develop TLMs suitable for activity-based learning;
- Plan an activity-based lesson using TLMs.

The remainder of this section is pre-reading for the PD session. As you read through this introductory section, and as you work through the activities in the following PD sessions, relate them back to the above learning objectives.

Figure 56. Students are conducting a peer-marking activity in English.

T5-3 i 2 Introduction to Activity-Based Learning

Activity-Based Learning (ABL) involves allowing students to master concepts and ideas by giving them relatively free access to teaching and learning materials and allowing them to plan activities and progress at their own pace. The teacher/tutor monitors the activities and provides minimal guidance as students work together in groups. By involving students in the learning process such that the focus is on them we create a student-centred environment. The more choice and involvement we give students in designing the process, the more engaged they become. Investigations are an example of Activity-Based Learning. Activity-based learning is also known as the "activity method".

T5-3 i 3 Why Use ABL?

Here are some of the reasons why we might do ABL and investigations with our students in the classroom:

- To describe what is happening - students observe or investigate a topic (e.g. a phenomenon, an event, a work of art). The findings raise questions that lead on to new areas of investigation;
- To test our ideas - students make predictions based on what they already know and see if they are right;
- To develop methods - students work out ways of improving how things are done;
- To solve problems - students use known techniques/methods to investigate new questions.

Pause for a moment and have a look at the teaching ideas to accompany this teaching strategy. While you are looking at them, ask yourself which of the four reasons they match with.

Using investigations in the science classroom can be particularly valuable because it allows students to develop their understanding about the *nature of science* and no/low cost TLMs can be used to facilitate this understanding.

A Ghanaian study has shown that *'when students are taught [...] concepts using locally available materials in the environment, which students are familiar with, compared to that of the conventional science materials and equipment, their performance could improve'*.

Figure 57. A group of female student teachers prepare for an investigation.

Further Reading

Christine Adu-Yeboah (2011), *Teacher Preparation and Continuing Professional Development in Africa (TPA) — Learning to Teach Reading and Mathematics*

and its Influence on Practice in Ghana. Available at https://www.sussex.ac.uk/webteam/gateway/file.php?name=report-ghana-1july2011.pdf&site=320

T5-3 i 4 Use of TLMs in ABL

You will see that many of the teaching ideas in this teaching strategy use no cost/low-cost materials that students are already familiar with - such as pieces of fabric, plastic containers etc. This is where your big box of collected items (from the introduction to this theme) will come in very useful. If you are going to give students the opportunity to do investigations you will have to manage your TLMs very well to ensure that there are always enough materials in the box for them to make use of. It will be a worthwhile endeavour though, as students taught using activity-based learning (ABL) are shown to make gains in their learning compared with students taught using the traditional lecture-based method.

Activity-based learning can be used across the curriculum in all subjects. By placing students at the centre of the teaching and learning process and allowing them to work together with TLMs, they can begin to understand concepts, facts and principles in a more meaningful way.

Keep these three things in mind as you experiment with ABL and investigations in your classroom:

- What are the students going to learn?
- How are they going to learn it?
- How are they going to show their learning?

Figure 58. A group of female teachers investigate volume.

T5-3 i 5 Using This Strategy in a Gender Responsive Way

As with all TLMs, it is important to establish ground rules for their use. This should include letting students know that both female and male students should have equal opportunities to be the first to use the TLM, that everyone should have equal amounts of time using the TLM, and that both females and males should take leadership roles in group work, presenting and reporting (if applicable). After verbally setting these ground rules, you should monitor and make sure that students are actually following them.

Teaching Strategy 3 — PD Session
Activity-Based Learning

T5-3 S 1 Reflect Together

Your Teaching and Learning Since the Last Session

Following the usual housekeeping, start the reflection. Turn back to T6-2 S, "Reflect After Your Teaching", where you will have filled out TLM Tool 2. Your PDC will guide you through the reflection.

T5-3 S 2 Review and Recap

Introducing This Session

Review pre-reading. Now turn to the pre-reading. Does anyone have any questions about the introduction? Spend a few minutes discussing any issues with your colleagues.

Recap learning objective. Finally, recall the specific learning objectives for this teaching strategy. Are there any questions?

T5-3 S 3 Activity 1

Brainwriting and Pyramid/Snowball on ABL

This activity will allow you to find out about other colleagues' experiences of ABL. You can ask them questions about their experience and knowledge and share your own thoughts too. By the end of the activity you will hopefully have a better understanding of what we mean by ABL.

Step 1: Brainwrite. Based on your own knowledge and experience, write down 5 keywords (or short phrases) related to activity-based learning on a post it note. These words should reflect your own personal involvement with ABL and they do not have to be only be positive words. Negative words are acceptable too.

The next 3 steps are the pyramid/snowball part of the activity and nothing new will be written down.

Step 2: Pairs. Pair up with the person next to you and share your keywords with each other. Explain why you chose those words. Did you have any of the same words? If so, draw a line through (but make sure you can still read) the

duplicate words so that there is only one instance of them on the two post it notes. This is your new list.

Step 3: Fours. Pair up with another pair and share your new lists with each other. Briefly talk about the words on your list. Do the same as before and cross off any duplicate words. The four post it notes are now your new list.

Step 4: Eights. Each group of four joins with another group of four and repeats the process of crossing off duplicate words. Each time new members join your group, be prepared to explain why you have chosen a particular keyword if they ask. Your new list is now made up of eight post it notes.

The final step (Step 5) is for you to decide: Get creative, think on your feet and maximise that learning potential!

Step 5: Decide what you want to do now. Sometimes it can be difficult to draw an activity to a close. What is the best way to end this activity? Discuss this in your groups of eight and then finish the activity. Different groups can choose to end the activity in different ways.

Tutor Discussion

Here are some questions for discussion:

- Did the activity fulfil its aim (see first paragraph)? How?
- What did you think of the final step of the activity? Was it easy/difficult to come up with a conclusion to the activity?
- How important is it to draw activities to a close? Why?

T5-3 S 4 Activities 2a–d

Different-Tasks Group Work

The following four activities use balloons in an interesting and fun way to explore everyday science concepts. Work together in a group to complete the activity. There is a short video to accompany each activity in the Further Resources section.

T5-3 S 5 Activity 2a

Under Pressure! Balloon in a Bottle.

In this activity you will try to blow up a balloon in a bottle. What do you think will happen?

For this activity you will need:
A few balloons
A few different-sized bottles (plastic or glass)
Something to make a hole in a plastic bottle (scissors)
A straw and some multi-purpose glue (optional)

Dangle a balloon inside an empty water bottle and roll the neck of the balloon back around the neck of the bottle like this:

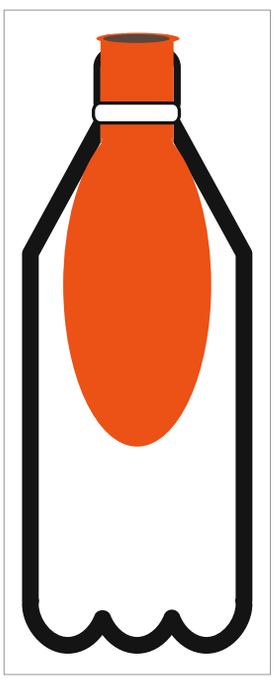


Figure 59. Balloon in a bottle

Now try to blow up the balloon by blowing into the top of the bottle. What's going on? Why can't you blow the balloon up? Try some of the following experiments:

- What happens if you use a bigger bottle?
- What happens if you make a small hole in the bottle?
- What happens if you suck air out through the hole or blow air in? You can use a straw and some glue (to seal the straw to the bottle) to make this bit easier but it still works if you don't have those things.

T5-3 S 6 Activity 2b

Bed of Nails: Using a Balloon and Some Drawing Pins to Investigate Pressure

Figure 60. Bed of nails: Why does the yogi lounging on the bed of nails not jump around in pain?

The trick is to spread your mass evenly over the surface!

This activity mimics the bed of nails scenario and is a very visual demonstration of pressure in action. It involves pushing a balloon onto drawing pins ("thumb tacks").

For this activity you will need:

- A few balloons;
- About 20 drawing pins.

Blow up the balloon. What do you think will happen if you push it on to a single drawing pin. Have a go. What do you think will happen if you push it on to lots of tacks like this?

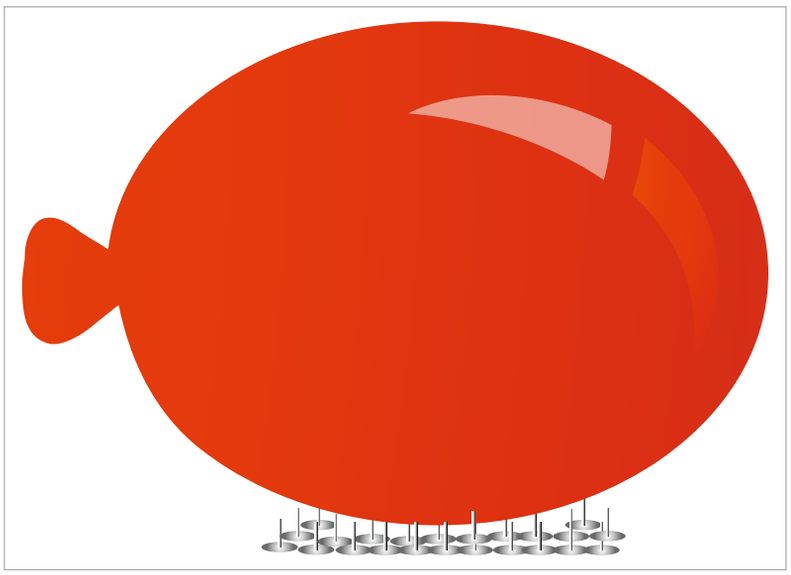


Figure 61. Balloon on tacks: Care should be taken in case the tacks fly around when the balloon pops.

This activity highlights the fact that pressure depends on area. If the area over which the force acts is large (due to the hand pushing over a large area) then the pressure on the individual tack is small. Conversely if the area is small (like when you tried the experiment first with just one thumb tack) the pressure is great.

This demonstration can form the basis of an investigation of pressure. For example: Use some dough (made from mixing flour and water) and some different sized blocks. How does the area of the block pushing down on the dough (place the block on top of the dough with a weight on top) affect how much pressure the block exerts on the dough (as measured by the depth the block sinks in)?

T5-3 S 7 Activity 2c

Balloon on Fire! Water Transfers Heat Energy Away From the Balloon

For this activity you will need matches, a candle, 2 balloons and some water.

- Add half a glass of water to one of the balloons and then blow it up and tie it (or twist the end and use a paperclip to hold it closed).
- Blow up the other balloon and tie it.
- Light a candle.
- Hold the balloon without the water about 30 cm above the flame and slowly bring it down to touch the flame. What do you think will happen?

- Repeat with the other balloon (with water inside). Make sure to lower the balloon on to the candle from above so that the part of the balloon with the water is going to be on top of the flame. What do you think will happen?

This activity gives you an insight into water's excellent capacity for storing heat. The following images will give you an idea of how to set up the activity.

Figure 62. Balloon on fire set up

Figure 63. Tutors are exploring activities with balloons.

T5-3 S 8 Activity 2d

Balloon Rockets! Newton's Laws of Motion in Action

This activity uses the idea that rockets are propelled by expelling (pushing out) gases.

You will need:

- Some string (enough to reach from one side of the room to the other) for each group
- One straw per group (to thread on the string and act as a guide for the 'rockets' - see diagram)
- Some balloons (one per group)
- Some tape (to tape the straw to the balloon - see diagram)
- Paperclips (one per group)
- Scissors

The aim of this task is to make a balloon rocket, tape it to the straw and see how fast it reaches the other side of the room

To make this fun activity even more exciting, have a race. Each group places their balloons at the starting position and they are 'launched' at the same time. The winner is the balloon that goes the farthest (or reaches the other side of the room first).

The image will give you an idea of how to set up the activity. You can also do the activity outside and tie the string to a tree branch:

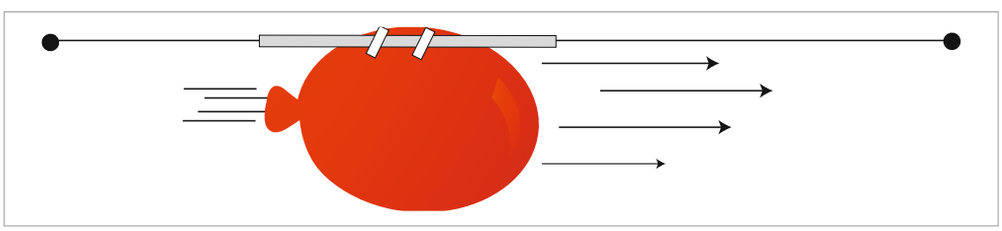


Figure 64. Balloon rocket

Steps to set up the activity:

- Blow up a balloon and fasten it with a paper clip to stop the air coming out. Don't tie it as you want the air to come out later.
- Thread the straw on to the string and check that it can move along freely.
- Using two pieces of tape, tape a straw to the bottom of the balloon like this:

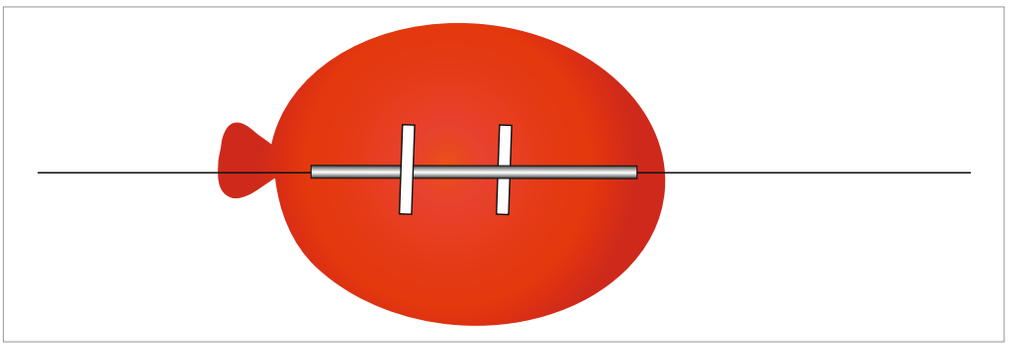


Figure 65. Taping the balloon to the straw

- When you are ready to go, remove the paper clip and the balloon rocket will whizz along the string.

T5-3 S 9 Activities 2a–d

Tutor Discussion

Here are some questions for discussion:

- Many students enjoy these types of activities, why do you think that is?
- Would you use any of these activities with your students? Why?
- Can you think of any benefits of doing these types of activity with your students?
- What is the best way to solidify learning at the end of an activity?
- What kind of activities can we do for other subjects?

T5-3 S 9 Activity 3

Make a Story Using Printed Materials

You are provided with a set of printed materials (including cardboard boxes, newspapers, plastic water bottles, empty biscuit packaging, credit scratch cards, etc). Develop a short story using only text you can find within/on the materials. If you like you can cut out the piece of materials that you use, and stick them onto a sheet of paper.

Tutor Discussion

- How did you decide who would do what? Can you think of another way?
- Was your group well organised? How do you know?
- How would you you solidify the learning/concepts at the end of this activity?

T5-3 S 10 Plan and Practise Together

Plan an Activity

It is now time to plan an activity. Each tutor should plan their own activity using the activity plans provided. To provide some inspiration, please consult the 'Teaching Ideas' section of this teaching strategy.

Remember: when planning and executing activities, always ensure that female students have equal opportunities to participate, try first and to take leadership roles. We often forget about being gender responsive and male students end up unfairly dominating and benefiting more

T5-3 S 12 End of Session

Agreeing Follow-up Activities

This is now the end of the session. Decide when you will teach your planned activity and make arrangements with a colleague for them to observe you (see the Teach and Observe section below). In the next PD session we will return to the Reflect Together section.

T5-3 S 13 After the Session: Teach and Observe

It is important for your professional learning that you actually teach the activity that you have planned. Please make sure that you have your activity plan available when you teach.

Any issues that arose during the lesson should be written down immediately after you have taught, and remember to fill in your observations section of the tools after you have taught.

If possible arrange with a colleague to observe each other when you each do the activity with your student teachers during the week.

T5-3 S 14 Reflect On Your Teaching

Investigations and Activity-Based Learning

Make sure to fill in this tool as soon as possible after you have taught your planned activity with your students. It will be used as a starting point for reflection during the next session.

Tool 2: TLM Observation Questions

Brief description of your TLM:				Notes/reflections
1.How long did it take you to prepare your TLM for the activty?	Less than 10 min	10-30 min	More than 30 min	
2. How easy was it to get hold of the resources you needed for your TLM?	Very easy	Not very easy	Hard	
3. How motivated were the students to engage with the TLM?	Very	Not very	Not at all	
4. Did you have enough TLMs for all the students to interact with?	Yes	No	Not sure	
5. Did you ensure that female and male students had equal opportunities to interact with the TLM?	Yes	No	Not sure	
6. Did your TLM enhance learning?	Yes	No	Not sure	
7. How was the pace of the lesson compared to normal?	Faster	Same	Slower	
8. Will you use this TLM again?	Yes	No	Not sure	
9. If yes, where will you store it in the meantime?				
10. Will you make any modifications to your TLM?	Yes	No	Not sure	
11. If 'yes' what will you change?				

T5-3 S 15 Further Resources

Online Video for the Above Activities

Activity 2a: Under Pressure! Balloon in a Bottle

https://www.youtube.com/watch?v=ViRHxOIJZGw

Activity 2b: Bed of Nails: Using a balloon and some drawing pins to investigate pressure

https://www.youtube.com/watch?v=glQ2NrnDHWc

Activity 2c: Balloon on Fire! Water transfers heat energy away from the balloon

https://www.youtube.com/watch?v=rwDinnQ9k8U

Activity 2d: Balloon Rockets! Newton's laws of motion in action

https://www.youtube.com/watch?v=1C8bYW7y9d0

Toys From Trash

If you search for 'Toys from Trash' on YouTube you will find lots more fun and educational activities that you can do with your students.

T5-3 S 16 Sources

Bed of nails image: Herbert Ponting - http://www.geocities.com/blackinkal4/RoyalGeographicalSociety_Asia_2.html Originally from en.wikipedia; in the public domain.

Teaching Strategy 3 - Teaching Ideas
Activity-Based Learning

T5-3 T 1 Plan and Practise Together

Writing an Activity Plan

As usual, you should use an activity plan template to guide your planning, in which you record the learning objective, the resources used, and the steps for the activity as usual. There is guidance available near the activity plan templates, as well as in T5-1T. Please refer back to this in case you are unsure of what to do.

Theme 5: Teaching and Learning Materials PD Session 3: Investigations and Activity-Based Learning	
Teaching Idea	**How it works**
T5-3 T 2. Investigating a painting	Students investigate a work of art to understand the historical and cultural context and influences on the artist.
T5-3 T 3. Investigating social issues through literature	This is a useful way of tackling sensitive or difficult issues with your students.
T5-3 T 4. Using toy cars/ plastic bottles to investigate forces	A balloon powered plastic bottle car can form the basis of lots of experiments in science.
T5-3 T 5. Building scales	Make a weighing scale from everyday material and use it to investigate a real-life issue.
T5-3 T 6. Investigating the absorbency of different materials	Challenge students to come up with a way of testing and measuring how absorbent different materials are.
T5-3 T 7. Patterns (with drinking straws and string)	Use cut-up bits of straw to decode sentences in English language classes. They can be used in maths too and anywhere else where patterns are important.

T5-3 T 8. Using drinking straws in language learning	In this activity you will use drinking straws to make sentence patterns.
T5-3 T 9. The three hole bottle experiment	This is a demonstration that will really get your students thinking. Yet another use for the ubiquitous plastic bottle!
T5-3 T 10. Investigating volume/capacity	Use different shapes and sizes of containers to improve students' understanding of capacity.
T5-3 T 11. Devising rich tasks	Allow students to demonstrate their knowledge by setting tasks that are open-ended and interdisciplinary. Tweak existing questions so that they ask more of students.
T5-3 T 12. Making a small change to an existing task to turn it into a rich activity	Students write a manual on how to make a clinometer (for measuring angles). Use this idea of asking students to write instructions (rather than just follow them) in all subjects. It is a simple way of encouraging them to think more about what they are doing and the reasons for doing things in a particular order etc.
T5-3 T 13. Investigating dissolving with sugar, salt and chalk.	This investigation uses three substances that look the same but have different chemical and physical properties. Students do experiments to quantify the differences in how they dissolve in water.
T5-3 T 14. Manipulatives in mathematics and other subjects	Students can investigate the relationship between surface area and volume using small cubes. Minimal instructions are needed for this type of activity. A simple prompt like 'find a short fat cuboid with the same volume as a long thin cuboid' is enough to get students started on this type of open investigation.
T5-3 T 15. Investigating cylinders made from parallelograms (eg kitchen roll tubes)	Who knew you could make a cylinder from a parallelogram? Even better, there are two types of cylinder you can make. Students can investigate the relationship between the size of the parallelogram and the height of the cylinder using kitchen roll tubes.
T5-3 T 16. Investigating balloon rockets	With some balloons, straws and string, students can investigate speed.

T5-3 T 17. Investigating heat transfer with balloons	This belief-defying 'trick' generates lots of questions from students as they try to work out how you can touch a balloon to a candle without it popping.
T5-3 T 18. Investigating pressure	Another demonstration that generates lots of questions but at the same time helps students to make sense of some curious phenomena. All you need is a balloon and some drawing pins (thumb tacks).
T5-3 T 19. Investigating text types	In this activity students investigate text types and produce a poster for display on the classroom wall.
T5-3 T 20. Investigating locally available indicators	This activity investigates locally available indicators for acids and bases.
T5-3 T 21. Project work	An introduction to project work in any subject.

T5-3 T 2 Teaching Idea

Investigating a Painting and Making Posters

Clarify learning objectives: In the activity as presented here, students understand the cultural and historical context of a work of art and influences on the artist. However, you can create very similar activities with learning objectives in other subjects.

DBE Syllabus (2014), painting: ECE 222, FVA 215, FVA 222, FVA 224, PRA 215; Ghanaian culture: FVA 221, FVA 222, FVA 223, FVA 224, FVA 225; history of clothing: FVH 121.

Decide which materials to use: An image of the painting to be investigated. As a tutor, you may have several printed images, or you may be able to download images from the internet. However, you can adapt this to an investigation of any kind of material or real-world object. If you are going to make posters, you need to have large sheets of paper and pens available.

Record steps for this activity, such as:

1. Students form groups. Each group chooses a work of art to investigate.
2. Brainstorm areas that students might investigate, e.g. the historical and cultural context of the painting, the artist, influences on the artist, the medium, their own perceptions of the painting. Determine broad questions to be used in the next step.

3. Students clarify and adapt the questions in their groups. Using their questions as a guide, students conduct research. You should agree how students will undertake and structure their research, for example using mind maps or PMI.
4. Students prepare and record their findings on a poster.
5. Rather than each group presenting their posters one by one, posters are displayed on the classroom wall (if there is space) or in another location. Students circulate, and discuss each other's posters.

After the activity, the posters can remain on display in the classroom, to create a resource-rich environment

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Figure 66. Paintings found in Ridge, Accra.

Sources

Photograph: Lucky Dube and John Kufuor. By Babak Fakhamzadeh, https://www.flickr.com/photos/mastababa/2044024272, Creative Commons Attribution-NonCommercial License, https://creativecommons.org/licenses/by-nc/2.0/

T5-3 T 3 Teaching Idea

Investigating Social Issues Through Literature

Clarify learning objectives: Students examine social issues and sensitive or difficult issues with your students. Explore their own beliefs and attitudes.

DBE Syllabus (2014), HIV: ECE 225, EPS 121, FDC 224, GNS 121, GNS 212, GNS 221, GNS 222; sexual harassment, discrimination: GNS 221; migration: FDC 128; violence: PRA 113.

Decide which materials to use: a short story, an extract or a poem of sufficient substance to conduct an in-depth examination of the issue to be investigated.

Record steps for this activity, such as:

1. Choose a short story, an extract or a poem of sufficient substance to conduct an in-depth examination of an issue such as HIV/AIDS, migration, discrimination.
2. Read the whole piece to the class so that they can get a "feel" for the text and then let students read it to themselves. (It is important to let students approach a piece of literature the first time without giving them any specific task other than to simply read it.)
3. When students have read the text once, set comprehension questions or ask them to explain the significance of certain keywords in the text.
4. Follow up comprehension questions with more subjective questions (e.g. Why do you think X said this? How do you think the woman feels? What made him do this?)
5. Add a factual dimension with supplemental material (including video if possible) about the issue. Alternatively set research questions and have students research the issue and present their findings to the class.
6. Conclude the investigation with a discussion about the topic. For example:
    - Prepare 3-4 controversial statements about the issue.
    - Display 'I agree/I disagree/I'm not sure' statements in different corners of the classroom.
    - Read out or display one of the statements. Give students a few moments to think (silently) about the statement and then ask them to go stand in the corner that corresponds to their opinion.
    - Invite a student in each corner to explain their decision. They should try to persuade the other students to join 'their corner'.
    - Facilitate the discussion and encourage participants to move to a different corner as their opinions are swayed.
    - Repeat with a new statement.

T5-3 T 4 Teaching Idea

Using Toy Cars/Plastic Bottles to Investigate Forces

Figure 67. Balloon-powered car

Clarify learning objectives: Come up with a suitable real life context to set the investigation in. Something like *'What material would make the best race track?'* would work. Relate this to a learning objective in the syllabus.

DBE Syllabus (2014), forces: FDC 124, TEC 121, TEC 221.

Steps for this activity: You can do this activity with a Newton meter (spring balance) to see how much force is needed to overcome friction and get the object moving on each of the different surfaces. An empty bottle may be too light to work with so students could try adding some sand or soil to their bottles. They could also investigate the effect on the friction force if they increase the normal reaction force (by increasing the amount of soil in the bottle).

A balloon can be used to power the car and the time taken to travel a particular distance across different surfaces could be measured (no spring balance needed).

Friction on an incline can be investigated (no spring balance needed).

Figure 68. What can we learn about forces?

Additional Resource: Students Teachers Build Their Own Cars

The video below demonstrates how student teachers built their cars from plastic bottles to investigate force.

Watch the video and think about the following question:

- When developing this TLM idea, how could you modify it to make sure it is an effective resource to investigate forces?
- What other locally available low-cost materials could you use?

Then develop an activity plan as suggested in the teaching idea above.

Figure 69. Using locally available materials to investigate force, http://tiny.cc/tpdvideo

Further Resources

Watch a video of how the car works here: https://www.youtube.com/watch?v=165AbLOY9PE

This video shows how to make a battery powered toy car from a plastic bottle: https://youtu.be/voT-xADi-RE

Sources

Art of Fishing. By Yenkassa, https://www.flickr.com/photos/88059007@N03/8116469535, Creative Commons Attribution License, https://creativecommons.org/licenses/by/2.0/

T5-3 T 5 Teaching Idea

Building Scales

In this activity, you make and use a Newton Meter to investigate mass (Hooke's Law), as well as to discuss the importance of scales, e.g. to farmers in Ghana (see box).

DBE Syllabus (2014), scales: EPS 311, FDC 118.

Materials needed: Elastic band, paper clips, objects to weight.

Steps for this activity: Come up with a suitable real life context to set the investigation in. Something like 'Which is more profitable, selling maize by the sack full or weighing sacks of maize and selling by mass?' Could keep it simple by just using an elastic band and measuring its length. Use a paperclip as a hook and hang things from the band.

Ghana – The importance of weighing scales

One of the biggest challenges for smallholders is getting a fair price for their produce. In West Africa, too often buyers take advantage of farmers, demanding that bags are filled to the brim instead of paying per kg. Farmers in Ghana were recently surprised with their financial remuneration when they used a weighing scale for their sales for the first time.

Fati Mahama is a smallholder from the district of Ejura Sekyedumasi in Ghana's Ashanti Region. She grows maize and cowpea on a small farm which is barely 2 hectares. In March this year, she was in for a surprise when she sold maize to the World Food Programme (WFP) through its Purchase for Progress (P4P) initiative.

"I can't believe that I sold only six heaped maxi bags (usually a 100kg bag) and made so much money," she said after she realized that she had just increased her income by 50 percent. Fati is a member of the *"Nso Nyame Ye Women's Group"*, one of 26 farmer organizations (FOs) which participate in P4P in Ghana.

The reason why Fati and her fellow farmers earned so much more is because previously, they would have used the "bush weight" system: This means selling heaped bags of between 130 kg and 150 kg of maize for the value of a 100 kg bag, which cheats farmers of a third to half of their produce per bag. However, thanks to the weighing scales introduced and provided by WFP, farmers can now weigh their produce and earn more money.

Source: World Food Programme, *Ghana – The importance of weighing scales* (20 July 2012), https://www.wfp.org/blog/blog/ghana-%E2%80%93-importance-weighing-scales

Figure 70. Scales at Agbogbloshie Makerspace Platform, https://qamp.net/.

Sources

Scales at Agbogbloshie Makerspace Platform: DSC_0944. By Agbogbloshie Makerspace Platform, https://www.flickr.com/photos/qampnet/14059336420, Creative Commons Attribution-ShareAlike License, https://creativecommons.org/licenses/by-sa/2.0/

T5-3 T 6 Teaching Idea

Investigating the Absorbency of Different Materials

In this activity, student teachers investigate the absorbency of different materials.

This activity can be applied in many different areas of the syllabus, e.g. DBE Syllabus (2014), on evaluating materials: FVA 223, FVA 224; as a precursor to FDC 124 (absorption of water by Osmosis).

Materials needed: Different types of containers, different types of materials (including absorbent, and non-absorbent materials).

Steps for this activity:

1. Students use small pieces of different materials to work out, for example, which one would be the best to make a raincoat out of or using different types of paper you could ask, *'What type of paper is best to wrap a parcel in? What type of paper is best to wipe water spillage?'*.
2. In the second part of the activity, students explore how absorbent the materials are. They will need to keep the size of the samples the same and come up with a way of measuring how absorbent the material is. For example, you should have a range of containers available as students may decide to put the pieces of fabric in them and add water to them.

T5-3 T 7 Teaching Idea

Patterns With Drinking Straws and String

Patterns are everywhere! Students can look for patterns in what they are wearing (printed material, soles of footwear etc.) or in the classroom and then do the following activity:.

Introduction. This short activity can be used before a trip outside to observe patterns in the environment. It encourages students to think about repeating units and their complexity (or lack of). Students draw simple sketches of the patterns they have made and begin to think of ways of classifying them. Patterns can be made with beads if available or with

drinking straws (low-cost option). [Note: A no-cost option for the first part of the activity is suggested at the end.]

How to do the straws and string activity. Students cut coloured straws into pieces that they can thread onto a piece of string. They make different patterns by threading the bits of straw onto the string then in pairs (back to back) one student describes their pattern to their partner ('2 short red, 1 long green, 2 short red' etc). The partner attempts to recreate it (by drawing?) and at the same time they try to work out what the repeating unit is.

Non linear patterns can be made by placing the cut straw pieces on the table rather than threading them (tiled patterns and overlapping ones can be done this way).

Taking it outside. Students can take a notebook and pencil outside with them and draw simple sketches of the patterns they see around them. Challenge students to find and sketch, for example. five patterns each. They could swap notebooks when they have finished sketching and try to spot each others' patterns in the environment.

Variations of this simple activity can be used when students are studying symmetry and sequences. A trip outside to observe these things in the natural environment will help to bring the subject alive for students and make it relevant to their everyday lives.

Alternative no cost version of the pattern-making activity. Instead of using straws and string to make patterns the students can try making patterns with themselves. One idea is to divide the class into two large groups. Each group makes a repeating pattern (using themselves) for the other group to guess. The pattern can be made by certain students standing on one leg, sitting, putting their hands on their head, left hand on left hip, right hand on left shoulder etc. The permutations and combinations are endless. The challenge with this activity will be for students to collaborate well and organise themselves efficiently. An element of pre-planning where the group comes up with the pattern on paper will also help although you may want to see how well students manage to organise themselves first without doing so. They might surprise you by managing very well.

Figure 71. Drinking straws.

Sources

Image: June 28. By Sarah, https://www.flickr.com/photos/daffydil/3668899842, Creative Commons Attribution-NonCommercial-NoDerivs License, https://creativecommons.org/licenses/by-nc-nd/2.0/

T5-3 T 8 Teaching Idea

Using Drinking Straws and String in Language Learning

Clarify learning objectives: The activity presented here focuses on English language learning, and sentence patterns. However, the idea behind this activity (using straws or coloured beads to organise ideas) can be used in various subjects. Think about the learning objectives you would like your student teachers to achieve, and note those in your activity plan.

DBE Syllabus (2014), sentence patterns, structure, types: FDC 111, FDC 113, FDC 121, FDC 213, FDC 311.

Materials needed: Coloured straws or beads, string.

Description of the activity: Student teachers use (pieces of the) the different coloured pieces of straws to represent the different parts of a sentence. For example, in English language learning:

- blue = subject,
- red = verb,
- yellow = object,
- green = complement (etc).

Students thread the coloured straw on to the string in the right order (from left to right) to show the various sentence patterns in what they are reading.

A simple SVC sentence e.g. 'Nothing is impossible.' would look like this:

-blue - red - green-

Here are other sentence patterns that you can use, just make sure you have enough different coloured straws. You can use beads or dried pasta (that you have painted or dyed) instead of straws:

- SV
- SVO
- ASVOC
- SVOO
- SOA
- SVOV
- SVOCA , etc.

Using the idea. Tutors write a sentence on the board for the whole class to think about e.g.

- "Everyday you come to school early."

Students then make the sentence pattern using the coloured straws. They can then pair up and explain their patterns to each other. You can easily see who has got it right by asking them to hold up their string.

Students work in pairs using a piece of text (a different paragraph from a book/story/newspaper for each student). They pick some sentences to make with straws and string. Their partner has to figure out, using the text and the string, which sentences they have chosen.

You can also do the activity in reverse by asking the students to come up with a sentence that fits the pattern of straws you have made.

Extending the idea into an investigation. Once student teachers get the idea of pattern spotting in text and representing these patterns using straws and string they will hopefully begin to see other possible ways of using this as a TLM. Working in groups students may be able to come up with some more interesting ways of using the straw and string to represent other aspects of the English language and language learning. For example, can the idea be used to indicate the mood (declarative, imperative, interrogative, exclamatory) of different sentences in a paragraph?

T5-3 T 9 Teaching Idea

The Three Hole Bottle Experiment

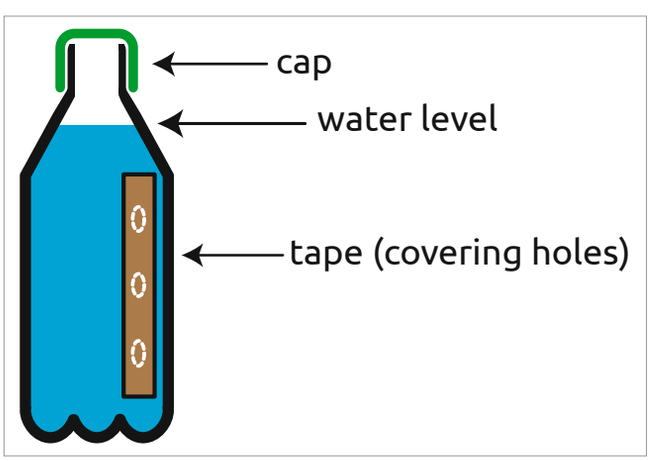

Figure 72. A bottle prepared for the three hold bottle experiment

This is a very rewarding experiment for a science class. The exploration of the experiment raises lots of questions among students.

DBE Syllabus (2014), discovery learning, discovery method: EPS 211, FDC 214, FVA 211.

Materials needed: A bottle with three holes (filled with water). Sticky tape to cover the holes.

Steps for the activity. During the activity, students predict what they think will happen when the tape is pulled off each hole in turn. Find out why keeping the cap on makes a huge difference to the results.

Tips: As a tutor, you will need to do this experiment yourself, to explore the different options, and come up with explanations. Refer to the Further Reading if needed.

Further Reading

Three-hole bottle, by Leslie Hays http://www.indiana.edu/~ensiweb/lessons/threehol.html.

T5-3 T 10 Teaching Idea

Investigating Volume/Capacity

This activity is an introduction to measurement, which is important in many areas of the curriculum (mathematics, science, arts, home economics, …).

DBE Syllabus (2014), capacity, ordering: ECE 123, EPS 311, FDC 224, PFC 222, PRA 125. DBE Syllabus (2014), water holding capacity: EPS 311. DBE Syllabus (2014), volume: FDC 112M, FDC 114, FDC 122, FDC 222, FVA 223, PFC 222; measurement: FDC 114, FDC 118, FDC 122, FDC 214, FDC 224.

Figure 73. Testing the submersion vessel.

Materials needed: A range of different containers of different shapes and sizes, including more regular containers like 1 litre or 2 litre plastic bottle and small 250ml ones. They will need access to water (a large basin would work).

Steps for this activity: Students can arrange a collection of empty containers in order of volume, and predict how many small containers will fill a large container.

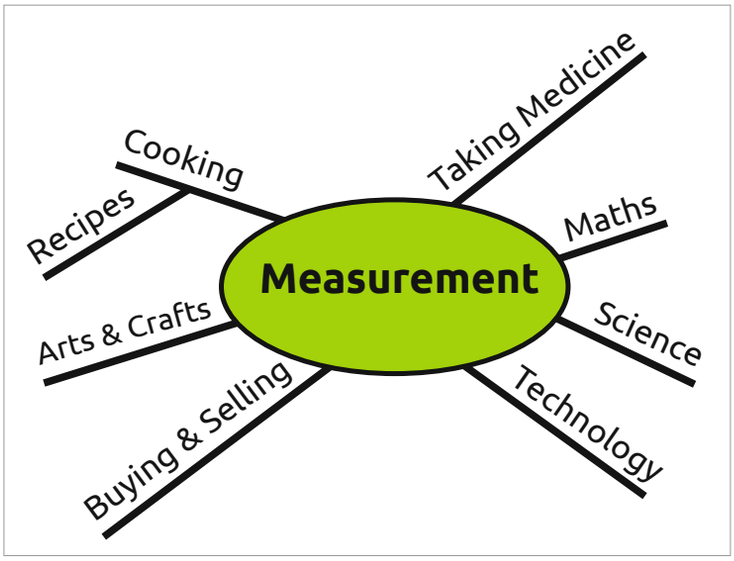

Figure 74. A mind map on measurement

Using an Overflow Can to Investigate Volume

Alternatively watch the video below. It demonstrates how student teachers developed a TLM to investigate the volume of an irregular-shaped object.

Materials needed: The materials they used were:

- Two to three plastic bottles
- One straw
- A piece of string
- A pair of scissors or a knife to cut the bottles
- Water

Whilst watching the discussion, think about the following question:

- How effective do you think this material was in supporting learning on this topic?
- Where can you apply similar approaches in one of your own forthcoming lessons?

Develop an activity plan for a forthcoming lessons.

Figure 75. Students investigate the volume of an irregular shaped object, http://tiny.cc/tpdvideo

Further Reading

Using the materials that have been collected, p. 24-26, from: University of Fort Hare Distance Education Project. *Core Education Studies Course: Helping Learners Learn. Umthamo 4: Independent Learning in a 'Resourceful' Classroom,* http://www.oerafrica.org/FTPFolder/Teachered/UFH/helpinglearnerslearn.umthamo4-independent-learning.pdf. Used with permission. For more resources from Fort Hare, see http://www.oerafrica.org/resource/university-fort-hare-distance-education-project-core-education-studies-course-helping-3.

T5-3 T 11 Teaching Idea

Devising Rich Tasks

Rich tasks are learning activities that:

- are accessible to everyone at the start
- allow further challenges and can be extended
- invite students to make decisions
- involve students in: speculating, hypothesis making and testing, reflecting, interpreting, proving or explaining
- do not restrict students from searching in other directions
- promote discussion and communication
- encourage originality/invention
- encourage 'what if?' and 'what if not?' questions
- have an element of surprise
- are enjoyable
- may be interdisciplinary (i.e. bring elements from different subjects together)

Source: Ahmed, A. (1987) Better Mathematics: A Curriculum Development Study. London: HMSO.

Many rich mathematics tasks can be found in books that you may have available (including the curriculum and your own lesson notes) as well as on the internet. You can also make your own rich tasks by tweaking existing mathematics activities, such as those found in a textbook. For example:

- **Changing starting conditions.** Change the starting conditions in a sequence for which you want to find the general rule T(n). For example, we usually start sequences with a positive number such as 3, 5, 7, 9, 11, … Instead, start it with a negative number such as -3, -1, 1, 3, …. Does this make it more difficult for your students? Does it bring out misconceptions.
- **Include unnecessary information**, for example exterior angles in a Pythagoras problem, and ask the students what other calculations could be done as a result (for example checking the length of the sides by using trigonometry);
- **Present the task in a more open way.** For example do not mention how they should solve the problem, but ask the students in how many different ways they could solve the problem. Then discuss which ones would be most efficient or best and why.
- **Take away vital information** and ask the students to identify what information is missing to be able to solve the problem. For example, instead of giving the student teachers the word problem
  - *"Laud left the house and started walking towards the market at an average speed of 5km/h. His sister Mary left the house half an hour*

later going to the same place and following the same route at an average speed of 7km/h. How long will it take for Mary to catch up with Laud?"

change it to

- *"Laud left the house and started walking towards the market at an average speed of 5km/h. His sister Mary left the house later going to the same place and following the same route at a faster speed. How long will it take for Mary to catch up with Laud?"*

- **Ask questions about a diagram.** instead of asking the student teachers a question that requires drawing or using a diagram, show the diagram and ask what maths questions could be asked that would fit the diagram. For example ask the student teachers to look at the figure underneath and think about what mathematical question they could ask about it. A selection of these questions can then be solved as a class activity.

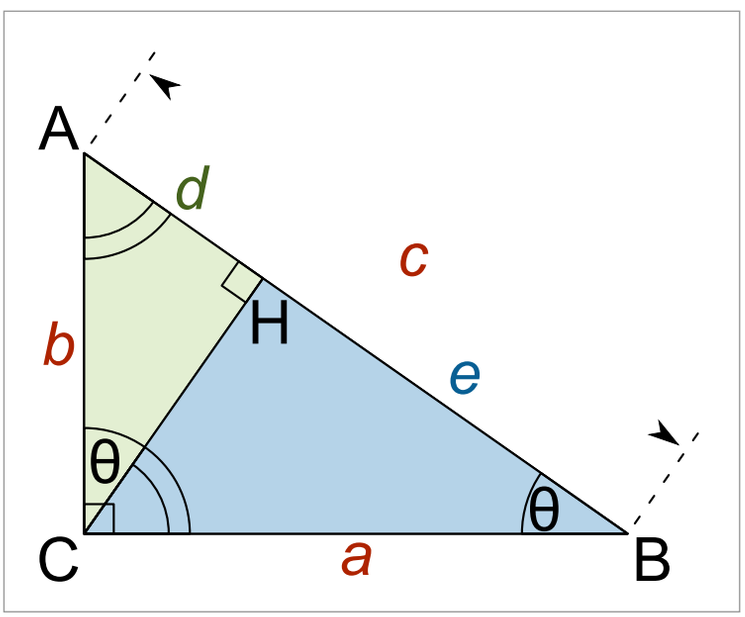

Figure 76. What questions will you ask?

- **Generalising.** Offer students the opportunity to generalise and use big numbers, for example for the sequence 7, 9, 11,.... what would the tenth term T(10), the thousandth term T(1000), the millionth term T(1000000), the n-th term T(n) be?

Decide on the rich activity you will do. Based on the examples above and on consulting textbooks (or the internet if available), the curriculum, and your own lesson notes, decide on the activity that you will do. Record the materials needed and the detailed steps in the activity plan.

Further Reading

The book "Better Mathematics" is not available online, but it is a great book, and you may find it in a University library: Ahmed, A. (1987). *Better Mathematics: A Curriculum Development Study*. London: HMSO.

The ideas above were adapted from the following publication, and you may wish to consult it for further inspiration: Back, J., Foster, C., Tomalin, J., Mason, J., Swan, M.& Watson, A. (2013) Tasks and their place in mathematics teaching and learning – part 1. *Mathematics Teaching* **232**. Available from https://www.atm.org.uk/write/mediauploads/journals/mt232/non-member/atm-mt232-06-08.pdf

Sources

Image: Pythagoras similar triangles, https://commons.wikimedia.org/wiki/File:Pythagoras_similar_triangles.svg. Public Domain.

T5-3 T 12 Teaching Idea

Making a Small Change to an Existing Task to Turn it Into a Rich Activity

Learning mathematics in school or college can result in students simply following procedures and not having to think why a certain algorithm or method is used, why it works or why it could give answers to questions. A way of making them think beyond the doing is to use rich tasks. The next activity is an example of such a rich task and devised by making a small change to an existing task.

Figure 77. Picture of the mausoleum in the Kwame Nkrumah Memorial Park, Accra.

The existing task is to make a clinometer by following instructions, and then use it to measure the height of a tall tree, object or local landmark that is too high to measure with rules or ropes or anything else, again by following

instructions. A clinometer (see figure below) is a tool used by land surveyors to work out heights. The existing task is adapted by instead of being given a manual showing how to use it, the students are asked to design such a manual, so they will first have to work out by themselves how and why a clinometer is a suitable tool – and, as such, what the mathematics of using a clinometer is. They have to make decisions on how to go about it, what to write in the manual and how to express their mathematical explanation.

Making a Clinometer

Learning objectives: calculations in trigonometry; using and applying trigonometry.

Decide which materials to use: you will need to decide beforehand what materials to use to make the clinometer, source these, or ask your student teachers to bring them to college.

Record steps for this activity: When you have decided on which materials to use, decide on the steps, such as:

Tell your student teachers that In this activity they are asked to make a clinometer. This is a tool to help surveyors measure the height of tall structures such as trees, landmarks or buildings. They are then asked to imagine they work for a company that produces such clinometers and they have to write a manual on how to use it. They should remember that their clients are surveyors who are quite knowledgeable about mathematics and trigonometry, so they should feel free to include mathematical explanations on how and why a clinometer can be used for working out heights.

To make a clinometer they will first need to modify their protractor and use it as shown in the two figures below. The clinometer measures what is called the 'angle of elevation' and they use it as shown in the figure below.

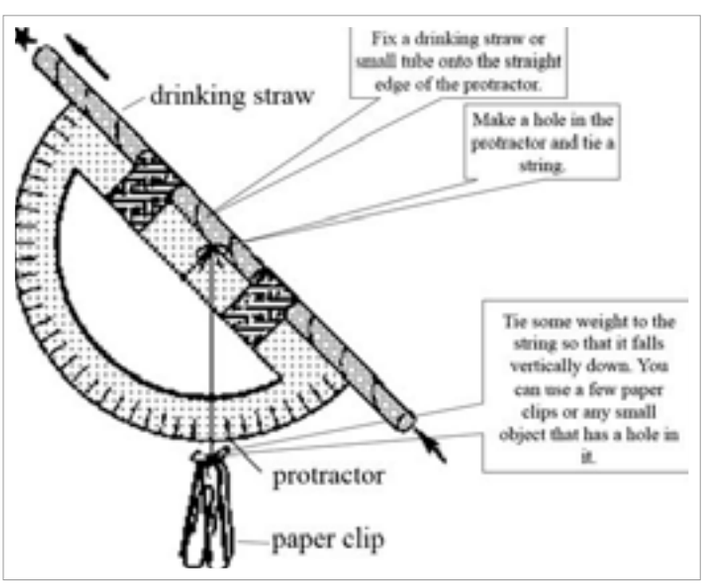

Figure 78. Making a clinometer

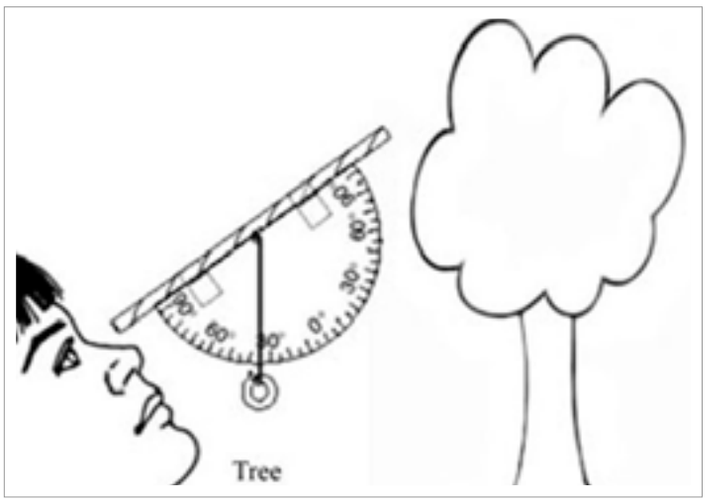

Figure 79. Demonstration of the angle of elevation on a clinometer.

Answering these questions will help the student teachers to design their manual:

- What are the components of this instrument and how does it work? What is the mathematics involved? It might help to make a drawing of what you think happens.
- Work out how you can use your clinometer to work out the height of a tall object. What is the mathematics involved? It might help to draw what you think happens.
- What happens if you stand on a hill and the object you are measuring is at the top of the hill? Do you need a different method or not?

Ask the student teachers to write up their manual to explain to its users how the clinometer works and how to use it. Remind them that drawings might make it clearer.

Sources

TESS-India, "Developing creative thinking in mathematics: trigonometry", http://www.tess-india.edu.in/sites/default/files/imported/57357/SM12_AIE_Final.pdf, available under Creative Commons Attribution-ShareAlike (http://creativecommons.org/licenses/by-sa/3.0/; unless identified otherwise).

Kwame Nkrumah Memorial Park Accra, https://pixabay.com/en/kwame-nkrumah-memorial-park-accra-659315/, CC0 Public Domain, https://creativecommons.org/publicdomain/zero/1.0/deed.en.

T5-3 T 13 Teaching Idea

Investigating Dissolving With Sugar, Salt and Chalk

Figure 80. A tutor supports a group of student teachers. Student teachers investigate liquids.

DBE Syllabus (2014), food substances: EPS 311, FDC 114B, FDC 224.

Materials needed: The materials needed for this activity include beakers (which can be made from plastic bottles), as well as sugar, salt, and chalk powder.

Steps for this activity: Ask students to work out which of the three white powders dissolves best in water. Try to set the investigation in a real life context or frame it as a question about which students will want to know the answer.

Tips: How will students make their investigation a fair test? Which variables will they change/keep the same?

As an extension to the activity students could investigate what happens to the solutions if they are left for the water to evaporate. Or they investigate the rate of dissolving and try to improve it (e.g by using more water/hot water, stirring, shaking etc.)

T5-3 T 14 Teaching Idea

Manipulatives in Mathematics and Other Subjects

This activity is about using manipulatives to help student teachers understand mathematics. However, the activity could also be used in other subjects. The activity was inspired by a classroom investigation on area and volume of cuboids, conducted at Mary Waters High School and Rhodes University, Grahamstown, South Africa (see image and image source below).

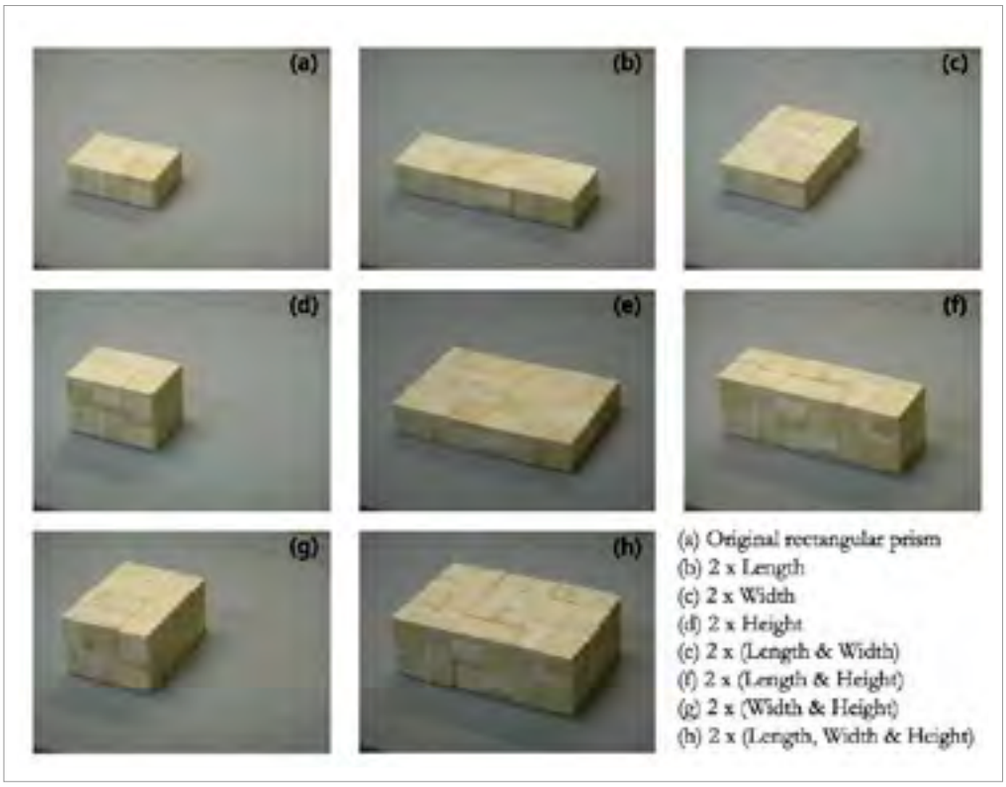

Figure 81. A classroom investigation focusing on surface area and volume of rectangular prisms.

Clarify the learning objectives: For which subjects and topics could you use manipulatives in mathematics?

Example activity: The above shown in the image using small blocks. Give students autonomy over how to go about this investigation by allowing them to record and present their results in whichever way they choose. However, make sure that each group decides clearly how to record and present in advance. Note that for this example activity, the concepts in this are not difficult, but sometimes there are misconceptions concerning the relationship between surface area and volume.

Sources

Image source: “Investigating the Surface Area and Volume of Rectangular Prisms”, Senzeni Mbedzi and Duncan Samson, http://www.amesa.org.za/amesal_n15_a2.pdf. Permission granted for use under Creative Commons Attribution ShareAlike.

T5-3 T 15 Teaching Idea

Investigating Cylinders Made from Parallelograms

This activity works with any cardboard cylinder, such as the tubes found in toilet rolls and kitchen rolls.

DBE Syllabus (2014), cylinder: ION 184, PFC 222.

Students can experiment with making different cylinders (short/tall, fat/thin) from different sized parallelograms. Unravel such a cardboard tube. What shape is it? Can you roll it in a different way to make a shorter fatter cylinder?

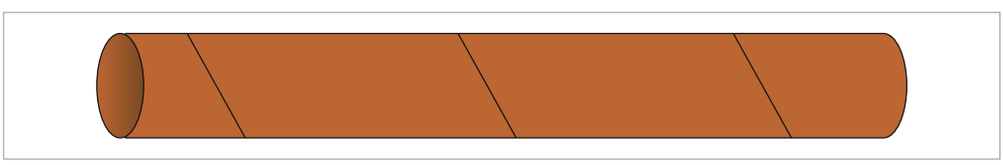

Figure 82. Cardboard tube that unravels to a parallelogram

Decide on learning objectives: Can you come up with a context to set this investigation in? What is the topic in the curriculum that you will address? What are the learning objectives?

Further Reading

- Cylinder Cutting, https://nrich.maths.org/7530.
- Toilet Paper Math, http://runningwithteamhogan.com/toilet-paper-math/.

T5-3 T 16 Teaching Idea

Investigating Balloons Rockets

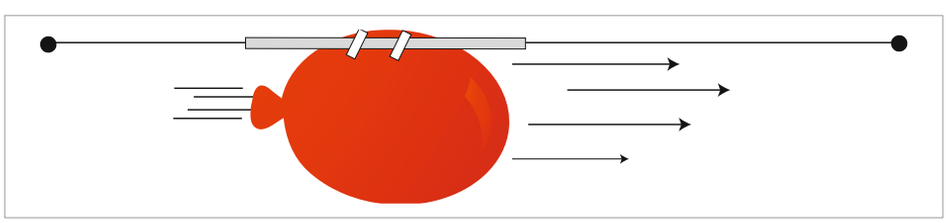

Figure 83. A balloon rocket.

This activity uses the idea that rockets are propelled by expelling (pushing out) gases. The aim of the task is to make a balloon rocket, tape it to the straw guide and see how quickly it reaches the other side of the room.

DBE Syllabus (2014), forces: FDC 124, TEC 121, TEC 221.

Decide on a learning objective: How can you relate this activity to curriculum-based learning objectives? Decide on the lesson where you will use this activity.

Materials needed: You will need some string (enough to reach from one side of the room to the other) for each group and one straw per group to thread on the string and act as a guide for the rockets. Each group will also need: 2 straws, and some tape. Scissors can also be used.

To make this fun activity even more exciting, have a race. Each group places their balloons at the starting position and they are 'launched' at the same time. The winner is the balloon that goes the farthest (or reaches the other side of the room first).

Students can do this activity as an investigation by varying the exhaust they use for their rocket. They can change the length of the exhaust pipe and see how that affects the speed of their rocket or they can change the number of exhausts and see if that affects the speed. By setting up a table like this one students can begin to make quantitative predictions and test hypotheses:

Number of straw exhausts	Time taken to travel across the room (seconds)	Speed of balloon rocket (distance travelled/time) in m/s
1		
2		
3		
4		

Other factors that can be changed include the shape of the balloon and the string position (horizontal, vertical, at an incline).

T5-3 T 17 Teaching Idea

Investigating Heat Transfer With Balloons

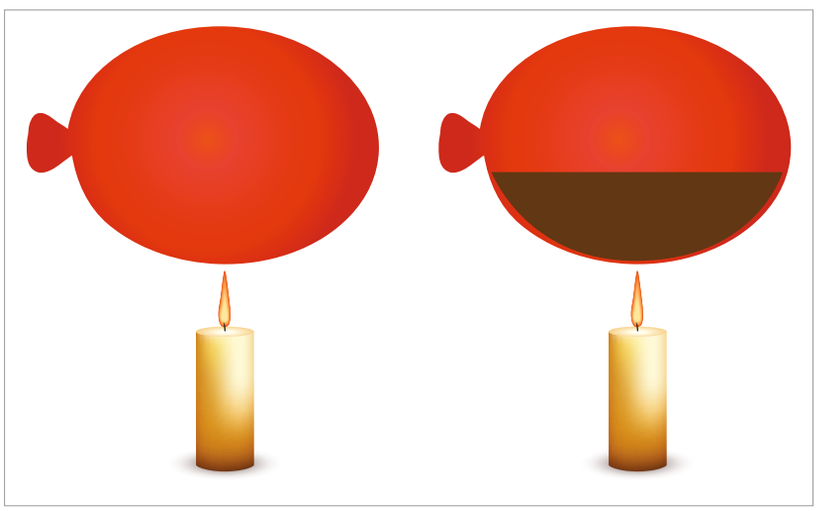

Figure 84. Balloon heat transfer.

This is the same activity as 'Balloon on Fire!, from T5-3P. You will need the same materials as used during that session. In the same way as you explored this during the session, ask students to draw what they think is happening in the two scenarios. As students to produce drawings, as they often reveal misconceptions.

DBE Syllabus (2014), heat transfer: FDC 224, FVH 212.

Tips:

- To set this activity in a meaningful context you can ask students questions like: 'Have you ever wondered why surfers prefer the early morning surf?' 'Or 'Why when your hot apple pie seems cool enough to eat it still burns your tongue?'. (Explanation: Water heats up slowly and cools down slowly whereas land heats up quickly and cools down quickly.)
- This kind of activity can be used as a starting point for an activity-based lesson on heating and cooling. Students could investigate the rate at which water cools in containers with different surface areas etc. They can then move on to looking at ways to speed up/slow down the rate at which water heats/cools.

T5-3 T 18 Teaching Idea

Investigating Pressure

This bed of nails activity in T5-3P highlights the fact that pressure depends on area. If the area over which a force acts is large then the pressure is small;

conversely if the area is small the pressure is great: pressure equals force divided by area.

DBE Syllabus (2014), pressure: EPS 311, FDC 124.

A demonstration of the balloon and drawing pins (thumb tacks) activity can form the basis of an investigation of pressure. Students will enjoy the demonstration and will be more motivated to work on their own investigation.

Example activity: Use some clay (or perhaps plasticine or play dough if available would also work) and some different sized blocks. How does the area of the block pushing down on the dough (place the block on top of the dough with a weight on top) affect how much pressure the block exerts on the dough (as measured by the depth the block sinks in)?

Materials needed: Students could be given minimal instructions and asked to conduct their own investigation using the equipment needed, e.g.

- some clay;
- some blocks/cubes with different surface areas;
- some weights (to place on top of the blocks;
- a ruler (for measuring the depth).

Figure 85. Pressure is an important concept in many areas.

Sources

Image: Celebrate My Drive: Check Your Tire Pressure. By , https://www.flickr.com/photos/statefarm/14799235964, Creative Commons Attribution License, https://creativecommons.org/licenses/by/2.0/

T5-3 T 19 Teaching Idea

Investigating Text Types

Learning objective: Students are able to identify features of different text types.

DBE Syllabus (2014), types of literature: FDC 123.

Decide which materials to use: samples of different text types taken from textbooks, magazines, newspapers, etc.

Record steps for this activity, such as:

1. Divide students into groups of 4-5. Assign each group one of the following text types: narrative, descriptive, expository, argumentative.
2. Students look for examples of their text type in their coursebook, readers, old magazines and newspapers, etc.. They should find at least two examples to work with.
3. Students analyse the texts in terms of purpose, features and language. They design a poster to present their findings.
4. Groups take turns to present their posters to the rest of the class. Leave the posters displayed on the walls for future reference.

T5-3 T 20 Teaching Idea

Investigating Locally Available Indicators for Acids and Bases

Learning objectives: students investigate sources and properties of acids and bases, and will be able to prepare indicators from locally available resources including flowers or a given part of a plant.

DBE Syllabus (2014), acids and bases: Integrated Science 3, Semester 4, Year 2, FDC 224; accidents involving acids: FDC 214.

Decide which materials to use: the discussion in the video below outlines a number of materials you could consider to indicate acids and bases. These included:

- Lemon juice
- Flowers including, hibiscus flower (*sobolo*)
- Ashes
- Carbide

You may also need:

- Plastic bottles, or other material to hold and funnel liquids
- String to act as dropper

Watch the video below discussing how they created the indicators, and think about the following question:

- What indicators do you have access to in your college and surrounding area?
- How could you use them to investigate their properties as acids and bases?

Figure 86. Making indicators for acids and bases, http://tiny.cc/tpdvideo

T5-3 T 21 Teaching Idea

Project Work

Project work enables students to investigate a topic (e.g. an event, a work of art, a piece of music) in depth. It involves planning, collaboration, creativity, constant evaluation and reflection. It can be used in any subject and integrates a variety of language skills.

DBE Syllabus (2014), project work, project realisation: ECE 213, ECE 311, EPS 211, EPS 321, FVA 211, ING 111, PRA 213, PRA 223, TEC 112, TEC 121, TEC 211, TEC 212, TEC 222, TEC 311, TEC 311D.

Students carry out the project work in groups. Groups can work on the same topic or each group can work on a different topic. Project work is most successful when students are involved in identifying the topic(s) themselves.

A project can continue throughout a whole course, with time allocated each week for project work. However, it can also be small and just last a week or two. The end project can be displayed using different media, e.g. a poster, a PowerPoint presentation, an advert, etc. Collaboration with other subject teachers (e.g. art, IT) can add to the value of project work.

The following steps are suggested:

1. Form project groups on the basis of the students' interests and needs. Assign roles and coordinators for each group.
2. Agree on the topic(s) of the project and agree on the final outcomes. Possible topics include:
    - Local history
    - A guide to local restaurants
    - A class newspaper, newsletter or news programme.
    - A science fair
    - Planning a music festival
    - Healthy eating, including tasks like keeping a food diary, making a food pyramid, etc.
3. Present a very clear timetable of when each stage of the project should be completed.
4. Guide students in structuring the project work. This includes determining the information required, sources of information and how analysis of information will take place, Plan short project meetings with each group for updates and progress reports.
5. Students gather information from a variety of sources, e.g. magazines, newspapers, the Internet, and libraries.
6. Students analyse the data gathered, that is, select appropriate information and discard irrelevant material.
7. Students present the final product.
8. Give feedback and/or encourage peer evaluation. Have students reflect on the process and their contribution to the final product.

Figure 87. Group collaborates.

Teaching Strategy 4 - Introduction
Using the Outdoors and the Environment

T5-4 i 1 Learning Objectives

In this teaching strategy, you will learn to

- Draw on your own prior experiences of learning outdoors;
- Survey the local environment for TLMs;
- Plan an activity using the outdoors and environment as a TLM.

The remainder of this section is pre-reading for the PD session. As you read through this introductory section, and as you work through the activities in the following PD sessions, relate them back to the above learning objectives.

T5-4 i 2 Introduction to Outdoors and Environment

Learning outdoors engages and excites students and gives them a sense of freedom. They are more motivated to learn and feel more connected to their community and environment with a greater sense of belonging.

Many subjects when taught outside really come alive for students. Tutors see the benefits in improved communication with students and there is increased mutual respect.

Sometimes it is just being outside that turns a learning experience from a normal everyday one into something a bit out of the ordinary, one where students are willing to get fully involved with and that will have a longer lasting (more memorable) impact.

The time spent outside can be extensive, for example, for a field trip that lasts the whole day or just for the duration of an activity during the course of a lesson. A project might involve regular sessions outside on a weekly basis and be planned well in advance or you may spontaneously decide that the classroom is feeling crowded and that an activity will work much better where the students have the space to move around more.

The outdoors has much to offer us in terms of TLMs, from both the natural and the man-made environment. By taking students outside and making the real world relevant to their learning, you will be helping to prepare them for life after college.

Figure 88. The TLM tutor at OLA examines clay present in the soil on campus.

Figure 89. Drying corn. By World Bank Photo Collection, https://www.flickr.com/photos/worldbank/2074138198, Creative Commons Attribution-NonCommercial-NoDerivs License, https://creativecommons.org/licenses/by-nc-nd/2.0/

Teaching Strategy 4 — PD Session
Using the Outdoors and the Environment

T5-4 S 1 Reflect Together

Your Teaching and Learning Since the Last Session

Following the usual housekeeping, start the reflection. Turn back to T5-3 S, "Reflect After Your Teaching". Your PDC will guide you through the reflection.

T5-4 S 2 Review and Recap

Introducing This Session

Review pre-reading. Now turn to the pre-reading. Do you have any questions about the introduction? Spend a few minutes discussing any issues with your colleagues.

Recap learning objective. Finally, recall the specific learning objectives for this teaching strategy. Are there any questions?

T5-4 S 3 Activity 1 — Talking Tokens

What is Your Experience of Outdoor Learning?

Here we will use a Talk for Learning strategy to ensure that everyone gets to contribute equally to the discussion on outdoor learning. Working in groups of four or five, each person in the group will get 3 talking tokens and give up one each time they contribute information (about their own experience of outdoor learning) to the discussion.

You can choose to talk about times that you have used the outdoors to contribute to students' learning or to talk about things you have learned yourself from the natural environment. You might even choose to talk about things you have seen or heard with regard to what other teachers are doing outdoors with their students (e.g. field trips, excursions, project work etc.).

Organise your group so that someone takes notes (you can share this between a few people) and someone is prepared to give feedback to the whole class.

Tutor Discussion

- Has anything surprised you about this discussion? What?
- In your own school career (both as a student and as a teacher) did you have any lessons outside the classroom? What were they?
- Do you have any reservations (things that worry you) about taking your class outside?

T5-4 S 4 Video

Extension Activity: Example of Use of Outdoor Materials as a TLM

Watch the video of Cynthia, the TLM tutor at OLA, demonstrate how she took advantage of locally available resources at her college to use as TLMs with her students. Think about your context and after watching, discuss in a pair:

- In what ways can you be innovative and make use of your local environment?
- How can you overcome any challenges that may arise?

Figure 90. Making use of clay, http://tiny.cc/tpdvideo

T5-4 S 5 Activity 2 — Take it Outside!

Mini Excursion to the Great Outdoors

We are going to go outside to gather some information. When we come back into the classroom we will share our ideas about the experience.

After doing a very short activity outside you will try to think of ways in which you can use the environment to enhance the teaching of your subject area. Look around you, walk around and think creatively. Perhaps work with other tutors who teach your subject and try to come up with some ideas together.

You may bring back inside anything that you find that could be useful as a TLM so long as it is safe to do so. If you have a smartphone you can take a picture of something outside that you could make use of, or you might want to bring a note pad and pen to write down some notes/sketches.

When we come back into the classroom we will spend a few minutes sharing what we have found out.

For example, a trip outdoors could provide an opportunity for English students to practise the structure ' to hear/see someone doing something' as in the following sentences:

- I saw a man painting a wall.
- I heard some birds singing.

Tutor Discussion

- How did it feel when you found out you would be going outside for this part of the session?
- What was the best bit about going outside?
- What was the worst bit?
- Did you find anything in the natural environment (or anything man-made) that you could use as a TLM?

Figure 91. Tutors at OLA on a mini-excursion outdoors.

T5-4 S 6 Plan and Practise Together

Plan an Activity on Outdoors and Environment

It is now time to plan an activity. Each tutor should plan their own activity using the activity plans provided. To provide some inspiration, please consult the 'Teaching Ideas' section of this teaching strategy.

Remember: when planning and executing activities, always ensure that female students have equal opportunities to participate, try first and take leadership roles. We often forget about being gender responsive and male students end up unfairly dominating and benefiting more.

T5-4 S 7 End of Session

Agreeing Follow-up Activities

This is now the end of the session. Decide when you will teach your planned activity and make arrangements with a colleague for them to observe you (see the Teach and Observe section below). In the next PD session we will return to the Reflect Together section.

T5-4 S 8 After the Session: Teach and Observe

It is important for your professional learning that you actually teach the activity that you have planned. Please make sure that you have your activity plan available when you teach.

Any issues that arose during the lesson should be written down immediately after you have taught, and remember to fill in your observations section of the tools after you have taught.

If possible arrange with a colleague to observe each other when you each do the activity with your student teachers during the week.

T5-4 S 9 Reflect On Your Teaching

Outdoors and Environment

Make sure to fill in this tool as soon as possible after you have taught your planned activity with your students. It will be used as a starting point for reflection during the next session.

Tool 2: TLM observation questions

Brief description of your TLM:				Notes/reflections
1.How long did it take you to prepare your TLM for the activty?	Less than 10 min	10-30 min	More than 30 min	
2. How easy was it to get hold of the resources you needed for your TLM?	Very easy	Not very easy	Hard	
3. How motivated were the students to engage with the TLM?	Very	Not very	Not at all	
4. Did you have enough TLMs for all the students to interact with?	Yes	No	Not sure	
5. Did you ensure that female and male students had equal opportunities to interact with the TLM?	Yes	No	Not sure	
6. Did your TLM enhance learning?	Yes	No	Not sure	
7. How was the pace of the lesson compared to normal?	Faster	Same	Slower	
8. Will you use this TLM again?	Yes	No	Not sure	
9. If yes, where will you store it in the meantime?				
10. Will you make any modifications to your TLM?	Yes	No	Not sure	
11. If 'yes' what will you change?				

Figure 92. Bridge in Kakum, Ghana. Source: 1 of 7. By Jo Fleet, https://www.flickr.com/photos/jofleet/285055761, Creative Commons Creative Commons Attribution-NonCommercial-NoDerivs License, https://creativecommons.org/licenses/by-nc-nd/2.0/

Teaching Strategy 4 — Teaching Ideas
Using the Outdoors and the Environment

T5-4 T 1 Plan and Practise Together

Writing an Activity Plan

As usual, you should use an activity plan template to guide your planning, in which you record the learning objective, the resources used, and the steps for the activity as usual. There is guidance available near the activity plan templates, as well as in T5-1T. Please refer back to this in case you are unsure what to do.

Theme 5: Teaching and Learning Materials PD Session 4: Outdoors and Environment	
Teaching Idea	**How it works**
T5-4 T 2. Storytelling in the outdoors	Use the outdoor environment to enhance your English language lessons or any other lesson wherever making a connection to the real world outside the classroom is possible.
T5-4 T 3. Writing and following directions	Students write directions to places on the college campus for their classmates to follow.
T5-4 T 4. Guided tour roleplay	Students practise describing places by giving their classmates a guided tour of the college campus.
T5-4 T 5. Mapping the college grounds	Students survey the college campus with the aim of creating a map or a guide.
T5-4 T6 . Signs	Students copy signs that they see in everyday life outside the classroom for a class activity on rules and regulations.
T5-4 T 7. Leaf Art	Students create a collage from fallen leaves.
T5-4 T 8. Investigating water retention in soil	Students can help you to gather samples of different soil types from around your locale. Using a funnel (made from the top a water bottle) and a beaker (made from the bottom of a water bottle), they investigate how much water each soil type can hold.

T5-4 T 9. Finding mathematical ideas outdoors	Finding angles in the college grounds and thinking about their significance: just what would happen if the angle between those walls was 20 degrees less? Help your students to understand the relevance of using and measuring angles in their everyday lives.
T5-4 T 10. Using the outdoors to work with bigger dimensions in mathematics	Give students the chance to experience metres as metres rather than just representing them as little 'ms' on paper. Choosing an appropriate scale to measure things is a useful skill and you can expose your students to a wide range of different-sized objects by moving out of the classroom and into the college grounds.
T5-4 T 11. Using outdoor games and sports to teach mathematical concepts	Students explore algebra and the concept of variables and constants in the context of cricket.
T5-4 T 12. Making a solar system model	By using the facts about how far planets are away from us and their size, students can begin to build an accurate picture of our solar system. Doing this activity on the scale of a large outdoor space brings it a little more to life than just reading about it in a book. Modelling it for themselves helps students to begin to appreciate our place in the universe.
T5-4 T 13. Kinaesthetic astronomy: embodying the movement of the Earth	Using scale models and their bodies to represent the Earth, students are able to get a better idea of how and why we have day and night and the seasons. By taking this activity outside students are able to gain an appreciation of the relative size and scale of what is involved.
T5-4 T 14. Distance, time and speed	A structured activity for measuring the speed of a ball rolling down a slope. There are examples of tables that students can use to record their data and instructions on how to work out average speed. Taking this outside makes the speed easily measurable.
T5-4 T 15. Stargazing	This simple activity involves looking at the night sky. Students can complete it as a homework assignment or do it during an overnight field trip away from college.
T5-4 T 16. Investigating shadows	Use this structured activity to make an outdoor compass and improve orientation skills.

T5-4 T 17. Making a sundial	Challenge students to make a sundial on a sunny day using a long stick, some chalk, stones and a watch.
T5-4 T 18. Looking for symmetry	Symmetry is everywhere around us! Encourage students to find symmetrical structures in places where they would not normally look.

T5-4 T 2 Teaching Idea

Storytelling in the Outdoors

Many subjects have aspects that involve the outdoors. In English lessons, invite a traditional storyteller or a cultural figure to share stories with the students beneath a shady tree. The sounds of nature all around can enhance the experience for all involved. As a follow-up activity, have students explore and study their outdoor environment and then write their own story that incorporates at least one sound or object, such as a flower, a tree, an insect or a bird.

Find ways to enhance your students' learning experience by integrating what is real and observable outside the classroom with what they need to know to succeed in your subject.

DBE Syllabus (2014), storytelling: ECE 121, ECE 122, FDC 211, PRA 221.

Figure 93. Carrot harvest. You might encounter this scene if you go outside with your students. What story could you tell?

Sources

Image: Carrot harvest with subtle rebellion. By Chad Skeers, https://www.flickr.com/photos/chadskeers/5457912937, Creative Commons Attribution License, https://creativecommons.org/licenses/by/2.0/

T5-4 T 3 Teaching Idea

Writing and Following Directions

In this activity students work in pairs to write directions to a mystery destination on the college campus for another pair of students to follow.

DBE Syllabus (2014), maps: FDC 118; space awareness, locations PRA 122.

Clarify learning objectives: students practise giving and following directions.

Decide which materials to use: students need notebooks and pens.

Record steps for this activity, such as:

1. Revise directions.
2. Put students in pairs. Explain that they are going to prepare directions to a secret destination on the college campus. The directions should include 5-6 sentences but must *not* name the destination. Instead, the last direction should be followed by a question that will prove if the person following the directions has reached the right place, e.g. What colour is the door on your right? What does the sign on your left mean? What does the picture on the wall in front of you show? Etc.
3. Allow students 10-15 minutes to go outside the classroom and prepare the directions.

Figure 94. How would you provide directions?

4. Pairs return to the classroom and swap directions. They go outside again and follow the directions to the mystery destination. They answer the question to prove that they followed the directions correctly!

Sources

Image: Elmina Wharves. By Francisco Anzola, https://www.flickr.com/photos/fran001/3587105307, Creative Commons Attribution License, https://creativecommons.org/licenses/by/2.0/.

T5-4 T 4 Teaching Idea

Guided Tour Role-Play

In this activity students prepare and give a guided tour of the college campus.

Clarify learning objectives: students practise describing places.

Materials: this task does not require any materials.

Record steps for this activity, such as:

1. Explain that you are all going for a walk around the college campus. Students will work in pairs. One student will take the role of a guest visiting for the first time and the other the role of a tour guide. The 'guide' must explain the places they are walking past and the 'guest' must listen and ask questions.
2. Elicit and practise the kind of things that the 'tour guide' might want to say, e.g.
   - This is …
   - On the left/right we can see …
   - On the corner there is ...
   - This was built in …
   - This building is used for ...ing
   - Over there you can see ….
   - This is where …
3. Go on your walking tour and have students give the guided tour to their partners. Half way through the tour, ask students to swap roles and continue.
4. Monitor the students' language during the 'tour' and make a note of common errors for an error correction activity when you get back to the classroom.

This activity could be followed up by having students prepare a written guide to the campus.

Figure 95. How would you do a guided tour? The art shown was created by El Anatsui, who uses bottle tops and discarded materials in his work.

Sources

Image: DSC03523. By muzina_shanghai, https://www.flickr.com/photos/muzina_shanghai/5070008426, Creative Commons Creative Commons Attribution-NonCommercial-NoDerivs License, https://creativecommons.org/licenses/by-nc-nd/2.0/.

T5-4 T 5 Teaching Idea

Mapping the College Grounds

Maps are important tools. At a basic level, they help you to get from A to B, but they have many important uses, including fighting malaria (see further reading below). Moreover, making maps involves the development of many important skills, such as the ability to organise information.

DBE Syllabus (2014), maps: FDC 118; space awareness, locations PRA 122.

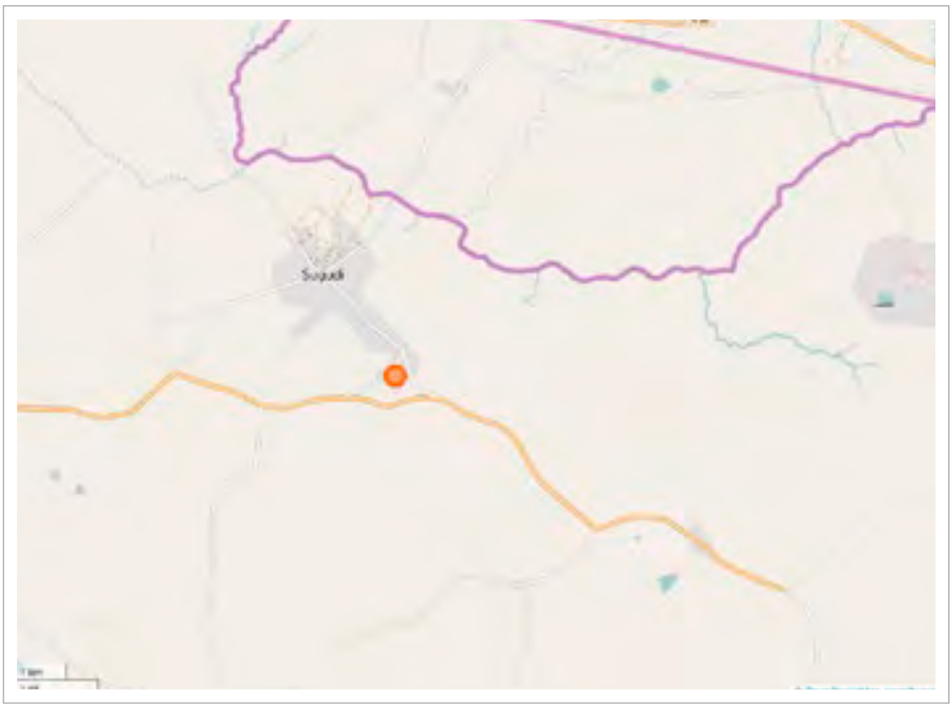

Figure 96. The location of Gbewaa College of Education

Do you have maps at your college? Look through some maps and notice how important landmarks are highlighted. In this activity, your students are going to make a map of the college grounds. Your students could go out and record their own maps (without you providing many instructions). When the return, compare the maps, and discuss the merit of the different maps, and different strategies taken.

Figure 97. Wesley College of Education, Kumasi.

Further Reading

- 260,000 more buildings in Zambia — New OSM data in Zambia supporting malaria prevention programs https://www.developmentseed.org/blog/2015/11/16/zambia-import/.
- Humanitarian Open StreetMap — Disaster Mapping Projects https://hotosm.org/projects/disaster-mapping.

Sources

Images of Gbewaa College of Education and Wesley College of Education. Cartography licensed under the Creative Commons Attribution-ShareAlike 2.0 license (CC BY-SA). OpenStreetMap is open data, licensed under the Open Data Commons Open Database License (ODbL) by the OpenStreetMap Foundation.

T5-4 T 6 Teaching Idea

Signs

Here is a concrete activity using sign to practice English. However, signs are very useful, and activities involving signs can be developed for almost any subject.

Some elements of the syllabus focus on signs (DBE Syllabus (2014), signs: EPS 311, FDC 118; signs in music: PRA 121; label/labeling: EPS 311, FDC 214, GNS 211). However, you can use signs as a teaching method for many topics that do not explicitly mention signs, e.g. to talk about rules: DBE Syllabus (2014), rules: FDC 122C, FDC 122T, FDC 124, FDC 214, FVA 225, FVH 121, FVH 212, PRA 124, PRA 212, PRA 216, PRA 222, TEC 112.

Learning objectives: Students practise talking about rules and regulations using *can*, *have to* and *(not) allowed to.*

Materials to use: Students copy signs that they see in their local environment.

Steps for this activity:

1. Ask students to look for and copy signs that they see on their way to college, in the market, on the roadside, on food packets, etc. Ask them to draw the signs on a sheet of A4 paper and bring to class, for example:

Figure 98. A selection on signs

Students should be given 2-3 days to collect pictures of signs.

2. Display the signs on the board. Students work in pairs and answer the following questions:
   Where might you see this sign?
   What does it mean?
3. Monitor. Ask questions to guide students to correct their own errors.

This activity could be followed up by writing a set of rules for living on the college campus.

T5-4 T 7 Teaching Idea

Leaf Art

In this activity, students create a collage from using parts of plants and trees, such as leaves.

Clarify learning objectives: Can you develop a learning objective (according to the syllabus) that fits with this activity? Learning objectives can come from any subjects. For example art (using natural materials to create artwork), in science (classifying trees), and many others.

Decide which materials to use: You need to decide on a natural material that is readily available. For example, if you use leaves, then students need

to collect fallen leaves from around the college campus. In addition to the materials collected, you also need paper and multipurpose glue.

Record steps for this activity. When you have decided on the learning objective and which materials to use, decide on the steps, such as:

1. Students collect fallen leaves. (Where will this take place? How long should this take?)
2. They study their shape, colour, texture, etc. (Where and when will this take place? During the lesson? As an assignment? How will students record their findings?)
3. Students create a collage from the leaves. (Where and when? Will the collage be displayed? Will other student teachers comment?)

Figure 99. "Collage" by Kimama

Figure 100. "Leaf turkey" by thirteensparrows

Sources

Collage 249. By Kimama, https://www.flickr.com/photos/20209265@N00/8408294384, Creative Commons Attribution-NonCommercial-NoDerivs License, https://creativecommons.org/licenses/by-nc-nd/2.0/

Leaf turkey. By thirteensparrows, https://www.flickr.com/photos/jennifer13/304316401, Creative Commons Attribution-NonCommercial License, https://creativecommons.org/licenses/by-nc/2.0/

T5-4 T 8 Teaching Idea

Investigating Water Retention in Soil

Learning objective: In this activity student teacher understand how different types of soil retain water. Different types of soil can hold different amounts of water.

DBE Syllabus (2014), water, water conservation, water and soil: ECE 123, ECE 214, ECE 225, EPS 222, EPS 311, FDC 114, FDC 118, FDC 124, FDC 214, FDC 224, FVA 223, PRA 125, PRA 215.

Materials needed: For this investigation, each group will need:

- Samples of different types of soil (at least 3 different types of soil);
- Water bottles (one for each type of soil);
- Extra beakers (from the bottom of a water bottle);
- A stopwatch or other way of timing;
- Some water.

Steps for this activity: Students can investigate water retention of soil by comparing how long it takes for water to pass through samples of different soils. By keeping the amount of soil and water the same, students can begin to quantify the water retention properties of the different soils.

Figure 101. Three different soils

Make the investigation a bit more challenging by giving students a statement to substantiate. For example, present them with the statement “Clay soils can hold twice as much water as loamy soils” and allow them to design their own experiment to convince the rest of the class of the facts.

Figure 102. Testing water retention

You can make it even more open ended by giving the students a concept cartoon with a range of different hypotheses (each character makes a different statement about the water retention properties of the different types of soil). Students are then given the task of working out who is right and convincing the rest of the class.

Further Reading

You can watch another video on water retention in soil here: http://oer.educ.cam.ac.uk/wiki/Video/Priscillah_Water_Soil_A04.m4v.

T5-4 T 9 Teaching Idea

Finding Mathematical Ideas Outdoors

‘Mathematics is all around us’ can often be heard, especially from mathematics teachers! But somehow, very little maths activities in schools and colleges involve looking at the maths around us, and using it to develop mathematical understanding. Here are two ideas for bringing the ‘maths is all around us’ into the learning context of a maths lesson. The first activity does this in the context of angles. The second one looks at area and perimeter outdoors.

Figure 103. What can we learn from an aloe plant?

Angles all around us

Angles play an important role in life. Yet somehow, students often do not see these angles around them or associate them with the angles that they work with in the classroom. When the students do not notice the angles around them, they are less likely to understand the importance of angles or to understand how two angles are related.

In the next activity you will ask your student teachers to identify different angles, first in the classroom, then in the college grounds. The activity then asks them to think about the importance of the measurements of the angles, and what would happen if they were changed.

Learning objectives: angle types; real-life applications of angle

Preparation: this is an outdoor activity looking for angles in real life context. To prepare, think about where the best places would be to ask your student teachers to go. If your student teachers have the possibility of taking photographs, for example on their mobile phones, ask them to take these with them.

Record steps for this activity, for example: Arrange students in groups of four or five. Give them their instructions before taking them out to the college grounds. Tell each group to find at least three examples of each different type of angle, such as obtuse, acute or straight angles. Then ask them:

- to find different angles in the college grounds, and to make a note and a drawing of these
- to estimate the size of these angles and make notes

- to categorise these angles into acute, obtuse, etc. and make notes.

If your students have access to digital cameras or mobile phones with an integral camera, these could be used to take photographs of the angles that the students find when they are working out-of-the-classroom. This would be an exciting alternative way for them to record their findings. If you have access to a computer and a printer, you may be able to print out some of the students' photographs and make an exciting display on angles to go on the classroom wall.

Back inside ask the groups to report back to the whole group on some of their findings – reporting back on all of their findings might take too long.

Ask students:

- What would happen if the angles you found were reduced to smaller angles?
- What would happen if the angles you found were increased to larger angles?

Figure 104. What mathematical considerations can be made here?

Sources

TESS-India, "Using embodiment, manipulatives and real-life examples: teaching about angles", http://www.tess-india.edu.in/sites/default/files/imported/57316/EM14_AIE_Final.pdf, available under Creative Commons Attribution-ShareAlike (http://creativecommons.org/licenses/by-sa/3.0/; unless identified otherwise).

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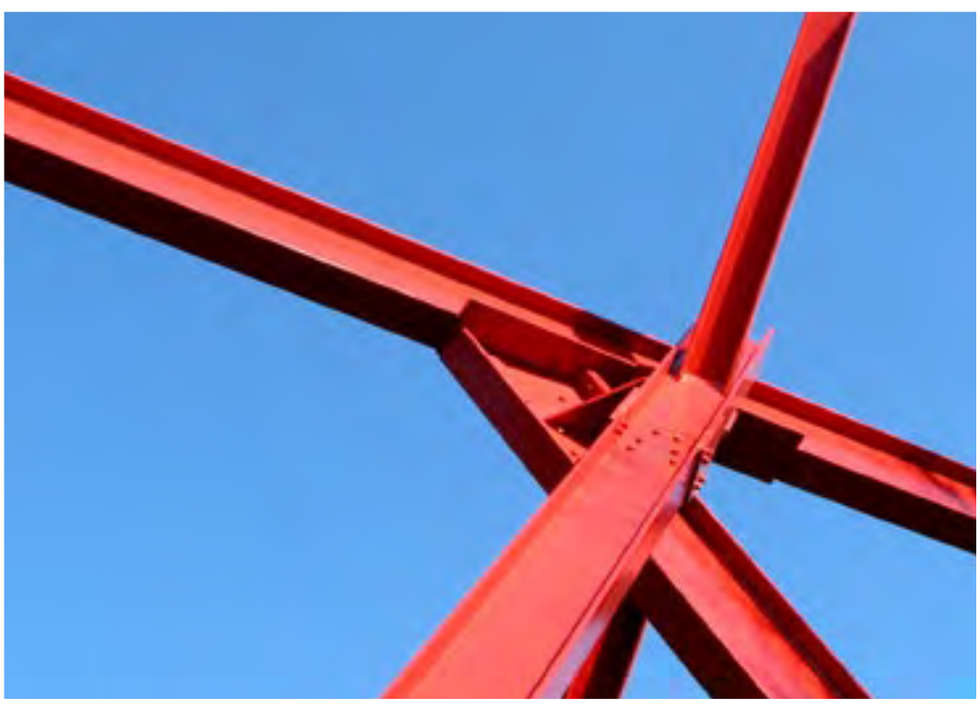

Figure 105. Angles in construction.

T5-4 T 10 Teaching Idea

Using the Outdoors to Work With Bigger Dimensions in Mathematics

When working on area and perimeter, students tend to be told to use units of measurements such as metres, centimetres, inches, etc. but without letting them understand from their own experience why it is actually a good idea to do so. They also often do not know how big the larger dimensions are in reality, because they tend to work with representations of this on paper. A unit of measurement is a measure defined and adopted as a standard by convention or by law, such as a metre, a gram or a litre.

The next activity aims to address these issues by working outdoors on area and perimeter. Students are asked to explore in groups any areas and perimeters they can find outside the classroom using their own measures, and then to compare and discuss their findings with the other students. Taking the mathematics outside of the classroom in this way also allows the students to become aware that mathematics is all around us. At the same time, it gives them the opportunity to experience working with larger shapes than pencil and paper allow.

Learning objectives: to experience area and perimeter on a larger scale; to explore the effectiveness of different unit measures.

Preparation and materials needed: This out-of-the-classroom activity works well when students work in groups of four or five and they have been assigned roles within their groups. For example, two students can be asked to measure, one student to oversee, one or two students to record the observations. If your students have access to digital cameras or mobile phones with an integral camera, these could be used to take photographs of the shapes that the students measure in their groups. Alternatively, a tape recorder could be used to record the measurements instead of writing them down when the students are working out-of-the-classroom.

Activity, Part 1: Working out perimeter and area of large shapes. Ask students to measure and work out the perimeter of as many large shapes as they can within a certain time period outside of the classroom. For example, they could measure the perimeter and area of the path in front of the building, the flower bed, the outside corridor area. Decide with the students on a list of which shapes to measure so that the measurements can be compared later. The students are not to use any metric measures like metres, but their own 'measures' such as sticks, feet, steps, etc.

Activity, Part 2: Comparing findings. Back in the classroom, ask the students for their findings and write these on the blackboard. Ask the students whether they came up with the same measurements. What was the same and what was different? Did they encounter any difficulties when measuring? Can they think of more effective and accurate ways to make such measurements? Could they convert their measurements into units of measurement?

Figure 106. Angles outdoors: buildings in Accra.

Sources

TESS-India, "Using rich tasks: area and perimeter", http://www.tess-india.edu.in/sites/default/files/imported/57309/EM10_AIE_Final.pdf, available under Creative Commons Attribution-ShareAlike (http://creativecommons.org/licenses/by-sa/3.0/; unless identified otherwise).

Image: Angles & Colors. By C.C. Chapman, https://www.flickr.com/photos/cc_chapman/7128353655, Creative Commons Creative Commons Attribution-NonCommercial-NoDerivs License, https://creativecommons.org/licenses/by-nc-nd/2.0/

T5-4 T 11 Teaching Idea

Using Outdoor Games and Sports to Teach Mathematical Concepts

Games and sports such as football, tennis, cricket offer great opportunities to learn about variables and constants in mathematics. Doing so allows participants to discover the meaningfulness and value of mathematics in their everyday life. Sometimes heated discussion about point scoring happens, which actually means people are discussing mathematics!

Activity: Cricket to Learn Algebra

This activity can be used as a consolidation exercise, where students can use their learning a different context — sports and in particular cricket. Your

students may not be familiar with cricket, and you can adapt this activity to another sport. The activity allows students to become aware of variable quantities in a sports game.

For this activity the students should go outside and play the game for real. Explain to the students they are going to play a 5-5 cricket match (or the alternative sport that you have chosen). Create groups of two teams of five students. Each team is to include both women and men. For each team, one student will be designated the scorekeeper (not always the females!). Each team bowls five overs.

After six balls have been bowled, the score needs to be added for that over. Ask two scorers to jointly fill in the table below by recording the number of runs scored in each over:

Over	Team 1	Team 2
1		
2		
3		
4		
5		
Totals		

Figure 107. Score card

After the match, ask the whole group to discuss the following questions. In larger groups it works well to ask the students to first discuss these questions in small groups and then share with the whole group.

1. Did each team score the same number of runs in each over? Why/why not?
2. What is the maximum number of runs that could be scored per over? Why? (Note: You can score one, two or three runs if you really run between the wickets, four for reaching the boundary if the ball hits the field first, and six for hitting the ball over the boundary without hitting the field first – so the maximum number of runs is six sixes. This is a case of a variable having limited values that it can take.)
3. For each team, is there a visible trend in the number of runs scored in each over? Is the trend the same for both teams? If not, why do you think the trend is different?
4. If this was a six-over match, what could have been the runs scored by each team? Would the result of the game be different or the same if each team got six overs?
5. Which of the following quantities are variables? In other words, what may have varied during the match?
    - number of wickets taken by each bowler

- number of overs bowled by each team
- number of boundaries scored by different batsman
- weight of the ball used in the match.

6. What other quantities may have varied during the match? What quantities are constants (which remain unchanged during the match)?

Then ask the students to use their list of variables and constants to construct their own statements with algebraic expressions.

Figure 108. Boxing training in Ghana.

Sources

TESS-India, "Learning through talking: variables and constants", http://www.tess-india.edu.in/sites/default/files/imported/57314/EM12_AIE_Final.pdf, available under Creative Commons Attribution-ShareAlike (http://creativecommons.org/licenses/by-sa/3.0/; unless identified otherwise).

Image: Boxing training. By André Hofmeister, https://www.flickr.com/photos/exil-fischkopp/31376700, Creative Commons Attribution-NonCommercial License, https://creativecommons.org/licenses/by-nc/2.0/

T5-4 T 12 Teaching Idea

Making a Solar System Model

Make an outdoor dynamic model of the solar system, to illustrate the scale of distances between the Sun and planets, and the idea of orbits. Because the team to set this activity up is quite small, you may want to do the initial building activity as part of different-task group work.

DBE Syllabus (2014), solar system, planets, universe: FDC 114, FDC 118, FDC 214.

Resources needed. Here is a long list of possible resources that you can use. However, this activity can be varied according to the resources that you have available.

- Football for the Sun (if you don't have a football, an object like a box or a bag can also work);
- Pointed wooden sticks for planet signs;
- Nine pieces of paper or stiff card for planet labels;
- Thumb tacks (drawing pins) or tape to secure labels to sticks ;
- Large outdoor area
- Table showing planet names, distances from sun, distances on model.

Planet	Distance from Sun (millions of km)	Distance from model sun (paces)	Distance to next planet label (paces)
Mercury	58	1	1
Venus	108	2	1
Earth	150	2.5	0.5
Mars	228	4	1.5
Jupiter	779	13	9
Saturn	1426	24	11
Uranus	2870	50	26
Neptune	4490	77	27

Figure 109. Table of planet distances. Model distances are to nearest participant long pace (1 long pace = 58,000,000 km). Note that Pluto does not occur in this list, because it is now regarded as a 'dwarf' planet – not one of the official planets of our solar system.

Instructions for making the model. These instructions could be done by a small group of student teachers, just to assemble the model:

1. Cut eight labels from card;
2. Write the planet names on the cards;
3. Cut eight pieces of straight stick (50cm long) - sharpen the points;
4. Pin the planet labels to the blunt ends of the sticks (these are now eight planet signs);
5. Write out the table of distances on a large piece of flipchart paper or cardboard.

Figure 110. The solar system: Sun, planets, and dwarf planets. Sizes are to scale. Distances from the Sun are not to scale.

Modelling the solar system. In this part of the activity, you now model the solar system. You will need to do this outdoors. This requires students (or pairs of students) to "be" one of the planets. Nominate one pair of participant to be the Sun (give them the marker for the sun, e.g. the football); nominate eight pairs of participants as the planet sign carriers – list them on the flipchart. Allocate participants equally regarding gender:

1. Place the Sun (on pair) on a spot in the playground with sufficient space around it (holding the marker/football up);
2. Ask the first planet sign carriers to stand beside the Sun – then walk one long pace from the Sun and push the Mercury sign into the ground; the pair remains with the sign;
3. Repeat this for the other seven planet signs (each planet participant spair teps out the distance according to the distance chart);
4. Nominate two participants to be checkers of the distances (they should step out the distances again);
5. Ask the Mercury planet sign carrier to begin moving in an orbit round the Sun (so that she remains the same distance from the Sun;
6. Ask the Venus planet sign carrier to do the same. Then, ask all the carriers to begin moving.

The other student teachers observe this process. As they get an idea of how the planets move in orbits, then they should draw a sketch of this dynamic model created by their peers. Here are some additional learning points that you can embody:

- You can vary the activity by asking some of the observers to join the model. For example, the size of the planets varies, and larger planets could be represented by more students.

- Also, many planets have moons, and some participants could be moons.
- You could discuss how the distances change as you go through the solar system.
- You could discuss how the speed of the planets changes as you go through the solar system.

Further Resources

NASA Scale Models of the Solar System http://www.nasa.gov/offices/education/programs/national/summer/education_resources/earthspacescience_grades7-9/ESS_ss-scale-models.html

City of Longview Solar System Walk http://www.mylongview.com/index.aspx?page=585

Sources

Image: Planets2008.jpg, Public Domain, https://commons.wikimedia.org/w/index.php?curid=14586846

Tara's Solar System. By Tara Herberger, https://www.flickr.com/photos/taratara69/5580580817, Creative Commons Creative Commons Attribution-NonCommercial License, https://creativecommons.org/licenses/by-nc/2.0/

Figure 111. A model solar system

T5-4 T 13 Teaching Idea

Kinaesthetic Astronomy: Embodying the Movement of the Earth

The previous idea can be adapted to embody the movement of the Earth around the Sun. Students make a similar scale model of the Earth, the Moon and the Sun (with students representing those three objects). They use their model to show the relative positions of the Earth, Moon and the Sun at different times of the day and different times of the year (the seasons). Rather than just having one student for the Earth, you can have a larger number of students, each being the Earth, forming an ellipse around the sun: Each student now represents the Earth at a different time of year.

DBE Syllabus (2014), solar system, planets, universe: FDC 114, FDC 118, FDC 214.

Further Reading

The Space Science Institute has some very useful pages on "Kinesthetic Astronomy" that you can find here http://www.spacescience.org/education/extra/kinesthetic_astronomy. Resources can be downloaded from here: http://www.spacescience.org/education/extra/kinesthetic_astronomy/download.html.

T5-4 T 14 Teaching Idea

Distance, Time and Speed

Use a stopwatch to time a ball rolling down a sloping track, and find the average speed of the ball's roll along two sections of the track.

DBE Syllabus (2014), distance, velocity and acceleration: FDC 122C.

Resources needed :

- Ball track (a medium to long surface that a ball can roll on, like a wooden bench, a wooden plank or a piece of plastic gutter, if available)
- Any solid object you can use to prop one end of the track up higher than the other end
- Ball (that is not wider than the width of the track)
- Tape measure
- Stopwatch (most mobile phones have a stopwatch capability)

Instructions:

- Set up a ball track with a slope of not more than 15 degrees from the horizontal. The slope should have a gradual incline so that the ball does not roll too fast and can be easily timed.

- Mark three points on the track – A, B and C. Use a felt pen or pieces of paper stuck to the sides of the track. Pieces of paper are good, because the ball brushes against them as it rolls. This prompts you to 'start' and 'stop' the stopwatch. Pictures A, B and C show the set-up.
  - **Picture A : ball and track**
  - **Picture B : checking the angle of slope for the track**
  - **Picture C : preparing to time the roll**
- Use the table below to record all the data.

		Time (sec)								
	Distance (cm)	**1st roll**	**2nd roll**	**3rd roll**	**4th roll**	**5th roll**	**Total for 5 rolls (sec)**	**Mean time (sec)**	**Distance/ mean time cm/sec**	**Average Speed cm/sec**
AB										
BC										
AC										

Stage 1

- Measure the distance from A to B. Record in the second cell of Row AB of the table.
- Measure the time it takes for the ball to roll from A to B. Use the electronic stopwatch on a cell phone. There is a 'start' and 'stop' button. Record the time to tenth of one second (e.g. a reading on the stopwatch might be 1.67 ; record this as 1.7). Enter this time in the third cell of Row AB of the table.
- Roll the ball for distance AB on five occasions. Record the times and enter them in the appropriate cells of Row AB.
- You now have five readings for the time of the roll for the distance AB. They are probably all different. Total them. Enter the total in cell 8 of Row AB. Find the 'mean time' by dividing the total by 5. Enter the answer in cell 9 of Row AB.
- Use the data to calculate the distance AB divided by the mean time. This is written ***distance (cm)/mean time (sec)***. Enter this sum into cell 10 of Row AB. Record the answer in cell 11 of Row AB.
- This is the average speed of the ball rolling the distance from A to B on your track.
- To ensure that you enter your data correctly, here is an example of data entered into the cells for an imaginary distance XY.

	D (cm)	Roll 1	Roll 2	Roll 3	Roll 4	Roll 3	Total (sec)	Mean time (sec)	d/t	Av. speed
XY	63	1.7	1.3	1.2	1.7	1.8	1.5	7.7/5 = 1.54	63/1.54	40.9 cm/ sec

- Check to make sure you have everything done for the distance AB.

Stage 2

- Follow exactly the same sequence of steps for the distance BC.
- Measure the distance from B to C. When doing the rolls of the ball, start the roll from the top of the track. Record all the data, and calculate the average speed of roll for BC.

Stage 3

- Calculate the distance AC, by totalling AB and BC. Enter the distance in the appropriate cell (2nd cell of Row AC).
- Follow the same sequence of steps for AC. Start the roll from the top of the track.
- Enter all the data in Row AC of the table.

Stage 4

- Now, complete this table of results :

Distance	average speed	
AB		
BC		
AC		

- Study the results. Have students discuss them with others in a group and write a summary of what they have learned about the average speed of a ball rolling down a sloping track.

T5-4 T 15 Teaching Idea

Stargazing

There is much that you can learn from the night sky. If you did the activity with your students on making and using a clinometer in T5-3T, here is an extension activity. Your students would need to do this partially in their spare time as an assignment.

DBE Syllabus (2014), solar system, planets, stars, universe: FDC 114, FDC 118, FDC 214; types of observation: ECE 212.

Part 1. During class clarify with your students how the Earth rotates, and what this means for the night sky. Make sure everybody understands the rotation of the Earth and the night sky.

Part 2. If your student teachers are unclear about this, ask them to observe the night sky. They should identify a bright star, and see how it changes hour by hour. If they are clear about it already, skip this part. Tip: In order to identify the right star repeatedly, you might need to draw the constellation it is in.

Part 3. Once all students are clear about the rotation of the Earth and the night sky, ask students to can use a clinometer to measure how the angle of a bright star changes over time. For instance, record the time at one hour intervals. Do all stars change by the same angle?

Figure 112. Stars over time.

Sources

Image: Tree Trails. By Frank Pierson, https://www.flickr.com/photos/frankpierson/4890776817, Creative Commons Creative Commons Attribution License, https://creativecommons.org/licenses/by/2.0/

T5-4 T 16 Teaching Idea

Investigating Shadows

This activity uses a large outdoor space on a sunny day to investigate the points of a compass.

Learning objective: Points of the compass. Learn the points of the compass by playing a 'changing places' game.

DBE Syllabus (2014), compass, cardinal points: FDC 118; shadow: FDC 114.

Resources needed:

- Groups of nine participants
- Chalk
- A sharp stick (about 0.5m long)
- Large, flat area like a football pitch

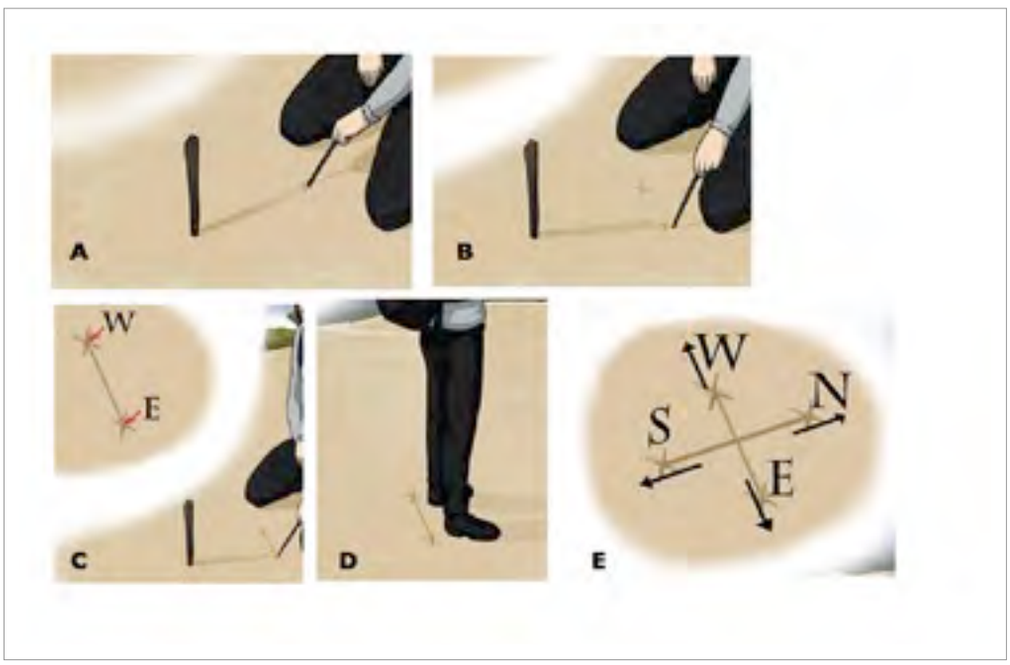

Figure 113. Pictures A–E.

Step 1: Marking the shadow tip. In a level area of the football pitch, push a stick into the ground, so that it is upright, and so that you can see its shadow. Use a sharp object to mark the tip of the shadow with an X (Picture A: marking the shadow tip).

Step 2: Marking the second shadow tip. Wait for about fifteen minutes. The tip of the stick's shadow will move from west to east. Mark the new position of the the shadow tip (Picture B: Marking the second shadow tip).

Step 3: Draw a straight line on the ground, to join the two marks (Picture C). This line is an approximate East-West line (Picture C : marking an E-W line between the shadow tips).

Step 4: Stand with the first mark (west) on your left, and the other mark (east) on your right. You are facing North (Picture D : using the E-W line to face North).

Step 5: Draw a line on the ground at 90 degrees to the first line. This new line is the North-South line (Picture E : marking the four points of the compass).

Step 6: Use chalk to draw a large compass on the ground. Picture F shows a sketch of this. Make the spokes of the compass at least four metres long. Draw the central circle first. Then draw the North spoke. This should point to North, as you found it with the shadow stick.

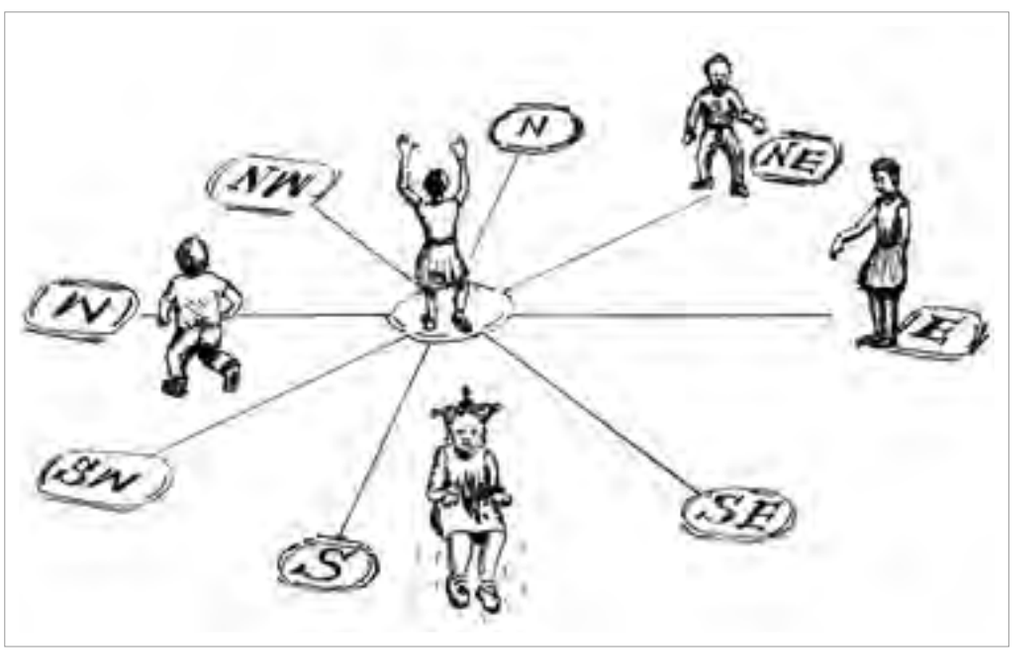

Figure 114. Picture F. Using a large compass rose on the ground.

Step 7. Draw the other spokes. Draw the circles for the points. Label the eight points of the compass as on the sketch (N, NE, E, SE, S, SW, W, NW).

Step 8. Ask participants to stand on each of the eight points of the compass. Ask each participant to call out which point she is.

Step 9. Ask a participant to stand on the middle circle.

Step 10 . Explain how the 'changing places' game will work.

- When two compass points are called out, the participants on them try to change places as fast as possible. The participant in the centre tries to run to one of the two points called out. She tries to get there before a participant reaches it. If she does, the 'out' participant must go to the centre. He will try to catch out the others in next round.

- Call out two compass points (e.g. South-East and North). Observe the reaction of the two participants on these points. Do they quickly realise they are being named? Does the participant at the centre quickly determine one of the points she should run to?

This game helps participants to learn the eight points of the compass. It encourages listening and responding to instructions. It also develops the capacity for rapid running movement.

Sources

Pictures A–E. WikiHow http://www.wikihow.com/Find-True-North-Without-a-Compass. Creative Commons Attribution Non-Commercial ShareAlike.

T5-4 T 17 Teaching Idea

Making a Sundial

As an extension to the previous activity, for students to do in their own time, students chart the shadow of a large stick throughout the course of the day to make a sundial.

DBE Syllabus (2014), sundial: EPS 311; telling the time: ECE 123; shadow: FDC 114.

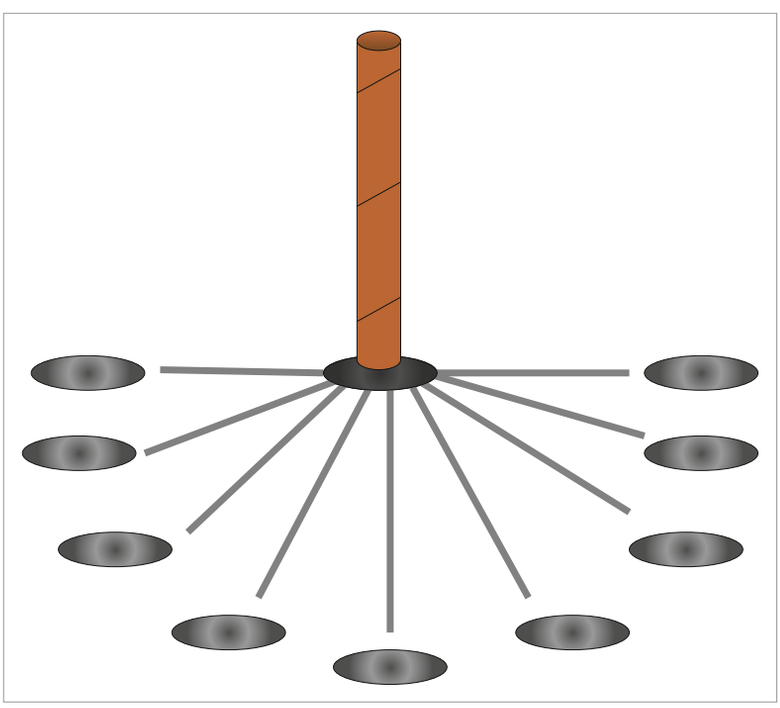

Figure 115. Shadow markings on the ground

Useful resources for this activity: Chalk, stones, a sharp stick (about 0.5m long), a large flat area like a football pitch, a watch to tell the time. A portable version can be made using a pencil instead of a stick and making the markings on a paper plate.

Further Reading

Make a Sun Dial from a Plate, https://www.nwf.org/kids/family-fun/crafts/sundial.aspx.

Creating an equatorial sundia, http://www.mysundial.ca/sdu/sdu_digital_equatorial_sundial.html.

T5-4 T 18 Teaching Idea

Looking for Symmetry

Learning objectives: finding different types of symmetry in real-life contexts.

DBE Syllabus (2014), symmetry: FDC 122, FDC 222V, PFC 222.

Preparation: this is an outdoor activity looking for symmetries in real life context. To prepare, think about where the best places would be to ask your student teachers to go. If your student teachers have the possibility of taking photographs, for example on their mobile phones, ask them to take these with them.

Record steps for this activity, so that students can do this activity in the school building or in the grounds. They could even do it as part of a field trip to a place where there may be interesting structures and buildings to see. After talking about the different kinds of symmetry (rotational, translational, etc.) send students on a symmetry hunt to find unique and interesting symmetry in places or in objects where we might not even think to look. They should draw a sketch or write a description that would enable others to find the structure and comment on its symmetry. Groups can present their findings to the class for discussion.

Figure 116. Symmetry in nature.

Figure 117. Sea shells at OLA — how can they make a TLM?

Sources

Image “Symmetry in nature”: img_0879. By Äpfel X, https://www.flickr.com/photos/aepfelx/245747046, Creative Commons Creative Commons Attribution-ShareAlike License, https://creativecommons.org/licenses/by-sa/2.0/

Teaching Strategy 5 — Introduction
Using TLMs Effectively

T5-5 i 1 Learning Objectives

In this teaching strategy, you will relate the use of TLMs to the previous themes, and discuss how these are related to student teachers' learning.

T5-5 i 2 Reviewing Our Journey so far

The table below shows the familiar themes from the TPD programme. You have so far worked through Themes 1 – 5, and you may already be familiar with Leadership for Learning (Theme 6).

Theme number	Theme
1	Creative Approaches
2	Questioning
3	Talk for Learning
4	Group work
5	Teaching and Learning Materials
6	Leadership for Learning
7	Assessment for Learning
8	Gender and inclusion
9	Project work and investigation
10	Teaching reading, writing, and numeracy across the curriculum
11	Using digital and mobile technology for effective teaching and learning
12	The tutor as a researcher

Figure 118. The Themes in the TPD programme

Other important elements are included in Themes 7–12, with topics such as Assessment for Learning, inclusive education, project work, early-grade reading and mathematics, as well as the use of digital and mobile technology for effective teaching and learning. For continuous improvement, the tutor herself is the learner, and we may say that a true learner is a researcher. Theme 12 thus focuses on action research.

Figure 119. Making a periscope out of paper.

T5-5 i 3 Why Focus on These Themes?

These themes were chosen because they relate closely to how children learn most effectively. Feedback on the TPD programme showed that tutors would sometimes like to know a little more about the research background, and a selection of freely downloadable papers has been made available in Appendix 1, "Literature on Effective Learning".

There are many different ways of summarising effective teaching approaches, and the TPD Themes is only one way of representing them. However, there is very broad consensus that there are some core ideas that are very important:

- Dialogue and classroom talk, including feedback and questioning;
- Collaborative learning and peer tutoring, including group work);
- Teachers assessing student progress (within an activity), and students assessing their own learning (metacognition and self-regulation).

Teaching and learning materials play an important role too, and in particular when these support such effective approaches.

T5-5 i 4 The Highlights of Your Journey

Consult your own lesson plans and your learning journal. Flick through the materials for Themes 1–4 to remind yourself of what you have done so far. What were the highlights for you? Were there particular situations where you were impressed by your students' learning?

Write the examples you remember in the table below.

1	
2	
3	
4	
5	

Now that you have written down some examples, can you relate them to effective teaching strategies?

If you have any materials that relate to the above experiences (such as lesson plans, materials produced by students, or other TLMs), please bring them along to the session.

T5-5 i 5 Further Reading

- PD Guide for Tutors, Theme 1: Creative Approaches
- PD Guide for Tutors, Theme 2: Questioning
- PD Guide for Tutors, Theme 3: Talk for Learning
- PD Guide for Tutors, Theme 4: Group work
- PD Guide for Tutors, Theme 5: Teaching and Learning Materials
- PD Guide for Tutors, Theme 6: Leadership for Learning

Also see Appendix 1, “Literature on Effective Learning”.

Figure 120. Where will the road take you?

Sources

Young girl walks to school (Walking to school, Ghana). By World Bank Photo Collection, https://www.flickr.com/photos/worldbank/5094183737, Creative Commons Attribution-NonCommercial-NoDerivs License, https://creativecommons.org/licenses/by-nc-nd/2.0/.

Figure 121. Many ways to learn about colour.

Teaching Strategy 5 — PD Session
Using TLMs Effectively

T5-5 S 1 Reflect Together

What TLMs Have We Used so far?

Following the usual housekeeping, start the reflection. Turn back to T5-4 S, "Reflect After Your Teaching". Use "Tool 3" to review the TLMs that you use in your teaching (including the classroom and outdoors). How has this affected your students' learning?

T5-5 S 2 Review and Recap

Introducing This Session

Do not review the pre-reading. Unlike other sessions, we will not review the pre-reading. We will review the pre-reading as part of an activity below.

Recap learning objective. Recall the specific learning objectives for this teaching strategy. Are there any questions?

T5-5 S 3 Discussion

Which Activity Will You Do?

Decide which one of the following three activity you will do in this session. Give tutors a few minutes to look at the activities, and then make a decision. Only do one of the activities

T5-5 S 4 Activity 1

Textbook Tango! A Fun Activity That Uses Textbooks as a Resource in a Novel Way

In this first activity, we revisit the use of textbooks and printed materials (T5-2).

The purpose of this activity is to get you handling and flicking through textbooks as if they are an everyday commonplace thing. This is how we should think about them if we are to use them effectively in teaching and learning. Of course they should be handled with care and should not be mistreated but they are strong and will not break or tear easily, so do not let that put you off using them.

Part 1

- Each group has two textbooks of roughly the same size (the "PD Guide for Tutors" are good for this).
- One person in each group takes a textbook in each hand with the spines pointing away from each other. Using their thumbs they flick through the books from the back to the front, interweaving the pages of each book as they go.
- Overlap the pages as much as possible so that the resulting 'double book' is not much wider than one of the books.
- The more pages you interweave the better the next part of the activity will be so try to interweave one in every 5-10 pages as a guide.

Part 2

- Swap 'double books' between groups so that each group has a different one from the one they made.
- Take it in turns in your group to try to pull the interweaved books apart. Do this by gripping the spine of one book in one hand and the spine of the other book in the other hand and pulling in opposite directions.
- The winner is the group whose books are hardest to pull apart.

Figure 122. Tutors make novel use of textbooks.

Part 3: Tutor Discussion on Textbooks

Here are some quick questions for discussion in your groups:

- Do you have textbooks in your classroom?

- If yes, how often do you use them?
- Are they covered with film or protected in any way?
- Do the students treat them respectfully?
- Can students take textbooks home?
- Is there a system in place for sharing textbooks between classes?

T5-5 S 5 Activity 2

Making a Tall Tower out of Old Newspapers

In this first activity, we revisit the activity-based learning (T5-3). Each group gets the same number of sheets of newspaper (or a whole newspaper paper if possible), a bottle top and a marble (or something else small and heavy for the tower to support).

Your challenge is to work together to build the tallest structure you can using just the newspaper in the time allowed (5 minutes). Your structure should support an upturned bottle top with a marble/stone in it and stand on its own for at least 10 seconds.

Tutor Discussion

- How did you decide who would do what? Can you think of another way?
- Was your group well organised? How do you know?
- What learning behaviours did you use during the task?
- Were you motivated to complete the task? Why?

Figure 123. Tutors using newspaper to build.

T5-5 S 6 Activity 3

Bag of Bones - Making a Skeleton From Plastic Bags

You need a lot of plastic bags for this activity (20 per team).

Working in two large groups use plastic bags to make a life-sized human skeleton. Groups compete during this fast-paced activity that relies on cooperation and creativity. Marks are awarded for scientific accuracy. Bones can be stuck on to a life size outline of a person.

Books/internet can be used to get anatomical details correct. Make sure everyone in the group has a job to do. Marks will be also be awarded for collaboration so be sure to work together as a team.

Tutor Discussion

- How did you decide who would do what? Can you think of another way?
- Was your group well organised? How do you know?
- How would you you solidify the learning/concepts at the end of this activity?

T5-5 S 7 Discussion

Using TLMs Effectively

Consider the three effective teaching approaches mentioned in the introduction:

- Dialogue and classroom talk, including feedback and questioning;
- Collaborative learning and peer tutoring, including group work);
- Teachers assessing student progress (within an activity), and students assessing their own learning (metacognition and self-regulation).

How do these relate to the 12 Themes in the TPD programme? Clarify any questions that you may have.

In turn, describe some of the highlights of your own teaching that you have noted down in the introduction, and share with others the materials you have brought along.

T5-5 S 8 Plan and Practise Together

Plan an Activity Using TLMs

Inspired by what others have shared, now plan an activity. Each tutor should plan their own activity using the activity plans provided. To provide some

inspiration, please consult the 'Teaching Ideas' section of previous teaching strategies (T5-1 to T5-4), which have ideas for activities.

Remember: when planning and executing activities, always ensure that female students have equal opportunities to participate, try first and take leadership roles. We often forget about being gender responsive and male students end up unfairly dominating and benefiting more.

T5-5 S 9 Discussion

Celebrating Our Progress

Spend a few minutes to discuss what you could do to celebrate your progress in the TPD programme. How can you make the progress visible? How will others visiting the college find out about it?

Decide on a few concrete actions to be undertaken.

T5-5 S 10 End of Session

Agreeing Follow-up Activities

As usual, agree on follow-up activities, including classroom teaching.

T5-5 S 11 After the Session: Teach and Observe

It is important for your professional learning that you actually teach the activity that you have planned. Please make sure that you have your activity plan available when you teach.

Any issues that arose during the lesson should be written down immediately after you have taught, and remember to fill in your observations section of the tools after you have taught.

If possible arrange with a colleague to observe each other when you each do the activity with your student teachers during the week.

Please fill in the "Tool 3: TLM Observation Questions" (see below) after you have taught.

T5-5 S 12 Reflect On Your Teaching

Your Use of TLMs

Make sure to fill in the "Tool 3: TLM Observation Questions" (see below) as soon as possible after you have taught your planned activity with your students. Reflect on how the activity went by adding notes to the last column.

T5-5 S 13 Further Resources

Tool 3: TLM Observation Questions

Brief description of your TLM:				Notes/reflections
1.How long did it take you to prepare your TLM for the activty?	Less than 10 min	10-30 min	More than 30 min	
2. How easy was it to get hold of the resources you needed for your TLM?	Very easy	Not very easy	Hard	
3. How motivated were the students to engage with the TLM?	Very	Not very	Not at all	
4. Did you have enough TLMs for all the students to interact with?	Yes	No	Not sure	
5. Did you ensure that female and male students had equal opportunities to interact with the TLM?	Yes	No	Not sure	
6. Did your TLM enhance learning?	Yes	No	Not sure	
7. How was the pace of the lesson compared to normal?	Faster	Same	Slower	
8. Will you use this TLM again?	Yes	No	Not sure	
9. If yes, where will you store it in the meantime?				
10. Will you make any modifications to your TLM?	Yes	No	Not sure	
11. If 'yes' what will you change?				

Teaching Strategy 5 — Teaching Ideas
Using TLMs Effectively

T5-5 T 1 Plan and Practise Together

Writing an Activity Plan Using Your Own Teaching Ideas

As usual, you should use an activity plan template to guide your planning, in which you record the learning objective, the resources used, and the steps for the activity. There is guidance available near the activity plan templates, as well as in T5-1T. Please refer back to this in case you are unsure what to do.

You can look back at the teaching ideas sections of T5-1 – T5-4 to provide further inspiration, or perhaps you would like to look at the additional reading in the appendix. However, you may wish to simply invent your own teaching idea.

Figure 124. Can you tell a story?

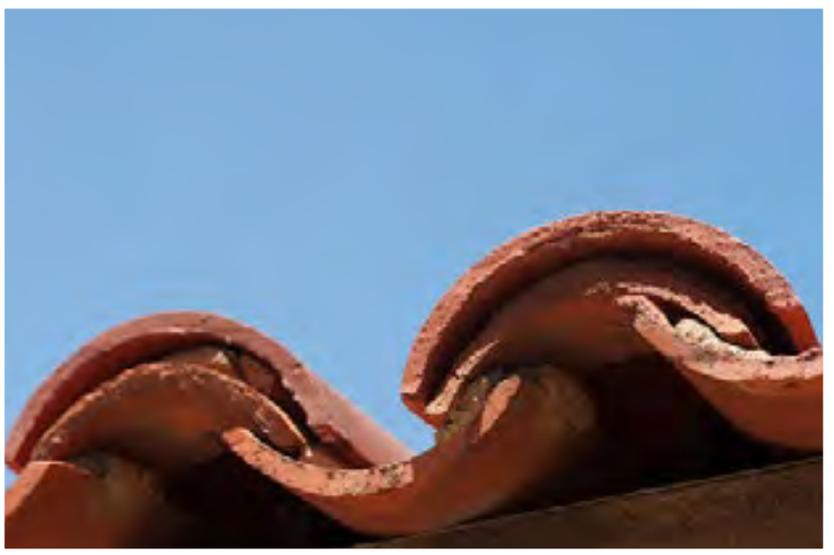

Figure 125. What can you observe?

Figure 126. What do you make of this picture?

Sources

Cocoa plantations in Ghana. By jbdodane, https://www.flickr.com/photos/jbdodane/9736769783, Creative Commons Attribution-NonCommercial License, https://creativecommons.org/licenses/by-nc/2.0/

I See Math. By Alan Levine, https://www.flickr.com/photos/cogdog/8671283352, Creative Commons Creative Commons Attribution License, https://creativecommons.org/licenses/by/2.0/

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Teaching Strategy 6 — Introduction
Open Educational Resources

T5-6 i 1 Learning Objectives

In this teaching strategy, you will

- Learn what Open Educational Resources (OER) are;
- Learn how they differ from other resources;
- Learn how to identify OER by looking out for the Creative Commons symbol;
- Learn to plan lesson activities involving Open Educational Resources;
- Learn how to use Open Educational Resources to promote students' independent learning.

The remainder of this section is pre-reading for the PD session. As you read through this introductory section, and as you work through the activities in the following PD sessions, relate them back to the above learning objectives.

T5-6 i 2 Explore Resources

The following images show a number of different websites. Look at the images and read the captions. What is the same among these sites? How do they differ? What sort of resources are available? For what level of education? Where is the organisation based?

Figure 127. The TESSA Ghana site at the Open University

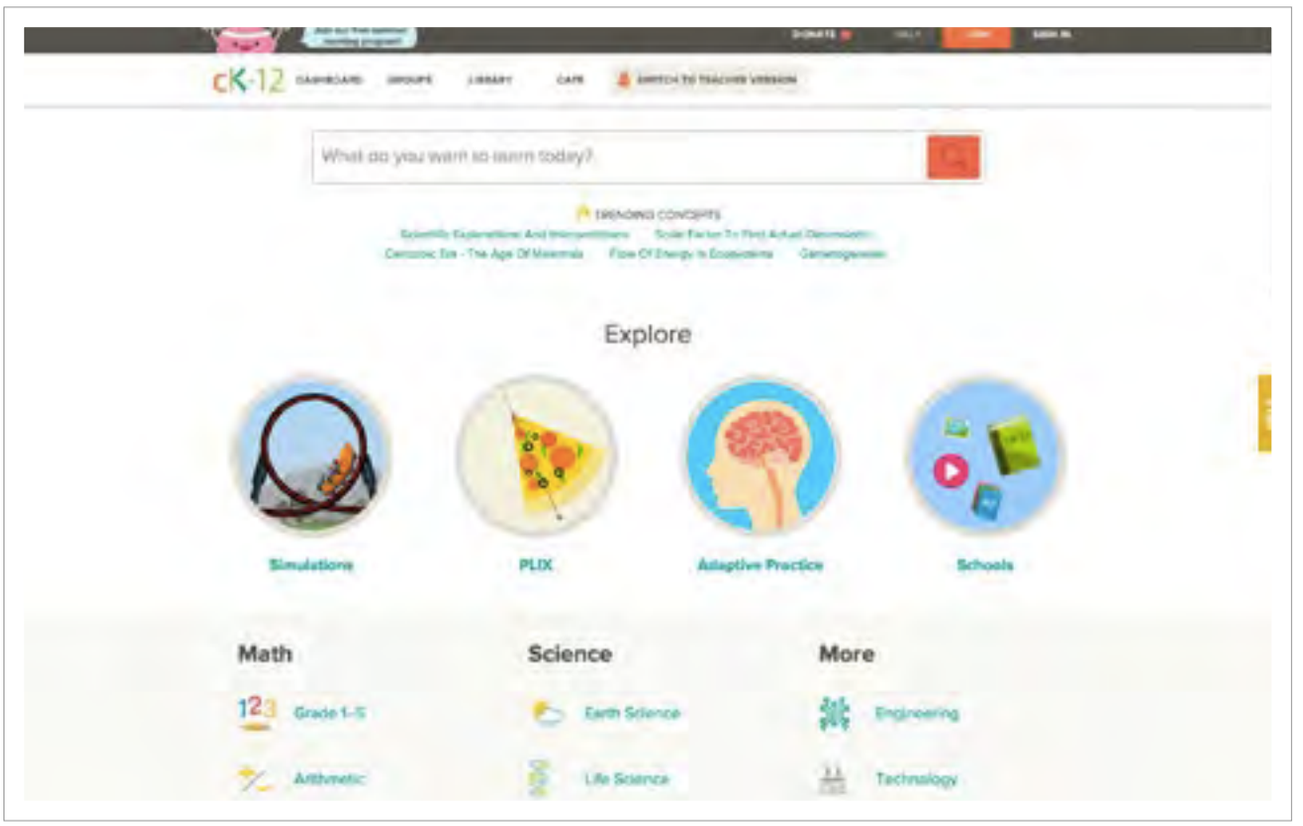


Figure 128. Textbooks from CK-12

Figure 129. Textbooks from Siyavula

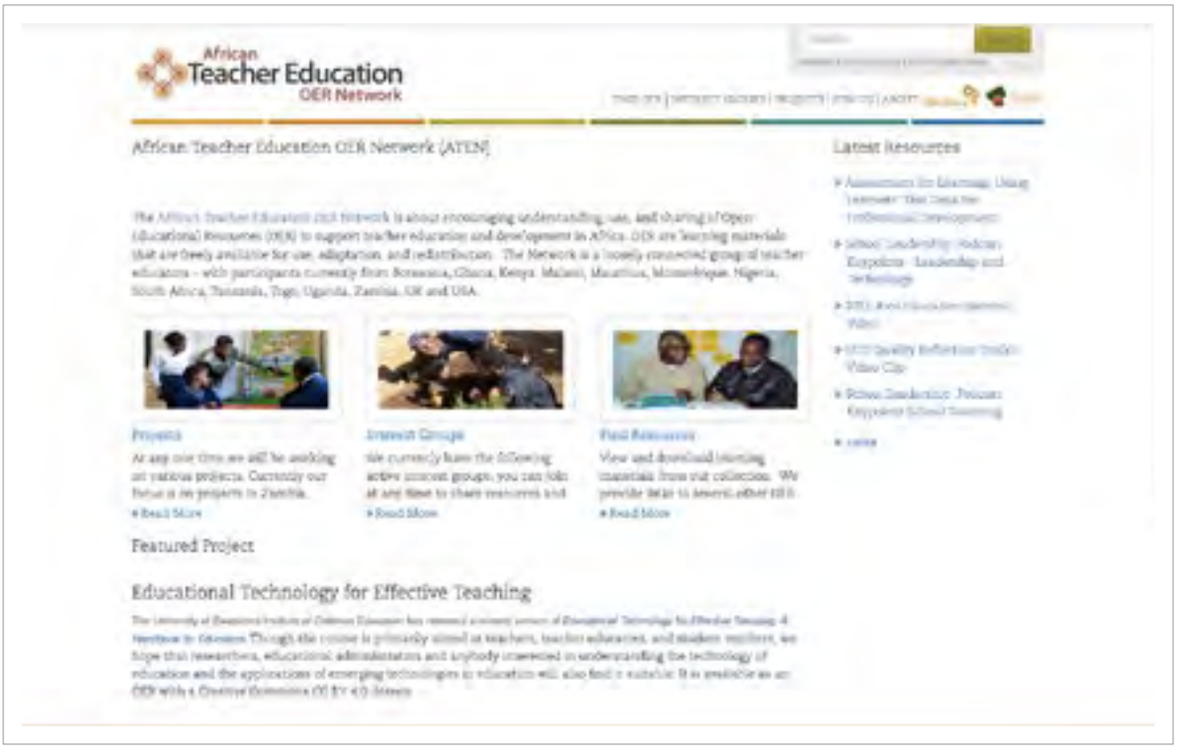


Figure 130. OER Africa and The African Teacher Education OER Network

Figure 131. MIT Open Courseware

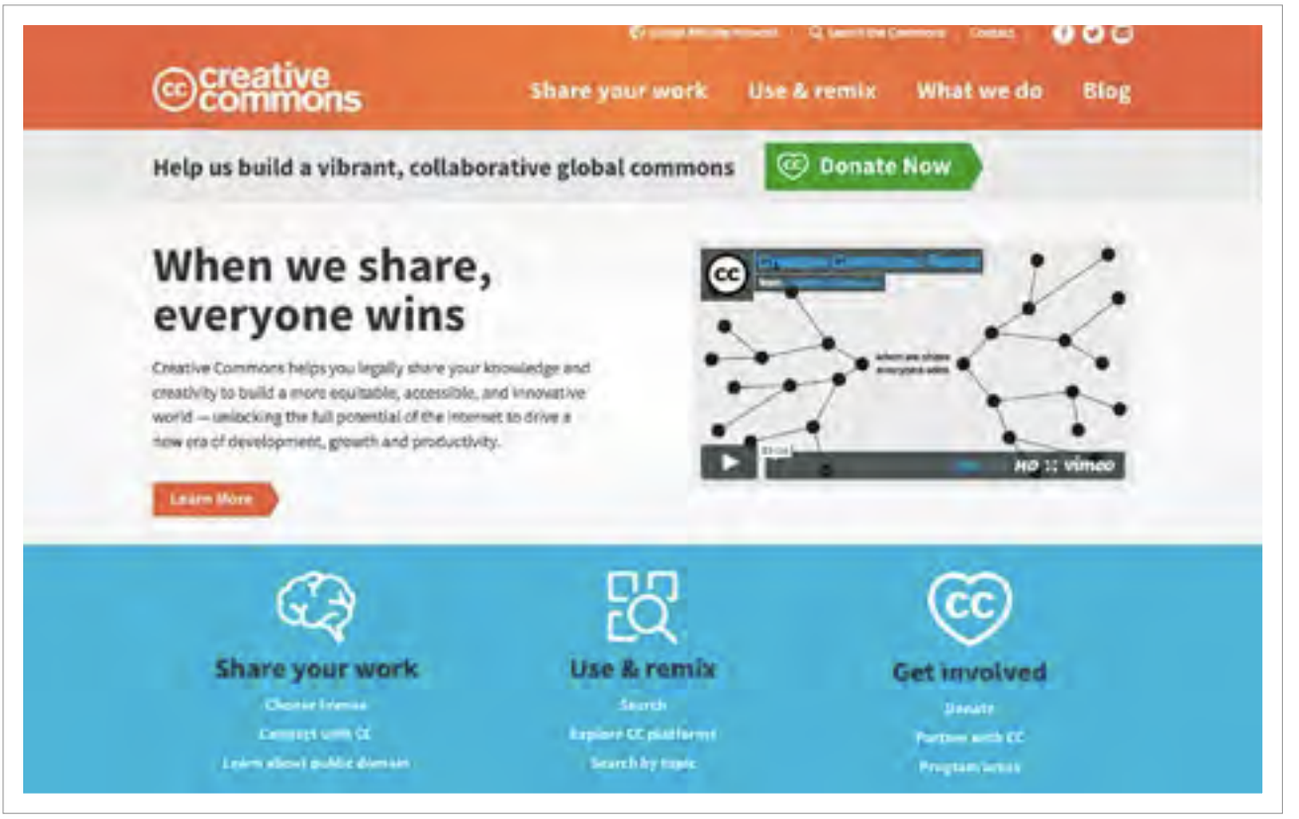


Figure 132. The Creative Commons website

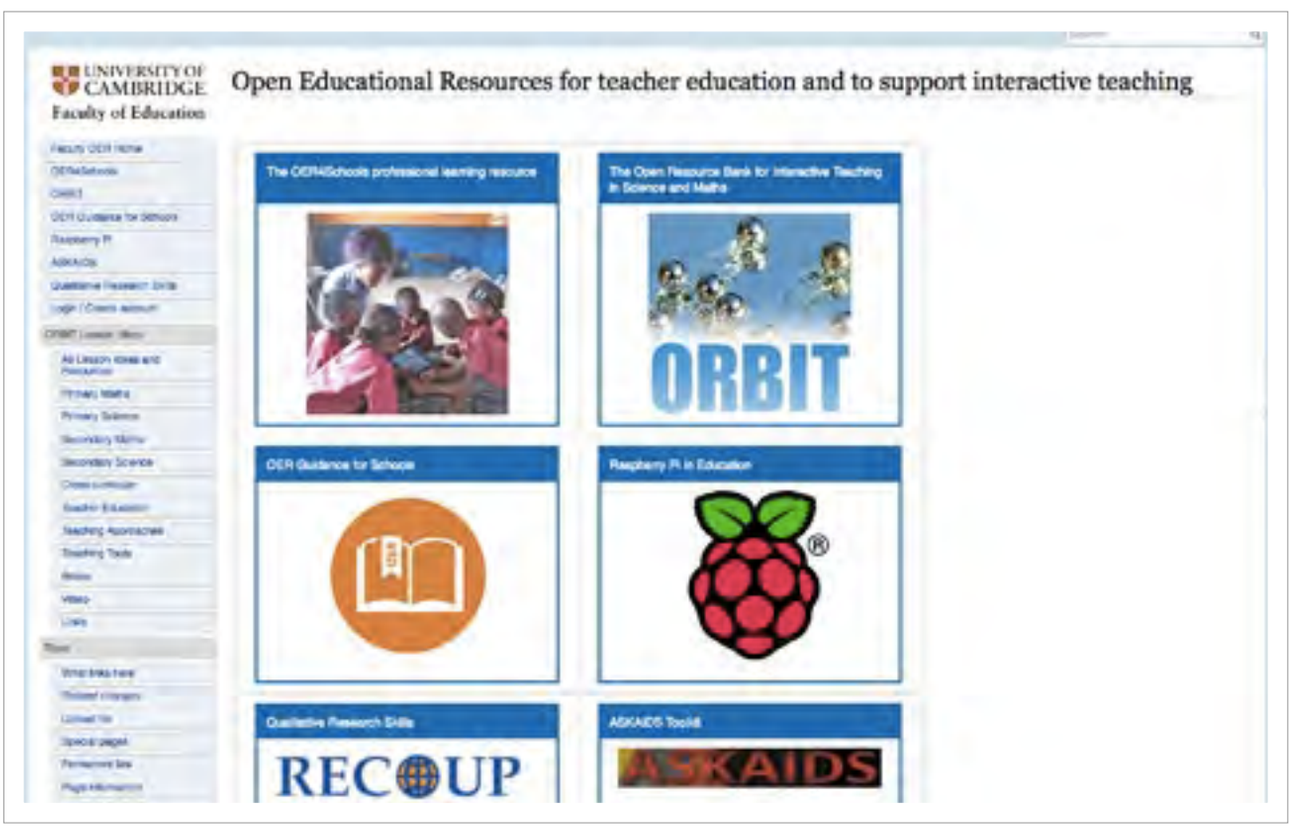


Figure 133. Open Educational Resources for teacher education at the University of Cambridge

Figure 134. Wikipedia in Twi

Figure 135. The T-TEL Learning Hub

T5-6 i 3 What Are Open Educational Resources?

The above websites represent organisations which are based in different countries, and offer resources for many different levels. The learning resources are digital, but many sites also offer resources for downloading and printing. However, there is one thing that those organisations have in common: they offer free learning resources. Not only do they offer free learning resources, but the resources are offered with the explicit invitation to adapt and share.

You might say that the difference between getting something for free and being invited to share is not significant. Consider this. Suppose you ask to borrow a dress from a friend to wear to a wedding. Your friend is happy to lend you the dress, and you pick it up a week before the wedding. When you try on the dress, you discover that the dress is a little too long, and you take it to a tailor, to have it fitted. The tailor removes some of the length, and the dress now fits you. After the wedding, your friend collects the dress, but now discovers that the dress no longer fits her, and that the extra fabric is gone. When she loaned you the dress, she was happy for you to wear it, but she never thought you would adapt the dress to your own size.

In the same way, free resources are often provided without a clear indication of what you are permitted to do with them. Sometimes the only permission given is the permission to view the resources. Open Educational Resources are different. They come with clear permissions as to what you can and what you cannot do. In particular, Open Educational Resources are an invitation not just to view, but to share and adapt materials to your own needs, and to your own contexts.

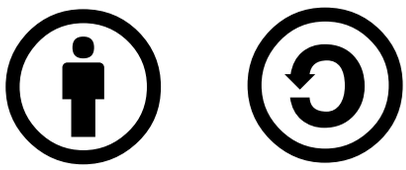
> **Open Educational Resources (OER)**
> Open Educational Resources (OER) are free learning resources that have been openly licensed or are in the public domain, and can be used or reused for free. OER formats include text (either print or digital); audio, video, or multimedia, or various combinations of these. They can support a single learning point, a lesson, a series of lessons, a whole course, or even an entire programme of study.

T5-6 i 4 Creative Commons

How is this invitation to share and adapt expressed? As we have just discussed, educational content (such as books and online materials) is usually copyrighted: You can view, but no licence granting permission for wider distribution or reuse is provided. Such content is not “free to reuse”, and permission needs to be sought from the copyright holder (even for educational use).

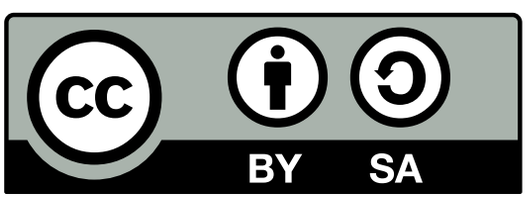
By contrast, “open content” (including Open Educational Resources, OER) is content for which extra permissions (including distribution and reuse) have already been given. Usually this permission is expressed through a Creative Commons licence. You can spot these permissions through the “CC” logo, which looks like this:

Creative Commons licences pose various conditions, such as the requirement to attribute, or to retain the same licence when sharing adaptations ("share alike"). You can spot these extra conditions by logos like these:



T5-6 i 5 Example: The Materials for Our TPD Programme

All TPD materials are shared as Open Educational Resources, under the Creative Commons Attribution ShareAlike licence. Materials available under that licence are identified by the Creative Commons licence badge ("CC BY-SA"):



Have a look on the inside cover of this book: You will find the same symbol there, including the attribution:

T-TEL Professional Development Programme. Theme 5: Teaching and Learning Materials (Professional Development Guide for Tutors). Published by the Ministry of Education (Ghana), under Creative Commons Attribution-ShareAlike 4.0 International. Available online at http://oer.t-tel.org. Version 1, 23 September 2016.

This means that all our TPD materials can be used and adapted by others (as long as T-TEL and the Government of Ghana are attributed, and resulting materials are shared under the same licence). There is no need to seek permission: use or adaptation of the TPD materials has already been permitted under the Creative Commons Attribution ShareAlike licence.

T5-6 i 6 You Can Distribute the Materials as They Are

What does this mean for a you? The first benefit of Open Educational Resources is that they can be distributed freely, without needing to obtain permission. This means that they can be distributed to Colleges of Education: versions are also made available offline at colleges, so that lack of Internet does not pose a barrier to the use and adaptation of the materials.

Once you have the book, here are some examples of what you can do with the it:

- You are free to photocopy the printed books — either the whole book, or sections of the book.
- You are free to reprint the PDF — one copy for yourself or 1,000 copies for your students.
- You are free to put the PDF onto your own college website or your personal website.
- You can make the PDF available to anybody at your college, for example through your computer lab.

The only condition is that you retain the attribution to the original producers. However, for distributing the book as a whole, this is already the case. The attribution is part of the printed book as well as the PDF, so there is nothing else to do. Where you only use parts, you need to retain the attribution text on the inside cover. You should also note that the licence does not stop you from charging for your effort and for printing.

You may have come across the WorldReader project in Ghana, promoting the use of digital books. These books are not usually read on laptops, but on smaller devices, like digital (Android) tablets, so-called e-Readers or even smart phones. To support small screen devices like smartphones, our materials are also available in an electronic book format called “ePub”. This means that those who do have such digital devices can read the materials more easily. For example, student teachers who have smartphones can download resources in this format, and read books in their own time, or away from college during teaching practice.

T5-6 i 7 You Can Adapt the Materials

What does this mean for a you? Another benefit of Open Educational Resources is that they can be adapted. Of course, a printed book or PDF files are difficult to adapt. This is why there are also editable versions available, including both the full-quality versions, as well as standard Word documents.

Many tutors are currently producing their own lesson notes, and many are using word processing software to produce them. You may be aware that a new curriculum is being developed, meaning that many lesson notes will have to be adapted. Through the TPD programme, you already have 1000s of pages of materials available, that you can adapt for your own lesson notes. Moreover, the process is simple. You can just copy and paste using your word processor.

As explained above, the only condition is that you attribute the source (T-TEL and the Government of Ghana are attributed as shown on the inside cover of the book) and that resulting materials are shared under the same licence (Creative Commons Attribution ShareAlike).

An important caveat. While we have covered most of the key aspects concerning Open Educational Resources, there is one important aspect

regarding adapting materials that we still need to mention. There are some Creative Commons licences that prohibit certain uses such as commercial use or adaptation ("No Derivatives"). Also, materials with the "Share Alike" condition cannot be combined with materials provided under certain other licences. The OER Guidance for Colleges explains this, but you may want to return to those details later, perhaps together with the college librarian.

Figure 136. Tutors are making an unusual use of Open Educational Resource: The PD Guide for Tutors, Theme 3, Talk for Learning.

T5-6 i 8 You Can Share Your Adaptation

Another benefit of OER is that you can then share you adaptations while being clear with others about the permissions, such as the need to attribute you as the authors (and other contributors). Think back to the lesson notes example. As colleges write schemes of work and lesson notes for the new curriculum, would it not be great for the effort to be shared? Open Educational Resources and Creative Commons licensing provide neat tools for sharing such materials under clear conditions.

T5-6 i 9 The Bigger Picture

You might still say that this does not matter to you right now, and maybe you are right. However, many governments and intergovernmental organisations are recognising the importance of OER, and the important contribution it can make to equitable and sustainable education, as embodied by the UNESCO Paris OER declaration.

For example, in the United States of America, the cost of textbooks has been identified as a significant barrier to education for everybody. The K-12 OER Collaborative is a non-profit organisation, funded by state governments, and dedicated to developing high-quality open educational resources. The

project will create a full-course set of maths and English language arts materials for distribution to school districts across the U.S., helping to save money and improve instructional materials quality. If OER is an important factor in lowering the price of quality education, even in one of the most significant economies in the world, then at least we should explore how OER can be used in our own context.

T5-6 i 10 Preparation for This Session

The PD session starts with a discussion of OER, to review the points covered in this introduction. However, you then have a choice of two tracks.

You can either build further on OER, and plan some activities with OER to engage your students. In that, you will need:

- **Access to digital Open Educational Resources.** Within our TPD programme, many OER are provided to colleges offline.
- **Devices on which to use OER.** Ideally, you and your students will have some access to digital devices. If your students do not have access to devices, you may need to print.

T5-6 i 11 Further Reading

B. Haßler, T. Mays, Open Content, Creative Commons Attribution 4.0, http://bjohas.de/Publications/Hassler_Mays_OpenContent.

T-TEL Professional Development Programme (2016). OER Guidance for Colleges. Published by the Ministry of Education (Ghana), under Creative Commons Attribution-ShareAlike 4.0 International. Available online at http://oer.t-tel.org.

OER Guidance for Schools (2014), by Björn Haßler, Helen Neo and Josie Fraser. Published by Leicester City Council, and available from http://schools.leicester.gov.uk/openeducation under Creative Commons Attribution 4.0.

WordRead Ghana. http://www.worldreader.org/where-we-are/ghana/

The Paris OER declaration (2012). http://www.unesco.org/new/en/communication-and-information/access-to-knowledge/open-educational-resources/what-is-the-paris-oer-declaration/

The K12 Collaborative. http://k12oercollaborative.org/

T5-6 i 12 Sources

OER Guidance for Schools (2014), by Björn Haßler, Helen Neo and Josie Fraser. Published by Leicester City Council, and available from http://schools.leicester.gov.uk/openeducation under Creative Commons Attribution 4.0.

First paragraph in the section “Creative Commons” was adapted from: B. Haßler, T. Mays, Open Content, Creative Commons Attribution 4.0, http://bjohas.de/Publications/Hassler_Mays_OpenContent.

Teaching Strategy 6 — PD Session
Open Educational Resources

T5-6 S 1 Reflect Together

What TLMs Have We Used so far?

Following the usual housekeeping, start the reflection. Turn back to T5-5 S, "Reflect After Your Teaching". Use "Tool 3" to review the TLMs that you use in your teaching (including the classroom and outdoors). How has this affected your students' learning?

T5-6 S 2 Review and Recap

Introducing This Session

Review pre-reading. Now turn to the pre-reading. Does anyone have any questions about the introduction? Spend a few minutes discussing any issues with your colleagues.

Recap learning objective. Finally, recall the specific learning objectives for this teaching strategy. Are there any questions?

Learning Objectives and Success Criteria

Learning objectives:

- Understanding what an OER is, and how it differs from free resources;
- Understanding and experiencing some of the benefits of OER;
- Knowing at least one search engine, and being able to find OER with that search engine (as opposed to just finding free content).

Success criteria:

- Participants were able to find OER suitable for their teaching or other school-related work.

Resources needed:

- Access to the Internet or offline, e.g. with laptops;
- The set of "OER Guidance for Colleges" and supporting documents;
- Whiteboard or flip chart, and pens;
- Ideally, a projector.

T5-6 S 3 Discussion

What Are Open Educational Resources?

Based on your pre-reading (T5-6i), briefly discuss the following:

- What are Open Educational Resources (OER)?
- How are free resources different from open resources?
- How are OER different from "just sharing"?
- What is a Creative Commons licence (CC)? How does it relate to OER?

T5-6 S 4 Activity

Searching for Open Educational Resources

The first step in using OER is actually to find OER that is useful to you. If your college has offline access to resources, you can do an offline version of the above activity. For instance, if you may have a server at your college, or if you have a WiFi resource bank (such as the BeLL, see links below), you can look up resources that way. You can also just look through resources available on a memory stick. Work in pairs, supporting in each other particularly in terms of technology use.

Good places to start include:

- The T-TEL resources;
- TESSA Ghana;
- OLE Ghana;
- OER Africa;
- OER4Schools;
- Wikipedia for Schools.

If you have access to the internet, you can also use various search engines. Record the web addresses (URLs) for the resources that you discover, so that they can be used in the next activity. Here are some options.

Using the Creative Commons search to search the Flickr image sharing site. Images can be very useful for a large range of activities. "Flickr" is a popular image sharing site, that contains many images available under Creative Commons licences. A good way to start searching Flickr for Creative Commons content is here: http://search.creativecommons.org. You can use the same site to search other sites with Creative Commons content as well. The document "Remixing with Images" (included with the OER Guidance documents) provides a step-by-step walk-through, starting with the Creative Commons search. It also explains how to find, use, and attribute Creative Commons licensed images. If needed, this walk-through can serve as a scaffold while they search for images themselves.

Using the Google advanced search. Google has advanced search, available here: http://www.google.com/advanced_search. Look out for the "usage rights" box, which allows you to specify the licence. If you need further help,

have a look at "How to find Creative Commons materials using Google" in the NCU/CCA Creative Commons Information Pack.

Searching YouTube. You can also use the search on YouTube to find Creative Commons licensed materials. Explore the YouTube search, and see if you can find where the option to search for Creative Commons contents is located. If you need help, see "How to find Creative Commons Material using YouTube" in the NCU/CCA Creative Commons Information Pack.

T5-6 S 5 Activity

Basic attribution

Having found some Creative Commons works (for example, content types such as texts, images, movies) in the previous activity, look at how to attribute the content. You can find examples for attributing Creative Commons content throughout the TPD materials. Generally speaking, the attribution should contain:

- the title of the work;
- if the resource is hosted online, the web address (URL) where you found the work;
- the creator of the work;
- the Creative Commons licence under which the work is available (together with the URL for the licence).

Have a look at some of the attributions made in this Theme (e.g. in the acknowledgements section) and see whether you can identify the above elements.

T5-6 S 6 Discussion

What Will You Do With OER?

If there is time, continue a discussion of the benefits of OER, and what you can do with it. If you are out of time, move on to the next activity.

T5-6 S 7 Plan and Practise Together

Plan an Activity on Open Educational Resources

It is now time to plan an activity. Each tutor should plan their own activity using the activity plans provided. To provide some inspiration, please consult the 'Teaching Ideas' section of this teaching strategy, which has ideas for activities with Open Educational Resources. As you work with Open Educational Resources, make sure that you attribute.

Remember: when planning and executing activities, always ensure that female students have equal opportunities to participate, try first and take leadership roles. Often we forget about being gender responsive and male students end up unfairly dominating and benefiting more.

T5-6 S 8 End of Session

Agreeing Follow-up Activities

As usual, agree on follow-up activities, including classroom teaching.

T5-6 S 9 After the Session: Teach and Observe

It is important for your professional learning that you actually teach the activity that you have planned. Please make sure that you have your activity plan available when you teach.

Any issues that arose during the lesson should be written down immediately after you have taught, and remember to fill in your observations section of the tools after you have taught.

If possible arrange with a colleague to observe each other when you each do the activity with your student teachers during the week.

Please fill in the "Tool 3: TLM Observation Questions" (see below) after you have taught!

T5-6 S 10 Reflect On Your Teaching

Open Educational Resources

Make sure to fill in the "Tool 3: TLM Observation Questions" (see below) as soon as possible after you have taught your planned activity with your students. Reflect on how the activity went by adding notes to the last column.

T5-6 S 11 Sources

OER Guidance for Schools (2014), by Björn Haßler, Helen Neo and Josie Fraser. Published by Leicester City Council, and available from http://schools.leicester.gov.uk/openeducation under Creative Commons Attribution 4.0.

T5-6 S 12 Further Resources

Tool 3: TLM Observation Questions

Brief description of your TLM:				Notes/reflections
1.How long did it take you to prepare your TLM for the activty?	Less than 10 min	10-30 min	More than 30 min	
2. How easy was it to get hold of the resources you needed for your TLM?	Very easy	Not very easy	Hard	
3. How motivated were the students to engage with the TLM?	Very	Not very	Not at all	
4. Did you have enough TLMs for all the students to interact with?	Yes	No	Not sure	
5. Did you ensure that female and male students had equal opportunities to interact with the TLM?	Yes	No	Not sure	
6. Did your TLM enhance learning?	Yes	No	Not sure	
7. How was the pace of the lesson compared to normal?	Faster	Same	Slower	
8. Will you use this TLM again?	Yes	No	Not sure	
9. If yes, where will you store it in the meantime?				
10. Will you make any modifications to your TLM?	Yes	No	Not sure	
11. If 'yes' what will you change?				

Teaching Strategy 6 — Teaching Ideas
Open Educational Resources

T5-6 T 1 Plan and Practise Together

Writing an Activity Plan

As usual, you should use an activity plan template to guide your planning, in which you record the learning objective, the resources used, and the steps for the activity. There is guidance available near the activity plan templates, as well as in T5-1T. Please refer back to this in case you are unsure what to do.

Please note that the teaching ideas proposed in this section are all very generic, and can all be used for all subjects. The ideas fall into two categories, labeled as follows:

- **Tutor uses OER**. You select an OER, that helps you prepare an activity. It may be the case that your activity also uses other TLMs (such as images), which student teachers encounter during the activity. From the students' perspective, this activity is the same as other lesson activities. From your perspective, you have used OER to prepare, and the engagement with the OER focuses on the tutor.
- **Student teachers use OER (on a digital device).** Here you select a whole set of OER (e.g. the set of PD Guides for Student Teachers, one or more open textbooks, or Wikipedia for Schools), and your student teachers engage with this whole set as part of independent learning activities. Student teachers are more actively aware that they are using an OER.

Clearly there is often overlap between these two, but hopefully this will give you some guidance.

Theme 5: Teaching and Learning Materials **PD Session 5: Open Educational Resources**	
Teaching Idea	**How it works**
T5-6 T 2. Adapt a Teaching Idea From an Earlier Theme to Create Lesson Notes Including an Activity	You are going to adapt one of the teaching ideas from earlier themes of the TPD programme to suit the learning objectives for an upcoming lesson. The aim is to create lesson notes (for part of a lesson) that student teachers can use during group work.
T5-6 T 3. Use Images From an Image Library	You select a set of images from an image library and develop an activity that uses those images in the classroom.

T5-6 T 4. Use a Video	You select one or more videos and develop an activity that uses those images in the classroom.
T5-6 T 5. Explore OER Africa	You select resources from OER Africa and develop an activity that uses those images in the classroom.
T5-6 T 6. Student Teachers Use The PD Guide For Student Teachers	Student teachers using their own device to access the PD Guides for Student Teachers to learn about a syllabus topic or to prepare a lesson.
T5-6 T 7. Student Teachers Use Open Textbooks	Student teachers using their own device to access open textbooks to learn about a syllabus topic or to prepare a lesson.
T5-6 T 8. Student Teachers Use "Wikipedia for Schools"	Student teachers using their own device to access Wikipedia for Schools to learn about a syllabus topic or to prepare a lesson.

T5-6 T 2 Teaching Idea: Tutor Uses OER

Adapt a Teaching Idea From an Earlier Theme to Create Lesson Notes Including an Activity

In the activity suggested in this teaching idea, you are going to adapt one of the teaching ideas from earlier themes of the TPD programme to suit the learning objectives for an upcoming lesson. The aim is to create lesson notes (for part of a lesson) that student teachers can use during group work.

Clarify learning objectives: For this activity, you will have to decide on your own (syllabus-related) learning objective for your student teachers, in relation to your own lesson forecast. Note this in your activity plan.

Decide which OER to use: Use the materials available through the TPD programme. For example, you could adapt a "Plan and Practise Together" section from any of the PD Guides for Tutors to fit the topic you are teaching (if the lesson is content-focused). Or, in preparation for a methodology lesson, you could adapt the introduction to a teaching strategy from the PD Guide for Student Teachers.

In order to adapt the idea, you will need access to Word versions of the PD Guides which you can download either from http://oer.t-tel.org, or use an offline copy (if available at your college). Once you have your own materials developed, you may need to print and photocopy them for your student teachers.

Other resources needed: Your student teachers will need to have access to a digital device, for instance their own, or computers if there is a computer lab. Students do not need individual devices, but can share.

Steps for this activity: Start by locating the Word files, and select one Word file that has content fitting for your upcoming lesson. Edit the Word file to suit your upcoming lesson. The finished file should include some pre-reading.

If you have access to digital devices during your lesson (e.g. a computer lab, or student teachers' devices), you could use the resulting file that way. Otherwise you have to print/photocopy the document for your student teachers.

Once you have created your digital file, return to your own activity plan for your lesson, and complete it. Under materials needed, you would enter the file that you created. Describe the steps the student teachers will take when using the file (or resulting printout).

Tip: This activity is really not that different from any of the activities during "Plan and Practise Together" activities that have you have done throughout the programme. The only difference is that rather than just developing an activity plan, you are now also developing a resource for use during the lesson. Moreover, you are developing the resource digitally, explicitly adapting an idea from the programme, and ending up with a digital document, that students teachers can use (either digitally, or printed).

Figure 137. What does this tell you? What teaching ideas does it remind you of?

Sources

Mognori village. By crosby_cj, https://www.flickr.com/photos/crosby_cj/8233421843, Creative Commons Attribution-NonCommercial-NoDerivs License, https://creativecommons.org/licenses/by-nc-nd/2.0/

T5-6 T 3 Teaching Idea

Use Images From an Image Library

The idea is very similar to the above idea ("Teaching Idea: Tutor Uses OER"), and has similar requirements. Please review the above instructions. Your preparatory task incorporates the use of an image library, such as the images in "Wikipedia for Schools" or an online image sharing site such as Flickr. Can you think of a classroom-based task that images from the library would be useful for? Can you think of a highly interactive student-centred task to use images for?

Obtain the set of images, and a concrete activity plan. If you are stuck for ideas, you could look at school students devising their own classification of animals in this set of OER4Schools videos: http://oer.educ.cam.ac.uk/wiki/Video/Eness_Vertebrates.

T5-6 T 4 Teaching Idea

Use a Video

The idea is very similar to the above idea ("Teaching Idea: Tutor Uses OER"), and has similar requirements. Please review the above instructions. Your preparatory task involves reviewing videos. There any many videos accompanying these resources, as well as videos available from other sources (e.g at www.OER4Schools.org). Have a look at some videos, and decide how you can use one of them in your teaching. Then develop an activity plan that incorporates the use of that video in your teaching according to your plan.

T5-6 T 5 Teaching Idea

Explore OER Africa

OER Africa (http://www.oerafrica.org/) is a ground-breaking initiative established by the South African Institute for Distance Education (Saide). OER Africa play a leading role in supporting higher education institutions across Africa in the development and use of Open Educational Resources (OER) to enhance teaching and learning.

The idea is very similar to the above idea ("Teaching Idea: Tutor Uses OER"), and has similar requirements. Please review the above instructions. Your preparatory task incorporates the exploration of the OER Africa site. Locate a resource that is useful for your own teaching, and develop an activity plan that incorporates the use of that resource.

T5-6 T 6 Teaching Idea: Student Teachers Use OER

Student Teachers Use The PD Guide For Student Teachers

In the activity suggested in this teaching idea, student teachers use their own device to access the PD Guides for Student Teachers to learn about a syllabus topic.

Clarify learning objectives: For this activity, you will have to decide on your own (syllabus-related) learning objective for your student teachers, in relation to your own lesson forecast. The activity could work well in a methodology lesson, but can be adapted to other lessons.

Decide which OER to use: You will need access to the "PD Guide For Student Teachers", and download these either from http://oer.t-tel.org, or use the offline copy (if available at your college). Select a specific section that you want the student teachers to look at.

Other resources needed: Your student teachers will need to have access to a digital device, for instance their own, or computers if there is a computer lab. Students do not need individual devices, but can share.

Record steps for this activity. The first step would be for your students to download the PD Guides for Student Teachers onto their device (or a device that they can share). For the second step, and thinking about the follow up task:

- What will students do? What is the task? For example, students could read the PD Guide for Student Teachers, and select sections that they will use during teaching practice.
- Will students now do this in class (e.g. if you are using this in a computer lab)? Or will students do this in their own time (if they have enough personal devices so that it can be done after class)? If the task is to be done in their own time, you need to review the outcome in the next lesson.

You might give the instruction that students are mainly to select one or more sections, to replicate them in class. However, you could also ask students to adapt an idea.

T5-6 T 7 Teaching Idea

Student Teachers Use Open Textbooks

This idea is the same as the previous idea ("Teaching Idea: Student Teachers Use OER"), and you can use the detailed instructions provided there. The only difference is that instead of using some of the TPD materials (which are tailored for your context already), you will use other materials, namely open textbooks, where you may have to do a bit more work to adapt ideas to your own context.

Decide which OER and resources to use: As above, student teachers use the computer lab (or, if available their own devices) to access the open textbooks, such as CK12 or Siyavula. You may not be able to access these online, but may have to use offline copies for this activity to run smoothly.

Record steps for this activity. As above, set a concrete task for your students, e.g. suggest that students determine three sections in one or more books that can help them to improve their content knowledge, and that they work on this after the lesson.

In the next lesson, ask students to briefly describe how their content knowledge was improved. Follow this up with a discussion on how they might use such digital resources in the future, whether for their own learning (e.g. learning of their own subject knowledge within the DBE curriculum) or the learning of pupils (within the context of the primary or JHS curriculum). Ask the students how they will use the digital textbooks, given that they (or their future pupils) may generally not have access to digital technology.

T5-6 T 8 Teaching Idea

Student Teachers Use “Wikipedia for Schools”

The idea is very similar to the above ideas (“Teaching Idea: Student Teachers Use OER”), and has similar requirements. Please review the above instructions. Can you develop a concrete activity plan, that incorporates the use of Wikipedia for Schools? This could involve:

- Students accessing Wikipedia for Schools in their own time (on their own device, or in the computer lab);
- Students accessing Wikipedia for Schools during a lesson (on their own device, using College-owned devices, or in the computer lab);
- You (the tutor) accessing Wikipedia for Schools in preparation for a lesson.

Appendix 1
Further Reading

Teaching and Learning Materials

Here are some books available online that provide further background to teaching and learning materials, including the following:

- Donald H. Chanda, Sonnile N.A. Phiri, D.C. Nkosha, Geoff Tambulukani (ed) (2000). *Teaching and Learning Materials Analysis and Development in Basic Education.* UNESCO Basic Education Capacity Building Project - Training Kits for Local NGOs, Theme 3. Available at http://unesdoc.unesco.org/images/0013/001320/132019eo.pdf.
- APEID (1980). *Low-cost Educational Materials.* UNESCO Regional Office for Education in Asia and Oceania (Bangkok). Available at http://unesdoc.unesco.org/images/0004/000433/043336eb.pdf.
- Mary Ann Dasgupta (2014). *Low-Cost, No-Cost Teaching Aids.* National Book Trust (A-5 Green Park, New Delhi 110016, India), http://www.nbtindia.gov.in/books_detail__4__creative-learning-series__496__low-cost-no-cost-teaching-aids.nbt. Available at https://zietmysoredigtallibrary.files.wordpress.com/2013/07/lowcostnocost.pdf, http://www.tarvindguptatoys.com/arvindgupta/low-cost-new.pdf (new version).
- University of Fort Hare Distance Education Project. *Core Education Studies Course: Helping Learners Learn. Umthamo 4: Independent Learning in a 'Resourceful' Classroom.* Available at http://www.oerafrica.org/FTPFolder/Teachered/UFH/helpinglearnerslearn.umthamo4-independent-learning.pdf. For more resources from Fort Hare, see http://www.oerafrica.org/resource/university-fort-hare-distance-education-project-core-education-studies-course-helping-3.
- Christine Adu-Yeboah (2011), *Teacher Preparation and Continuing Professional Development in Africa (TPA) — Learning to Teach Reading and Mathematics and its Influence on Practice in Ghana.* Available at https://www.sussex.ac.uk/webteam/gateway/file.php?name=report-ghana-1july2011.pdf&site=320
- Tony Read (2015), Where Have All the Textbooks Gone? Toward Sustainable Provision of Teaching and Learning Materials in Sub-Saharan Africa. World Bank. Available at https://openknowledge.worldbank.org/bitstream/handle/10986/22123/9781464805721.pdf?sequence=1
- Byers, A., Child, A., & Lane, C. (n.d.). The Science Teachers' Handbook: Ideas and Activities for Every Classroom. VSO. Avialable from https://www.gymnasiumnovum.nl/Portals/0/vakpaginas/Science/vso%20science%20handbook.pdf

- Portman, J., & Richardson, J. (1997). *The Maths Teachers' Handbook*. Heinemann. Available from http://www.arvindguptatoys.com/arvindgupta/vsomaths.pdf
- du Plessis, J., Habib, M., Haddy Sey, B. G., Baranick, A., & Rugh, A. (2002). *In my classroom: a guide to reflective practice*. Washington DC: USAID and AIR. Available at http://www.air.org/sites/default/files/downloads/report/In_My_Classroom_0.pdf.
- Du Plessis, J., & Muzaffar, I. (2010). *Professional Learning Communities in the Teachers' College: A Resource for Teacher Educators*. Available at http://www.equip123.net/docs/e1-PLCResource.pdf.
- Allen, I. E., & Seaman, J. (2016). *Opening the Textbook: Educational Resources in U.S. Higher Education, 2015-16*. Available at http://www.oerafrica.org/system/files/12320/openingthetextbook2016.pdf

Video resources

Sources of videos for tutor professional development:

- The TPD video resources are available at http://tiny.cc/tpdvideo.
- The OER4Schools programme has many videos available relevant to teaching and learning in sub-Saharan Africa http://www.oer4schools.org.
- Arvind Gupta Toys https://www.youtube.com/channel/UCT7EcU7rC44DiS3RkfZzZMg

You may also find this video interesting:

- Developing and Teaching with Creative, Low-Cost Resources, Ghana Teacher Training Videos, Sesame Street International Social Impact. Available at https://www.youtube.com/watch?v=oBy5Z5G8MVI.

Open Educational Resources

For more information on Open Educational Resources, consult the OER Guidance available at http://oer.t-tel.org.

Literature on Effective Learning

The following papers are all freely available, and focus on effective teaching and learning. Many of theses papers focus on teaching and learning in sub-Saharan Africa.

- Coe, R., Aloisi, C., Higgins, S., & Major, L. E. (2014). What makes great teaching? Review of the underpinning research. Retrieved from http://dro.dur.ac.uk/13747/
- Education Endowment Foundation. (2014). *EEF Toolkit*. Retrieved from http://educationendowmentfoundation.org.uk/uploads/toolkit/EEF_Toolkit_-21st_November_2014.pdf
- Haßler, B., Major, L., Warwick, P., Watson, S., Hennessy, S., & Nichol, B. (2016). *Perspectives on Technology, Resources and Learning - Productive Classroom Practices, Effective Teacher Professional Development*.

Faculty of Education, University of Cambridge. Retrieved from http://bjohas.de/wiki_source/images/f/f3/Hassler_et_al._%282016%29_-_Perspectives_on_Technology%2C_Resources_and_Learning.pdf

- Hennessy, S., Haßler, B., & Hofmann, R. (2015). Challenges and opportunities for teacher professional development in interactive use of technology in African schools. *Technology Pedagogy and Education: Special Issue "Capacity Building for 21st Century Learning in Africa: A Focus on ICT Integration in Education."* http://doi.org/10.1080/1475939X.2015.1092466
- Nag, S., Chiat, S., Torgerson, C., & Snowling, M. J. (2014). *Literacy, Foundation Learning and Assessment in Developing Countries*. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/305150/Literacy-foundation-learning-assessment.pdf
- Orr, D., Westbrook, J., Pryor, J., Durrani, N., Sebba, J., Adu-Yeboah, C., & others. (2013). *What are the impacts and cost-effectiveness of strategies to improve performance of untrained and under-trained teachers in the classroom in developing countries?: systematic review*. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London. Retrieved from http://sro.sussex.ac.uk/43901/1/Undertrained_teachers_2013_Orr.pdf
- UNESCO. (2014). *Teaching and learning: achieving quality for all*. (P. Rose, Ed.). UNESCO Publishing. Retrieved from http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/efareport/reports/2013/
- Westbrook, J., Durrani, N., Brown, R., Orr, D., Pryor, J., Boddy, J., & Salvi, F. (2013). *Pedagogy, curriculum, teaching practices and teacher education in developing countries: final report*. (No. 2110). Retrieved from https://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3433

The following two books are also very widely appreciated for their comprehensive summary of insights:

- Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Routledge.
- Hattie, J. (2012). *Visible learning for teachers: Maximizing impact on learning*. Routledge.

Further Inspiration

Arvind Gupta Toys, www.arvindguptatoys.com.

Makerspaces in Ghana:

- Agbogbloshie Makerspace Platform, https://qamp.net/project/.
- Agbogbloshie Makerspace Platform creates mobile workshops for world's largest e-waste dump, http://www.dezeen.com/2016/05/16/agbogbloshie-e-waste-dump-makerspace-platform-spacecraft-mobile-architecture-workshop-ghana-julien-lanoo-photography/.

- Kumasi Hive: a Makerspace for Entrepreneurs in Ghana, https://www.kickstarter.com/projects/kumasihive/kumasi-hive-a-makerspace-for-entrepreneurs-in-ghan/description.

Creative Low-Cost Teaching/Learning Aids, https://eltcation.wordpress.com/2016/01/23/creative-low-cost-teachinglearning-aids/

Using traditional knowledge to cope with climate change in rural Ghana, http://www.fao.org/docrep/011/i0670e/i0670e14.htm.

How plants can suck water from the sky, http://www.saps.org.uk/secondary/news-and-research/1267-how-plants-can-suck-water-from-the-sky.

Empowering Women – A Case Study of Sheanut Picking and Processing, https://traxghana.com/2016/02/02/empowering-women-a-case-study-of-sheanut-picking-and-processing/.

Ghana – The importance of weighing scales, https://www.wfp.org/blog/blog/ghana-%E2%80%93-importance-weighing-scales.

JICA Ghana science and maths lesson plans, http://www.jica.go.jp/project/ghana/0604654/pdf/008_01_Appendix.pdf.

Appendix 2
Materials you Might Find in College and in Schools

The following list of materials was put together by tutors and coaches, but it may not match what you have available in your circumstances. The list is meant to make you think about the things that *may* be available, and might prompt you to think of other items that we have missed.

In college

- Paper, manila cards
- Pens, crayons, coloured pencils
- Scissors, cutters
- Newspapers, magazines

Student-owned

- Books
- Calculator
- Phones

Community (near a college):

- Bottle tops
- Plastic bottles
- Cloth
- Newspaper
- Boxes
- Sticks , stones, beads
- Soil
- Hair products
- Shea butter
- String
- Mosquito nets (discarded nets)

Community (deep rural)

- Cardboard
- Charcoal

Figure 138. Simple drawings can make good TLMs.

Appendix 3
Resources from TESSA

The TESSA project has been active in Ghana (and many other countries in sub-Saharan Africa) for a long time. The TESS-INDIA project is also producing resources for the Indian context. Through both projects there is useful information on TLMs available. The following sections step from the TESSA and TESS-INDIA project, with some minor adaptations.

Being a Resourceful Teacher in Challenging Circumstances

Many teachers work in difficult contexts. They may have large classes. They may have few resources. The pupils in these contexts are not likely to have resources at home to compensate for limited school resources.

In the TESSA project, a group of teachers working in such circumstances brainstormed suggestions about how to be resourceful despite such difficult conditions. They came up with many ideas and decided that the following seven were most useful:

- Make maximum use of the local environment as a teaching aid. All schools have an environment that can be exploited for discussion, investigations and sources of classroom data.
- Make maximum use of the local community as a teaching aid. Parents and others are an important source for stories, for remembering what things were like in the past, and for having opinions on everyday issues.
- Exploit the communication systems currently in place. Nearly all communities now have access to radio, often with many channels available. Use the systems available to stimulate debate and discussion.
- Make teaching aids from materials around the school. Old boxes, magazines, newspapers and even plastic bottles can be turned into teaching aids (one of the teachers in the discussion group described how she had built a model of a volcano using such materials, the model could be opened out to show the 'inner workings' of the volcano).
- Cooperate with other schools, directly or by exchange of letters. This can be highly motivating for pupils and it opens up all sorts of possible exchanges of information (for example, exchanges of information between urban and rural schools can lead to interesting comparisons).
- Let the school become a resource for the local community: one teacher described how mothers joined in the reading classes and thus improved their own literacy.
- Set up a school garden: plants can be grown in even a small area. Pupils of all ages can benefit from participating in the planning, planting, growing and use stages in the development of a garden.

As you can see from this list, many learning resources can be used in teaching – not just textbooks. If you offer ways of learning that use different senses (visual, auditory, touch, smell, taste), you will appeal to the different ways that students learn. There are resources all around you that you might use in your classroom, and that could support your students' learning. Any school can generate its own learning resources at little or no cost. By sourcing these materials locally, connections are made between the curriculum and your students' lives.

You will find people in your immediate environment who have expertise in a wide range of topics; you will also find a range of natural resources. This can help you to create links with the local community, demonstrate its value, stimulate students to see the richness and diversity of their environment, and perhaps most importantly work towards a holistic approach to student learning – that is, learning inside and outside the school.

Making the most of your classroom

People work hard at making their homes as attractive as possible. It is worth thinking about the environment that you expect your students to learn in. Anything you can do to make your classroom and school an attractive place to learn in will have a positive impact on your students. There is plenty that you can do to make your classroom interesting and attractive for students – for example, you can:

- make posters from old magazines and brochures
- bring in objects and artefacts related to the current topic
- display your students' work
- change the classroom displays to keep students curious and prompt new learning.

Using local experts in your classroom

If you are doing work on money or quantities in mathematics, you could invite market traders or dressmakers into the classroom to come to explain how they use maths in their work. Alternatively, if you are exploring patterns and shapes in art, you could invite maindi [wedding henna] designers to the school to explain the different shapes, designs, traditions and techniques. Inviting guests works best when the link with educational aims is clear to everyone and there are shared expectations of timing.

You may also have experts within the school community (such as the cook or the caretaker) who can be shadowed or interviewed by students in relation to their learning; for example, to find out about quantities used in cooking, or how weather conditions impact on the school grounds and buildings.

Using the outside environment

Outside your classroom there is a whole range of resources that you can use in your lessons. You could collect (or ask your class to collect) objects such as leaves, spiders, plants, insects, rocks or wood. Bringing these resources in can lead to interesting classroom displays that can be referred to in

lessons. They can provide objects for discussion or experimentation such as an activity in classification, or living or not-living objects. There are also resources such as bus timetables or advertisements that might be readily available and relevant to your local community – these can be turned into learning resources by setting tasks to identify words, compare qualities or calculate journey times.

Objects from outside can be brought into the classroom – but the outside can also be an extension of your classroom. There is usually more room to move outside and for all students to see more easily. When you take your class outside to learn, they can do activities such as:

- estimating and measuring distances
- demonstrating that every point on a circle is the same distance from the central point
- recording the length of shadows at different times of the day
- recording observations and experiences
- reading signs and instructions
- conducting interviews and surveys
- locating solar panels
- monitoring crop growth and rainfall.

Outside, their learning is based on realities and their own experiences, and may be more transferable to other contexts.

If your work outside involves leaving the school premises, before you go you need to obtain the school leader's permission, plan timings, check for safety and make rules clear to the students. You and your students should be clear about what is to be learnt before you depart.

Adapting resources

You may want to adapt existing resources to make them more appropriate to your students. These changes may be small but could make a big difference, especially if you are trying to make the learning relevant to all the students in the class. You might, for example, change place and people's names if they relate to another state, or change the gender of a person in a song, or introduce a child with a disability into a story. In this way you can make the resources more inclusive and appropriate to your class and their learning.

Work with your colleagues to be resourceful: you will have a range of skills between you to generate and adapt resources. One colleague might have skills in music, another in puppet making or organising outdoor science. You can share the resources you use in your classroom with your colleagues to help you all generate a rich learning environment in all areas of your school.

Using the Local Community/ Environment as a Resource

It is important that you plan and prepare your lessons so that they stimulate your pupils' interest. Part of this planning involves identifying resources that will engage your pupils in learning. One valuable resource you can explore and use is your local environment, where not only do you have people who have expertise in a wide range of topics but you also have access to a range of natural resources.

Using such dynamic resources will:

- motivate your pupils
- stimulate their thinking
- open their eyes to the richness and diversity around them
- develop a link with the local community
- provide you with support
- link the curriculum to your pupils' lives
- introduce them to new experiences.

Using local experts in your classroom

Maybe you are doing some work on money in mathematics or you are doing pattern in your art lessons. How could you introduce these topics to your pupils in a way that will capture their interest? One way would be to invite in a local shopkeeper to talk about how they use money in their work or a local dressmaker who uses traditional patterned fabrics. Your pupils will be interested to hear about what the visitors do and will want to ask questions and so this needs to be carefully planned. If you choose to do this you need to be clear what you would like your pupils to gain and learn from the experience and then follow the steps below to prepare.

Before the visit

- Identify who you would like to ask.
- Ask if they would be willing to come.
- Talk to your class about the visit and what they would like to know.
- Ask them to write an invitation to the visitor.
- Plan with your class the questions they want to ask.
- Agree together with your class who will do this.
- Agree on who will give a vote of thanks.
- Discuss how you will sit when the visitor comes – in rows or in a horseshoe shape so that everyone can see.
- Confirm the visit with your guest and tell them what will happen.
- Ask them to bring some things to show the class.

On the day of the visit

Arrange for some pupils to meet the visitor at the appointed time at the school gate and bring them to the class. Introduce the visitor to the class and allow them to talk for a short time to the class about what they do (10–15 minutes), showing what they have brought if appropriate. Encourage your pupils to ask questions. When the visit is finished, ask one of your class to thank the visitor for coming.

After the visit

Think how you will use what your pupils have seen and heard. You could ask them to share their ideas in groups and make lists or posters of the key things they learned. You could plan more lessons using the ideas and information as the context for them to learn more about the topic. They could research more about the topic. They could share their ideas with other classes or their parents at a special parents evening or exhibition.

Using other local resources

The outside environment can be seen as a place to collect resources but it can also be an extension of your inside classroom. Here are some ideas about how to use the local environment to support, resource and extend your classroom teaching.

Living things

Wherever your school is, there will be a variety of living things and real objects that you could collect and bring into the classroom for short periods for your pupils to investigate and observe. You could do the collecting or you could take your class out to do the collecting. Bringing in leaves, for example, will enable pupils to study these more closely. Creatures such as preying mantis, certain spiders or other insects can be kept in suitable conditions/containers for a short period of time. Be clear what your pupils are going to learn and give them time to observe the creatures safely so they are not frightened and they do not frighten the animals either. Make sure they respect the animals and plants and understand how important these are to the community.

Local materials

There are many other things that you might be able to collect from the local environment – whether you are in a rural or urban setting – that might help you in the classroom. These include:

- rocks and stones to study
- rocks and stones to use as counters
- recyclable materials, such as card, paper, wire, wood, fabric, plastic containers.

All of these and many other materials could be gathered over time, so that when you want to do modelling with your class you have a stock of paper and card. Or when you want to do posters with your class about science you

have some card for each group to write on. Always ask if you can have the materials you see. Ask your class to help you gather materials in advance of your lessons.

The extended classroom

Rather than bring the outside into the classroom, take your pupils out into the school grounds or even further afield. If you decide to do this, always gain permission from the head teacher or principal beforehand. Taking pupils out to see the plants and animals in the real world will inspire more pupils. Taking them out to look at the way the environment is used, buildings are laid out, the local stream flows or where the cattle graze will interest your pupils more and stimulate their deeper thinking skills if you plan challenging activities for them to do.

Sources

The above text was adapted (with minimal changes) from the following three documents:

- Being a resourceful teacher in challenging circumstances http://www.open.edu/openlearnworks/mod/oucontent/view.php?id=80317
- Using the local community/environment as a resource. http://www.open.edu/openlearnworks/mod/oucontent/view.php?id=80322
- Key resource TESS-India. http://www.tess-india.edu.in/sites/default/files/imported/56846/KR_ALL_PDF.pdf

Appendix 4
Activity Plan

Instructions

If you wish to print extra copies, you can download the activity plan here: http://tiny.cc/TPD_Activity_Plan

Your name: *If you are planning to share the plan with others, please add your name ….* ***Your college:*** *… and also add your college.*	
Syllabus reference (course/topic)	*Enter the syllabus reference and add the specific topic you will teach, e.g. "DBE Syllabus, FDC 128 Governance, Unit 5, Constitution, Human Rights Abuse (p. 291)". You can omit "DBE Syllabus", but please make sure the course/unit reference ("FDC 128, Unit 5") is there, as well as the topic ("Human Rights Abuse"). The topic should be for the lesson that is to be taken for the particular period or day for which you are planning the activity.*
Theme	*Enter the theme, e.g. "T3 Talk for Learning", or "T3 – Talk" in brief*
Teaching strategy	*Enter the teaching strategy and strand, e.g. "T3-1 Initiating Talk for Learning, Strand A: Order and Matching".*
Learning Objective(s) of the activity	*Record the specific learning objectives of this activity: What is it that you want your students to learn? Imagine continuing the sentence: "My students will learn …", e.g. "... that there are many different ways in which human rights are abused". An activity objective (or lesson objective) is simply a description of what you want your students to know, understand or be able to do by the end of a lesson. What will your students have achieved? This is not about "How?" they have achieved it, or "Why?" they should achieve it. Activity objectives relate to knowledge or factual information, understanding such as concepts, reasons and processes, skills or abilities acquired through training or experience. Note: this is not the list of the content that the teacher wishes to teach, but the objectives for the activity, according to the definition above.*
Activity focus	*This is the focus of your activity, expressed in one sentence, e.g. "A brainstorm on human rights abuses in our communities". It answers the question: "What will your students do?" (in order to achieve the learning objective). As you can see, the activity focus can combine the teaching strategy above, with an aspect of the topic you will teach. Keep it to one sentence.*

Activity description	*The specific activities you and your students perform during the activity (for that part of the lesson). This also answers the question "What will your students do?", but you describe it step-by-step, so that another tutor could follow this. E.g. describe what questions you will ask to initiate the brainstorm. Will this be a whole-class brainstorm, or will it be in groups? Will students record their ideas on paper, or perhaps on the board? What will you be doing during the activity? What questions will you ask your students if the discussion gets stuck? If there are several parts to the activity, record them as **Part 1, Part 2, Part 3**, etc.*
Textbook title and pages (if available)	*If you are picking the lesson content from a particular textbook, or you are using a textbook in the course of the activity or preparation, you can name the textbook and the page numbers here.*
Materials/ resources	*Any teaching and learning materials (TLMs) that you are planning to use for the activity (e.g. pieces of paper, scissors, dictionary, computer lab, …)*
Date written: *When you wrote the plan.*	**Date Taught:** *When you taught the plan.*
Observations (after lesson)	*Immediately after the lesson, please add any observations you made. These should be points that you want to remember, so that you can bring them up in the next PD session. Were there students who did not participate? Who were they? Is there anything that worked well (and that you want to share with your colleagues)?*

Note: The following pages have blank activity plans. Please cut these out of your book (along the dotted line), so that you have them available for making activity plans in the teaching strategies.

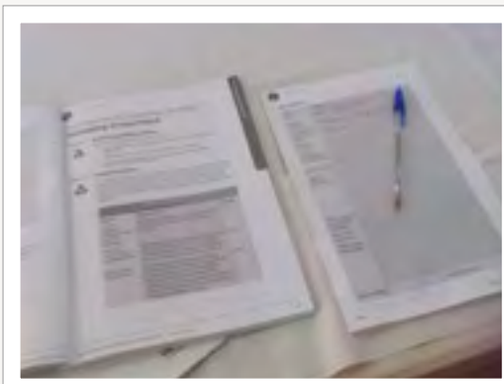


Figure 139. A tutor cuts out the activity plans and uses them side-by-side with the PD Guide for Tutors.

Activity Plan

Your name:		***Your college:***	
Syllabus reference (course/topic)			
Theme			
Teaching strategy			
Learning Objective(s) of the activity			
Activity focus			
Activity description			
Textbook title and pages (if available)			
Materials/ resources			
Date written:		**Date Taught**	
Observations (after lesson)			

Activity Plan

Your name:		***Your college:***	
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Learning Objective(s) of the activity			
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Textbook title and pages (if available)			
Materials/ resources			
Date written:		**Date Taught**	
Observations (after lesson)			

Appendix 5
PD Session Survey for Tutors

Here is a survey about the PD session you just attended. We will be very grateful if you can take some time to fill and submit this survey at the end of each PD session. This is a **prepaid** SMS survey, that is completely without cost to you. It can be done on any phone.

Here are the steps for submitting your data via SMS:

- Fill out the paper-based questionnaire first (see following pages), and determine the data to be submitted;
- Enter the data on your phone (as an SMS);
- Send SMS.

Please refer to Appendix 6 to find out your college code.

Many thanks!

PD Session - Tutor Survey

Questionnaire Code: 015

A. Answer the questions

Fill in your answers:

1. *Please enter your college ID number*

   Answer must be the Identification Number of the coe you are reporting on. .....

2. *Please enter the date of the session*

   Answer must be a date in the following format: day.month.year. Example: 25.12.2011 .....

3. *Did today's session take place?*
   a. *Yes*
   b. *No*

   Choose 1 answer from the list. Example: a .....

4. *What subjects do you teach at your institution?*
   a. *Mathematics*
   b. *Science*
   c. *English*
   d. *Methodology*
   e. *Other*

   Choose 1 answer from the list. Example: a .....

5. *Which theme was covered during the PD session?*
   a. *Teaching and Learning Materials*
   b. *Leadership for Learning*
   c. *N/A - The session did not happen*

   Choose 1 or more answers from the list. Example: a or ab .....

6. *How would you rate the content of the theme?*
   a. *Not at all relevant or useful*
   b. *Indifferent about it*
   c. *Somewhat relevant and useful*
   d. *Very relevant and useful*
   e. *N/A - The session did not happen*

   Choose 1 answer from the list. Example: a .....

7. *How likely are you to try the teaching strategies you learned today in class?*
   a. *Not likely*
   b. *Somewhat Likely*
   c. *Very Likely*
   d. *N/A - The session did not happen*

   Choose 1 answer from the list. Example: a .....

8. *How likely are your students to model these teaching strategies if you use them in class?*
   a. *Not likely*
   b. *Somewhat Likely*
   c. *Very Likely*
   d. *N/A - The session did not happen*

   Choose 1 answer from the list. Example: a .....

9. *How do you rate the performance of the PDC on how well he/she facilitated the session?*
   a. *He/she was not prepared*
   b. *He/she was somewhat prepared*
   c. *He/she was very prepared and knew the content well*
   d. *N/A - The session did not happen*

   Choose 1 answer from the list. Example: a .....

10. *In your opinion, what was the level of participation in today's session?*
    a. *75-100% of the tutors were engaged*
    b. *50-75% of the tutors were engaged*
    c. *25-50% of the tutors were engaged*
    d. *0-25% of the tutors were engaged*
    e. *N/A - The session did not happen*

    Choose 1 answer from the list. Example: a .....

B. *Prepare your SMS*

Enter all your answers. Use a space to separate them.

015

Example: 015 answer1 answer2 answer3 answer4 answer5 answer6 answer7 answer8 answer9 answer10

C. *Send your answers using SMS*

Send your SMS to the telephone number: .....(Prepaid number to be provided soon)

D. *Wait for our reply SMS*

You will receive an SMS confirmation or specific error message.

PD Session - Tutor Survey

Questionnaire Code: 015

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Fill in your answers:

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   Answer must be the Identification Number of the coe you are reporting on. .....

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   Answer must be a date in the following format: day.month.year. Example: 25.12.2011 .....

3. *Did today's session take place?*
   a. *Yes*
   b. *No*

   Choose 1 answer from the list. Example: a .....

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   d. *Methodology*
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   a. *Not likely*
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   Choose 1 answer from the list. Example: a .....

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   e. *N/A - The session did not happen*

   Choose 1 answer from the list. Example: a .....

7. *How likely are you to try the teaching strategies you learned today in class?*
   a. *Not likely*
   b. *Somewhat Likely*
   c. *Very Likely*
   d. *N/A - The session did not happen*

   Choose 1 answer from the list. Example: a .....

8. *How likely are your students to model these teaching strategies if you use them in class?*
   a. *Not likely*
   b. *Somewhat Likely*
   c. *Very Likely*
   d. *N/A - The session did not happen*

   Choose 1 answer from the list. Example: a .....

9. *How do you rate the performance of the PDC on how well he/she facilitated the session?*
   a. *He/she was not prepared*
   b. *He/she was somewhat prepared*
   c. *He/she was very prepared and knew the content well*
   d. *N/A - The session did not happen*

   Choose 1 answer from the list. Example: a .....

10. *In your opinion, what was the level of participation in today's session?*
    a. *75-100% of the tutors were engaged*
    b. *50-75% of the tutors were engaged*
    c. *25-50% of the tutors were engaged*
    d. *0-25% of the tutors were engaged*
    e. *N/A - The session did not happen*

    Choose 1 answer from the list. Example: a .....

B. *Prepare your SMS*

Enter all your answers. Use a space to separate them.

015

Example: 015 answer1 answer2 answer3 answer4 answer5 answer6 answer7 answer8 answer9 answer10

C. *Send your answers using SMS*

Send your SMS to the telephone number: .....(Prepaid number to be provided soon)

D. *Wait for our reply SMS*

You will receive an SMS confirmation or specific error message.

PD Session - Tutor Survey

Questionnaire Code: 015

A. Answer the questions

Fill in your answers:

1. *Please enter your college ID number*

   Answer must be the Identification Number of the coe you are reporting on. .....

2. *Please enter the date of the session*

   Answer must be a date in the following format: day.month.year. Example: 25.12.2011 .....

3. *Did today's session take place?*
   a. *Yes*
   b. *No*

   Choose 1 answer from the list. Example: a .....

4. *What subjects do you teach at your institution?*
   a. *Mathematics*
   b. *Science*
   c. *English*
   d. *Methodology*
   e. *Other*

   Choose 1 answer from the list. Example: a.....

5. *Which theme was covered during the PD session?*
   a. *Teaching and Learning Materials*
   b. *Leadership for Learning*
   c. *N/A - The session did not happen*

   Choose 1 or more answers from the list. Example: a or ab .....

6. *How would you rate the content of the theme?*
   a. *Not at all relevant or useful*
   b. *Indifferent about it*
   c. *Somewhat relevant and useful*
   d. *Very relevant and useful*
   e. *N/A - The session did not happen*

   Choose 1 answer from the list. Example: a .....

7. *How likely are you to try the teaching strategies you learned today in class?*
   a. *Not likely*
   b. *Somewhat Likely*
   c. *Very Likely*
   d. *N/A - The session did not happen*

   Choose 1 answer from the list. Example: a .....

8. *How likely are your students to model these teaching strategies if you use them in class?*
   a. *Not likely*
   b. *Somewhat Likely*
   c. *Very Likely*
   d. *N/A - The session did not happen*

   Choose 1 answer from the list. Example: a .....

9. *How do you rate the performance of the PDC on how well he/she facilitated the session?*
   a. *He/she was not prepared*
   b. *He/she was somewhat prepared*
   c. *He/she was very prepared and knew the content well*
   d. *N/A - The session did not happen*

   Choose 1 answer from the list. Example: a .....

10. *In your opinion, what was the level of participation in today's session?*
    a. *75-100% of the tutors were engaged*
    b. *50-75% of the tutors were engaged*
    c. *25-50% of the tutors were engaged*
    d. *0-25% of the tutors were engaged*
    e. *N/A - The session did not happen*

    Choose 1 answer from the list. Example: a .....

B. *Prepare your SMS*

Enter all your answers. Use a space to separate them.

015

Example: 015 answer1 answer2 answer3 answer4 answer5 answer6 answer7 answer8 answer9 answer10

C. *Send your answers using SMS*

Send your SMS to the telephone number: .....(Prepaid number to be provided soon)

D. *Wait for our reply SMS*

You will receive an SMS confirmation or specific error message.

Figure 140. Simple drawings can make good TLMs.

Appendix 6
College Codes

Please identify your college and corresponding code. You may with to circule the code for your college for future reference.

Name of College of Education	College of Education Unique ID Number
Abetifi Presbyterian College of Education	coe4
Accra College of Education	coe6
Ada College of Education	coe8
Agogo Presbyterian College of Education	coe38
Akatsi College of Education	coe9
Akrokerri College of Education	coe34
Atebubu College of Education	coe35
Bagabaga College of Education	coe21
Berekum College of Education	coe29
Dambai College of Education	coe15
Enchi College of Education	coe24
Evangelical Presbyterian College of Education, Amedzofe	coe14
Evangelical Presbyterian College of Education, Bimbilla	coe20
Foso College of Education	coe28
Gambaga College of Education	coe39
Gbewaa College of Education	coe22
Holy Child College of Education	coe26
Jasikan College of Education	coe10
Kibi Presbyterian College of Education	coe1
Komenda College of Education	coe23
Mampong Technical College of Education	coe30
Mount Mary College of Education	coe5
Nusrat Jahan Ahmadiyya College of Education	coe16
Offinso College of Education	coe33
Our Lady of Apostles College of Education	coe27

Peki College of Education	coe13
Presbyterian College of Education, Akropong	coe7
Presbyterian Women's College of Education, Aburi	coe2
Seventh Day Adventist College of Education	coe3
St. Ambrose College of Education	coe40
St. Francis College of Education	coe11
St. John Bosco's College of Education	coe19
St. Joseph's College of Education	coe31
St. Louis College of Education	coe32
St. Monica's College of Education	coe37
St. Teresa's College of Education	coe12
Tamale College of Education	coe17
Tumu College of Education	coe18
Wesley College of Education	coe36
Wiawso College of Education	coe25

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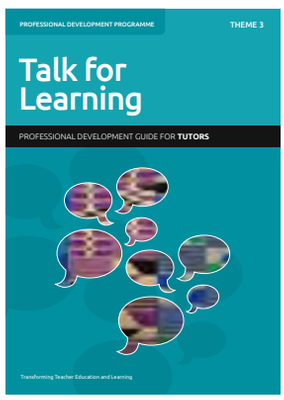
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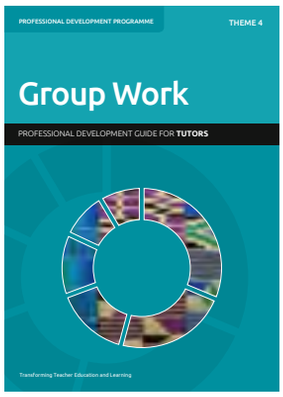
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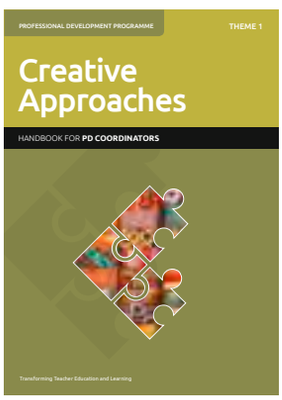
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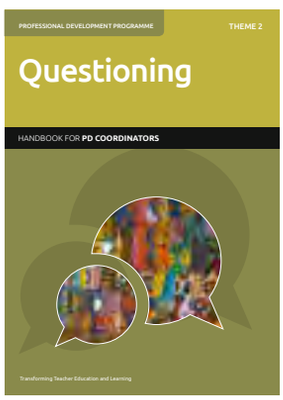
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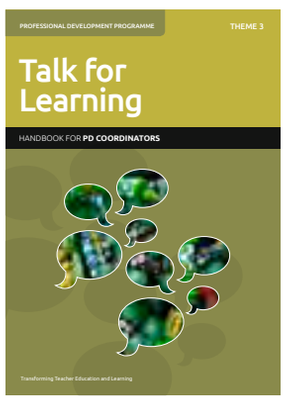
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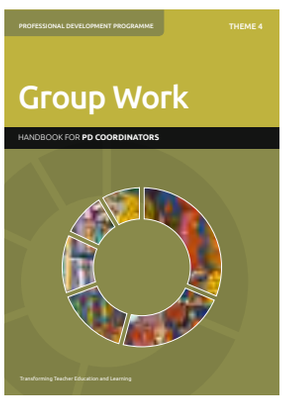
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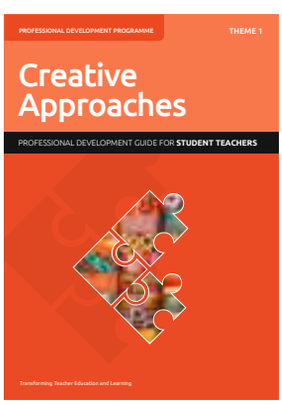
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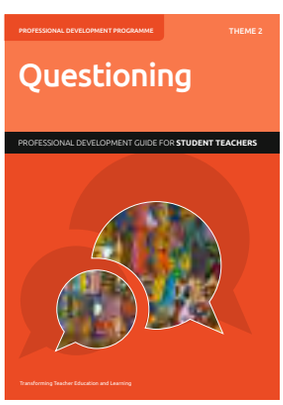
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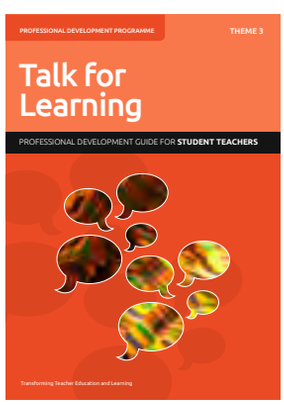
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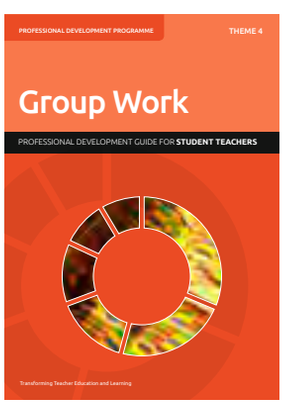
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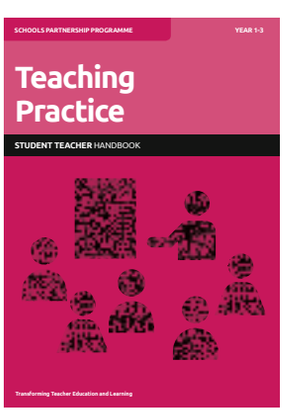
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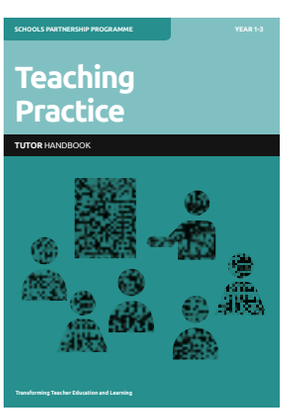
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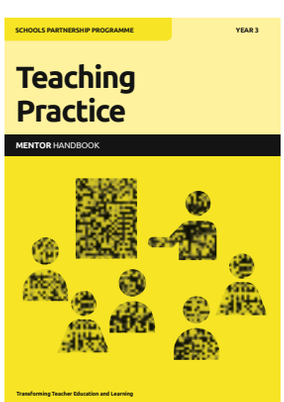
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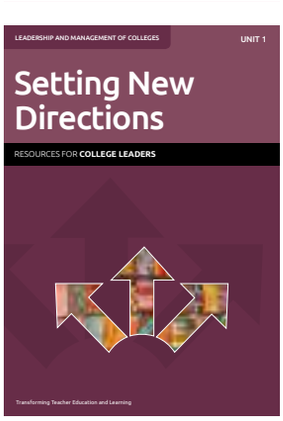
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