Questioning

PROFESSIONAL DEVELOPMENT GUIDE FOR **STUDENT TEACHERS**

Transforming Teacher Education and Learning

Professional Development Programme

Theme 2: Questioning
Professional Development Guide for Student Teachers

Contents

About these Materials

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

Transforming Teacher Education and Learning (T-TEL) is a Government of Ghana programme seeking to increase learning outcomes - for tutors in Colleges of Education, (student) teachers, and above all for pupils in school. To that end, T-TEL has created a set of professional development resources for use by you, the (student) teacher, to enhance your college-based and school-based teacher education. We also hope that practising teachers, no matter how long ago you did you initial teacher education, will also find this material useful.

The 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. The themes have been chosen because of their relevance to improving learning outcomes through the use of active pedagogies. For each of the twelve themes there are different teaching strategies (or teaching approaches). For instance, the teaching strategies in the theme "Creative Approaches" are songs, role-play, modelling, games, storytelling, poems and rhymes, and play.

For each of the strategies within a theme, the resources consist of three sequences of "Example - Plan - Teach - Reflect" (EPTR): one focusing on English, one on mathematics, and one on science. Many topics taught in the syllabus of the Diploma in Basic Education draw on those subjects, and you should find the examples useful irrespective of the course you teach.

Within each "EPTR" sequence there is an **example** for the use of the strategy (e.g. an example for using songs in English), followed by a section to support you in **planning** an 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 can then try out your activity (by **teaching** it to your pupils) after which you will find a number of activities for **reflection**, prompting you to think about your experience. For example: *Did the song achieve the intended learning outcomes? Did everybody (including girls and boys) participate in making the models? What can I do to involve learners with special needs?*

Within T-TEL, the student teacher resources are used within your usual College of Education teacher education programme, particularly within the elements relating to teaching practise. However, the resources are self-contained, and can 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 T-TEL materials available, detailing the elements of the professional development programme itself. There is

good evidence for the importance of learning together in "communities of practice". 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. Note that we will use the words "teacher" and "student teacher" interchangeably throughout, to designate both student teachers (who are still in college), as well as practising teachers.

For each theme, the teaching strategies are presented together in a single book (in print), but they are also available online on the T-TEL website in various formats (such as HTML, ePub, PDF) alongside supporting information. 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 TESSA Ghana materials, and the OER4Schools programme.

Introduction to Theme 2
Questioning

Why does it get dark at night? Why is the sky blue? Why do cars have wheels? Children ask questions all the time. All of us do. Questions feature in most conversations and dialogue. So it is no surprise that questioning is a big part of any classroom environment and accounts for a high proportion of talk in the classroom.

Teachers and pupils use questions for a wide range of purposes. They are a way of establishing existing levels of understanding or assessing the learning that has taken place during a lesson or at the end of it. In this way, question and answer techniques are essential for understanding the learning process. Questioning is also a powerful tool to help pupils acquire basic knowledge and developing higher-order thinking skills, such as application, analysis and evaluation. It also facilitates problem solving.

Questions may be asked by pupils as well as teachers. Helping pupils develop their own ability to ask questions and knowing which questions to ask are important elements of their teacher education.

Sometimes questioning can work well, and lead to lively and purposeful discussion. At other times a questioning sequence is simply repetitive with little learning taking place. Education research provides some insights into how to make questioning more effective for learning. For instance, a common problem is the lack of 'thinking time' (or 'wait time') a teacher gives the pupils to come up with an answer. Another issue is asking too many of the same type of questions.

Questions can follow a set pattern that is not productive for learning. One such pattern is called Initiation-Response-Feedback exchange, abbreviated as IRF. Here's an example:

> **Initiation (teacher): What's the capital city of Ghana?**
> **Response (pupil): Nairobi**
> **Feedback (teacher): No, that's not right. Who can tell me?**

Initiation-Response-Feedback is used widely in classrooms, but it is just about checking the facts. It often only involves a handful of pupils, usually those that are quick to raise their hands.

This theme on questioning will explore how to ask more productive questions that involve more pupils, so that in turn, they can use it when they enter the classroom and begin questioning pupils.

Important aspects of questioning are:

- the purpose of questions;
- the form in which questions are asked;
- the ways in which teachers handle responses.

Student Teacher Discussion

An important element of this programme is active learning. So rather than just reading the above text, let us ask some questions: *What do you think are the reasons for asking questions in a learning environment? Discuss your ideas with a colleague.* Write down your thoughts in your learning journal.

Theme Overview
Questioning

	Questioning aspects	Main points
T2-1	**Questioning to support learning**	Positive responses to questions; improving quality of responses; checking for understanding; using follow-up questions; prompting; listening to responses carefully.
T2-2	**Open and closed questions**	Questions with one correct response; questions with multiple answers; deep questions vs. surface questions; lower and higher order questions.
T2-3	**Common mistakes associated with questioning**	Encouraging pupils to respond; increasing pupil participation; handling responses effectively; increasing wait time after posing a question; creating a safe environment for learners; using higher order cognitive questions.
T2-4	**Using questions to promote thinking**	Questions for higher cognitive skills; questions for lower order skills; planning sequences of questions; probing; prompting; listening for innovative questions and answers.
T2-5	**Using questions to investigate misconceptions**	Assessing misconceptions; applying strategies for correcting misconceptions; creating cognitive conflict.
T2-6	**Involving everybody in questioning**	Strategies for increasing participation; ensuring inclusion; distributing questions effectively; pupils asking questions of each other and of the teacher.

Learning Outcomes for the Student Teacher
You will:

- have skills in the array of communication skills to motivate, manage, encourage, and develop co-operative learning with pupils;

- question and draw together pupils' contributions to help them learn;

- use questioning techniques skilfully;

- interpret, reflect on, and act on pupils' responses;

- teach concepts through activities that are pupil-centred;

- use questioning to support pupils in developing concepts;

- appreciate the importance of questioning to support learning;

- understand the differences between closed and open questions and how each can be used effectively;

- use open-ended questions and discussion to promote pupils' thinking;

- identify common mistakes associated with questioning;

- know how to use questioning to promote thinking;

- understand how questions can be used to investigate misconceptions;

- deploy strategies to involve all pupils in questioning.

Teaching Strategy 1
Questioning to Support Learning

When you ask a question, what do you expect the answer to be? Many questions focus on recalling facts by asking 'right' or 'wrong' questions. Knowing some facts is important. However, focusing only on recalling facts, rather than on pupils' understanding, does not promote learning effectively. In this teaching strategy, we look at how we can adjust the way we ask questions and how we react to responses to support pupils in their learning.

One way to move away from 'right' and 'wrong' answers is to think of sequences of questions: when you get an answer, ask a follow-up question. For example, imagine that a pupil has just responded to a question. The answer may be correct, or it may be wrong. You can follow up this answer by asking "Why do you think this is correct?" or "Does everybody agree?".

Here are some more examples of follow-up questions:

- Why?
- *How* did you arrive at this?
- *Can somebody think of* another way to answer this question?
- Does everybody agree? Who disagrees?
- Can somebody suggest a better word?
- Can you provide some evidence to substantiate your answer?
- What would happen if. . . ?
- Is this always the case?

Such sequences assist and encourage your pupils to say something and to engage in discussion. We call this "prompting". It is about using follow-on questions that help pupils to develop and improve the previous answer.

Listening carefully to responses from your pupils helps you notice unusual or innovative answers that you may not have expected. They may show a new approach that you had not considered, but they may also highlight misconceptions that need addressing. Wrong answers can be very helpful to you as a teacher: it gives you an insight into your pupils' thinking.

How you deal with your pupil responses to the questions is important as well. It can help in maintaining motivation and involving all in learning. Listening carefully and responding supportively will make your pupil feel valued, and empower them to think and try more. For example you could say *"I hadn't thought of that. Tell me more about why you think that way"*.

Asking pupils to explain further will give you both the opportunity to get an insight into the understanding of the pupils and expose misconceptions. If you do this for all answers, right or wrong, pupils will often correct their own mistakes. You will really get to know what and how your pupils have learned and this will help you in planning what to teach next.

Figure 1. Tutors discuss questioning for learning

Teaching Strategy 1
Questioning to Support English Language Learning

Theme	Questioning
Links to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching English in Basic Schools (FDC 211)
Learning Outcomes for Student Teachers	By the end of the session the student teacher will be able to: • Identify question types; • Use these questions to encourage learning; • Identify strategies that can make a lesson more interactive to support learning.

T2-1 E 1 Example

Questioning to Support English Language Learning

A student teacher is modelling a reading comprehension lesson with their pupils. The passage they are using is entitled 'The Murder of Mallam Maikudi'.

Read the scenario below and then answer the following questions.

1. What types of question does the student teacher use at the **start** of the lesson? What types of question does the teacher use **during** and **after** reading?

2. How does the student teacher make the lesson interactive and support learning? What strategies do they use?

3. How does the student teacher respond to their pupils?

Use the table for your answers to the questions.

Activities	
Types of questions used	
Strategies teacher used to help pupils' learning	
Pupils' reaction and response	

Examples of questions that can help our pupils' learning:

Examples of strategies that student teachers can use to help generate questions and responses from pupils:

The Murder of Mallam Maikudi

For this activity you will need the reading - 'The Murder of Mallam Maikudi', which can be found in New Gateway to English for Junior High School, Student Book 2, published by Pearson. The story is about Mallam Maikudi, a rich man, who is found murdered in his shop. Two inspectors investigate the scene of the crime, observing various facts, including a footprint leading away from the shop. The inspectors trick a number of suspects into leaving footprints, which helps them identify the murderer. If you do not have this story available, you could choose another story to fit the type of activities outlined below.

The student teacher starts the reading comprehension activity by writing the title on the board, 'The Murder of Mallam Maikudi', and then hands out the reading to the class.

The Activity

Having handed out the reading, the following activity takes place:

> **Student teacher (T):** I want one of you to read the title. (A pupil volunteers to do so and reads it.) Good.
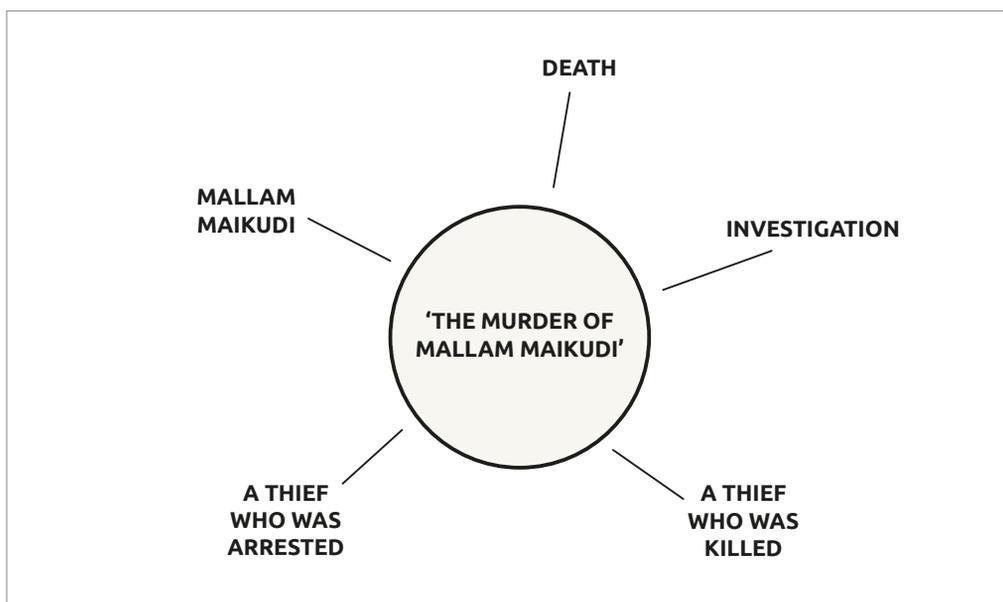
Figure 2. Aspects of 'The Murder of Mallam Maikudi': A questioning web to elicit prediction answers from the pupils

> **T:** Now, read the passage silently for ten minutes. (She now asks the pupils to answer some questions on the passage.)
>
> **T:** How many people were arrested by Inspector James?
>
> (Two pupils raise their hands)
>
> **Kojo:** Three people/men.
>
> **T:** Where can the answer be found? (This time more pupils raise their hands. T calls Abu)
>
> **Abu:** The last but one paragraph.
>
> **T:** Good! What did the Inspector see in the soft sand beneath the window? (More pupils volunteer)
>
> **Yaa:** Footprints.
>
> **T:** Where can this be found?
>
> **Dela:** In the third paragraph. (She reads it to the class.)
>
> **T:** Why did Inspector James say the footprint would disappear?
>
> **Ayi:** The thieves will come back to clean it.
>
> **T:** Does someone have a different answer?
>
> **Edna:** The wind will blow the sand over it.
>
> **T:** These are very good answers. Can we still have some more? (Pupils add other ideas)
>
> You've all done well. Why did the thieves use the back window?
>
> **Dede:** Because the door was locked.
>
> **T:** Great. Any other answers?

Ekuba and others: They didn't want to be seen entering the shop/breaking the door down will make noise etc.

T: Well done. Now fill in the table below with your own adjectives to describe the characters in the passage.

NAME OF CHARACTER	ADJECTIVE(S)
Mallam Maikudi	Miser, wicked

The student teacher then goes on to develop a role-play:

The Murder of Mallam Maikudi

(In groups of six.) You all live in Mallam Maikudi's town. One person is the Inspector, and the rest of you are the people in the town. What will you do when you all wake up in the morning and find the dead body of Mallam Maikudi in front of his shop? Some people also talk about Mallam Maikudi's wickedness.

For example:

Inspector: Good morning, what happened here?

Woman: We woke up and found a dead body here. . . .

T2-1 E 2 Plan and Practise Together

Questioning to Support English Language Learning

Here are your planning tasks. You can use the activity plan template found in the Appendix.

1. In groups think of a lesson and a topic that you will teach in the coming week and find the specific materials you will use.

2. Plan the questions you will use in your lesson. Think about different types of questions.

3. Indicate the types of questions and strategies used to elicit information from the pupils.

4. Plan strategies you will use to get the whole class to participate in the discussion of the topic.

5. Plan the strategies you will use to elicit information from the pupils, for example, motivation, use of visuals etc.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan.

T2-1 E 3 Teach

It is important for your professional learning that you actually teach the activity that you have planned. Please make sure you have your own activity plan available when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-1 E 4 Reflect Together

Questioning to Support English Language Learning

Now that you have taught the lesson activity, reflect on how it went. If at all possible, do the reflection together with a colleague who has also tried the activity. In your reflection, consider the following questions:

1. What strategies did you use to elicit information from your pupils?

2. What types of questions did you use to make your class interactive and support learning?

3. How did you help your pupils develop eliciting skills to get information from pupils?

4. Why do you think it is important for a teacher to plan the questions to be used in class?

5. Is there any difference between this strategy and what you already do/know? Describe it here.

Make brief notes about your reflections in your learning journal.

T2-1 E 5 Other Resources

Questioning to Support English Language Learning

Planning your Questions

Here are some questions you can use about your questions:

- Does this question have one correct answer?

- Is there more than one answer to this question?

- Are you using this question to get a pupil to give you a particular answer?

- Could a pupil come up with the answer through their own thinking, or is it something that they either know or don't know?

- If the question is answered by somebody, would it be possible for somebody to object to the answer, and come up with a different answer (that can be justified, or one that at least isn't easy to dismiss).

- Also try to answer the question yourself: Is it a productive question? You could also test your question on a peer/colleague: Again, how do they answer the question?

Here are some questions you can ask in class:

- Can you guess what will happen (next)?

- Can you give me an example? Can you find an (another) example?

- How does this explain ...?

- Is this the same as ...? Is this different from ...?

- Tell me something that is true about ...

- What connections can you see between ...?

- What always seems to happen?

- What other ways are there to . . . ?

- What do you think is happening?

- What would happen if ...?

- What could be changed if we want...? What would you change so that...?

- What is wrong with ...?

- What happens when ...?

- What did you observe?

- What do you think about ...?

- What do you think about what X said? Why?

- Why do you think that ...?

- Can you explain that to your partner?

- Can you group these?

Figure 3. Students play a game based on answering questions

Teaching Strategy 1
Questioning to Support Mathematics Learning

Theme	Questioning
Link to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching Basic School Mathematics (PFC 222) Primary: year, 1 unit 1.5, specific objectives 1.5.2 (determine the number of objects that are left if a number of objects are removed) , 1.5.3 (determine number of objects by comparison), 1.5.4 (comparison).
Learning Outcomes for Student Teachers	You will develop better questioning skills to support the learning of mathematics with your pupils.

T2-1 M 1 Example

Improving Questioning to Support Mathematics Learning

Maths teachers Gloria and Opoko were discussing their current practice on questioning. They both realised that they were not really aware of what questions they were asking in their classrooms, and how they were really responding to questions and answers from the pupils. They agreed that as a first step they would come and observe each other's lessons to help with that. They would record the questions that were asked, responses that were given, gestures of the student teacher, position of standing or moving around, time spent on questioning, the length of time the student teacher spoke and the length of the time the pupils could speak.

With the help of the record of these lesson observations, Gloria and Opoko were able to identify what they each wanted to focus on first to improve their questioning skills. Gloria wished to work on developing follow-up questions: she felt that she missed quite a few opportunities for the pupils to learn from each other, and to probe their thinking, by not asking follow-up questions. This also meant that she should develop her listening skills to understand better what the pupils were thinking. Opoko noticed that his lessons were not very interactive: they tended to consist of an explanation (though very good and clear) on how to do the maths, using 'right' or 'wrong' questions at times

to check understanding, followed by pupils doing lots of exercises on their own to apply and practise the newly-learned mathematical technique.

Gloria and Opoko were not teaching the same mathematics year groups, but they managed to help each other to come up with a list of strategies that they could try out in their own lessons:

	Gloria	Opoko
What I am trying to change…	To ask follow-up questions: I am missing opportunities for the pupils to learn from each other and to make them think more deeply. To develop my listening skills so I have a better insight into what my pupils are thinking	To make my lessons more interactive. To avoid explaining things, relying on right and wrong questions, and enabling pupils to do exercises by themselves.
The questions I will use to change this…	Use this list of questions (and write this in my activity plan): Why? How did you arrive at this? Can somebody think of another way to answer this question? Does everybody agree? Who disagrees? Can somebody suggest a better mathematical word? Can you provide some evidence to substantiate your answer? What would happen if. . . ? Is this always the case?	Use this list of questions (and write this in my activity plan): Why do you think this is? Can somebody think of another way to solve this problem? Can somebody suggest a better mathematical explanation? Can you provide some evidence to substantiate your answer? What would happen if. . . ? Is this always the case?
Other teaching strategies I could use…	Ask the pupils to first discuss their answers in pairs. Ask the pupils themselves to come up with follow-up questions to ask each other	Ask pupils to work in pairs or groups for doing a selected number of exercises. Then ask them to discuss what was the same and what was different between the exercises and how that affected the mathematical techniques they were using. Start with posing the mathematical problem and ask the pupils to come up with a solution to solve it instead of me giving an explanation straight away.

Discuss with your student teacher colleagues:

- What are the advantages and disadvantages of using peer-observation to learn more about your own practice? Would you use it? Can you think of some alternative strategies?

- How do the things Gloria and Opoko want to change relate with your experiences? Would you focus on other things?

- What do you think about the questions and teaching strategies Gloria and Opoko have selected to work on changing their practice? Do you think they will work? What changes would you make to the list?

Make a note of your thoughts in your learning journal.

T2-1 M 2 Plan and Practise Together

Supporting Learning Mathematics Through Questioning

Here are your planning tasks. You can use the activity plan template found in the Appendix.

1. In groups think of a lesson and a topic that you will teach in the coming week and find the specific materials you will use.

2. Think about what you want to change in your normal questioning practice.

3. Plan the questions you will use in your lesson to make this change happen.

4. Plan strategies you will use to get the whole class to participate in the discussion of the topic.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan

T2-1 M 3 Teach

It is important for your professional learning that you actually teach the activity you have planned. Please make sure you have your own activity plan available when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-1 M 4 Reflect Together

Does Questioning Support Mathematics Learning?

Now that you have taught the lesson activity, reflect on how it went. If at all possible, do the reflection together with a colleague who has also tried the activity.

In your reflection, consider the following questions:

1. What strategies did you use to elicit information from your pupils?

2. Did the questions you asked help to make your class interactive and thus support learning? How?

3. Why do you think it is important for a teacher to plan the questions to be used in class?

4. Is there any difference in the learning of the pupils from the strategies you tried out in these lessons from what you normally do?

Remember to write down your thoughts in your learning journal. Also note down what you learned from this unit that was most effective in improving your teaching.

T2 -1 M 5 Extension Tasks

Taking your Mathematics Questioning Further

If you want to take your questioning techniques further, here are two extension tasks that you can use for further discussion with colleagues in your own time.

Extension task 1. The Initiation – Response – Feedback (IRF) exchange is a common feature of classrooms. Its role as a teaching and learning tool depends on the nature of the initiation question. Some questions allow the pupil to demonstrate knowledge while other questions relate more to understanding. The nature of a question is often defined by the first keyword of the phrase. For example: *"What is the . . ."* is often used to test knowledge. Conversely: *"Explain why . . ."* requires some understanding.

Discuss with colleagues what advice can be given to pupils about:

- phrasing questions in order to check whether pupils have acquired knowledge;
- phrasing questions in order to check whether pupils have acquired understanding.

Extension task 2. A fellow student teacher tells you that she does not see the need for asking questions to find out if pupils have understood the lesson content because it will become evident whether they have understood or not when their work is marked.

Discuss with colleagues what arguments you could use to demonstrate to her why her approach is ill advised, and how she can make her teaching far more effective by encouraging two-way dialogue in her lessons.

Extension task 3: Flawed questions. Real life contexts which are familiar to pupils are often used in teaching. Putting something into a familiar context will make it easier to understand and more relevant to the learner. However, this approach is not without its pitfalls.

In an attempt to use real life situations teachers sometimes ask questions that cannot be answered by all pupils. For example a teacher might ask:

> *"There were nine apples on a tree. If some fell off, how many apples were left on the tree?"*

The problem here is that pupils are not told exactly how many apples fell off so they cannot say how many remain on the tree. This means an algebraic answer can be found (9-x; x is the number of apples that fell off the tree) but not an answer with a natural number (eg 3). Here is another example:

> *"Kofi has ten sweets. He gives each of his brothers and sisters a sweet. How many sweets does he have left?"*

Pupils are not told how many brothers and sisters Kofi has so they cannot say how many sweets were given, and how many were left. An algebraic answer could be given (10 − n; n is the number of siblings).

In your group of student teachers, come up with more of such questions that are flawed in some way and cannot be answered without using algebra. Make sure that some of those questions are relevant to the topic that you are teaching, and commit them to your learning journal. When you next teach, ask your pupils those questions and ask them to provide answers. You can use the activity plan template found in the Appendix. Use the discussion that will inevitably result to discuss the pitfalls of asking pupils to answer questions that they cannot answer with the mathematical knowledge they have. Note your findings in your learning journal.

Teaching Strategy 1
Questioning to Support Learning in Science Lessons

Theme	Questioning
Links to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching Science (FDC) UP Integrated Science Syllabus (2012), P6, Section 5 (Interactions of Matter), Unit 1.
Learning Outcomes for Student Teachers	Uses questioning to support pupil learning.

T2-1 S 1 Example

Food processing and food preservation

Here is an example of how student teacher Adabor is teaching the food processing and food preservation unit.

> At the start of the lesson, Mr Adabor has brought a few sample raw food items to the classroom. He asks his pupils to name a few of the fresh food items they use at home. He also asks them to list some of the food items on sale at the local market.

CABBAGE   SUGAR   POTATO   PLANTAIN   COCOYAM

TOMATOES   GUAVA   BREAD   CHICKEN   FISH
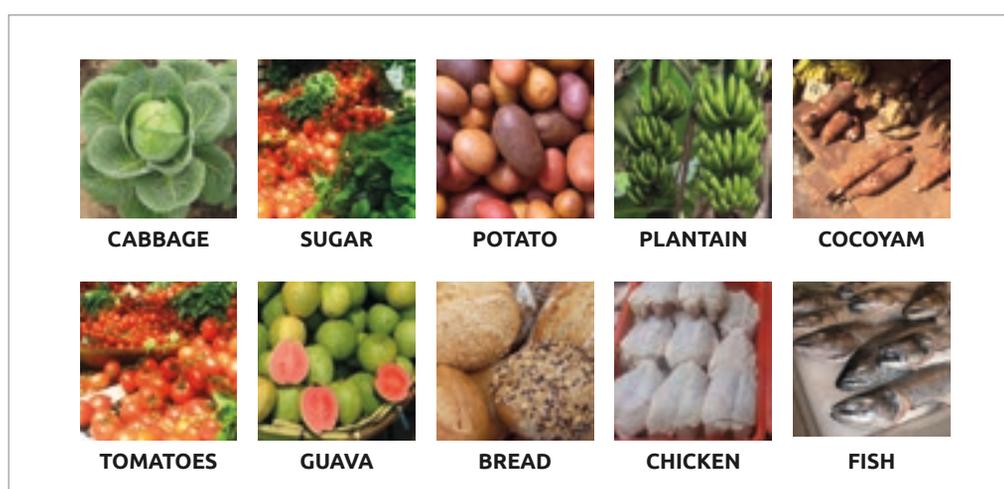
Figure 4. Fresh foods

He forms five groups of seven pupils to do the activities.

Mr Adabor: "List the names of the food stuffs on your table."

Pupils: "Tomatoes, pepper, fish, cocoa, cassava, plantain, meat, mango, milk."

Mr Adabor: "That's great!" "How can you keep these food items for long (preserve)?"

He gives them several minutes to discuss their ideas before asking each group to list their responses on a sheet of paper for all to see. He asks group leaders to display the group responses on the wall. Mr Adabor and the pupils picked out the common ideas and terms they had used. For example, 'peeling', 'washing', 'processing', 'smoking', 'freezing', 'salting', 'drying' and 'frying'. He asks them to write a sentence about what is done under each of the terms they have stated.

Mr Adabor asks:

"What do you have to do when you want to preserve food items?"

"Why do we have to process foods?"

"Do we preserve all foods in the same way?" Pupils give a chorus answer, "No!"

"OK, then, group the following raw foods under the following ways of preserving food: Canning, Freezing/Refrigerating, Drying, Salting, Bottling, Packing, and Smoking."

Mr Adabor pastes a chart on the chalk board showing various food items and how they have been processed and preserved.

COCOA BEANS	→	PROCESSED COCOA
PLANTAIN	→	PROCESSED PLANTAIN
SUGAR CANE	→	PROCESSED SUGAR CANE
RAW MILK	→	PROCESSED MILK
MEAT	→	PROCESSED MEAT
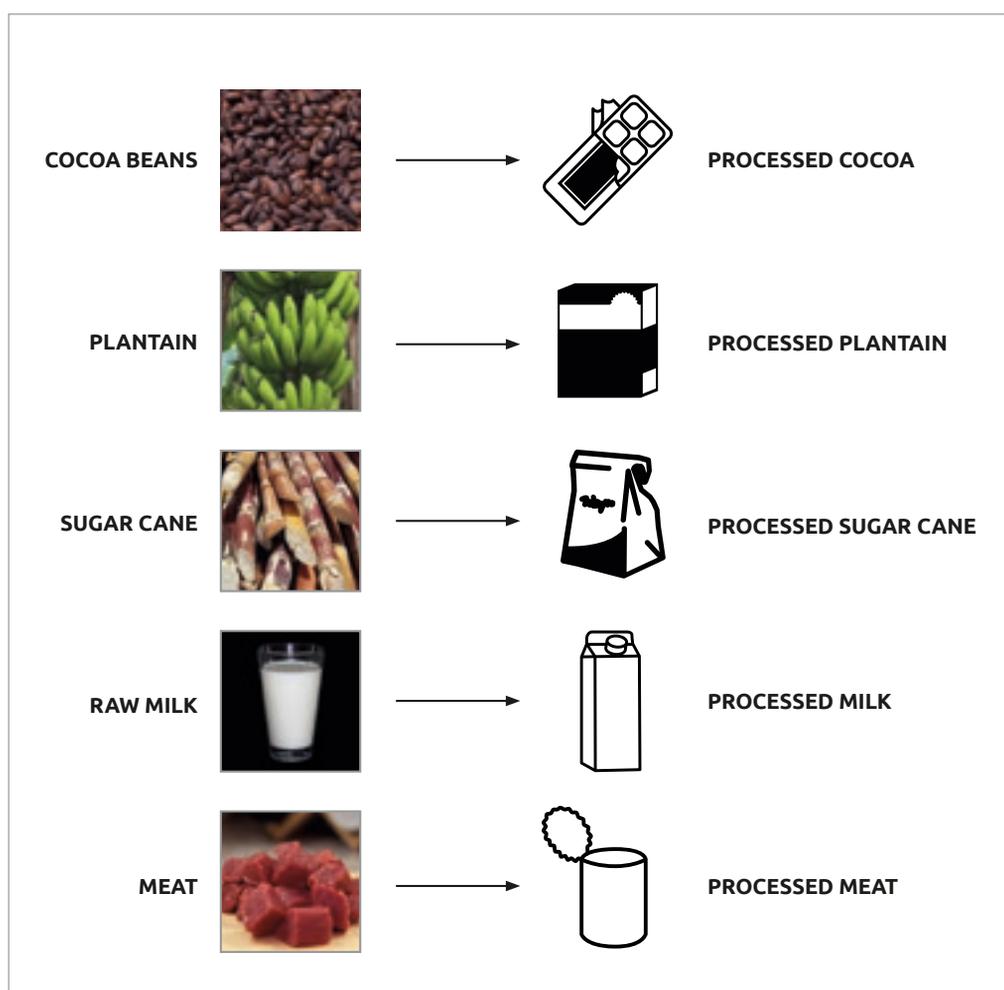
Fresh foods to processed foods

He then asks the pupils to compare their answers to what he has on the board. He visits each group as they do the activities to help pupils find answers to any challenges they have.

He asks the pupils the following questions one at the time. He also makes sure he gives the pupils enough thinking time by checking on his watch and not saying anything further for at least 30 seconds.

"What happens if you leave fresh fruit in normal room temperature for some days?"

"What do you do if you want to stop food from becoming rotten?"

"Why do you use the refrigerator?"

"If you don't have a refrigerator, what can you do to keep your food for a longer period?"

"Mention four ways of preserving food in your community."

"Why do you think shops sell a lot of food in cans?"

Mr Adabor refers to the examples of processed foods that he has brought to the classroom. He clarifies the terms 'food processing' and 'food preservation'. He also asks pupils to do exercises on food processing and preservation in their textbooks.

Student Teacher Discussion

Discuss with your colleagues and make a note of your thoughts in your learning journal about:

- What do you think about the questions Mr Adabor asked?

- Do you think giving longer 'thinking time' or 'wait time' is a good idea or not? Why? In what circumstances?

T2-1 S 2 Plan and Practise Together

Questioning to Support Learning in Science Lessons

Before using questioning for learning in your teaching, it is important that you try the questions out yourself with your student teacher colleagues. Think of a lesson you must teach this week. Decide on a specific class and topic and use the activity plan found in the Appendix. Trying out the questions, and the 'wait time' you plan to use, will help you to determine their suitability for the lesson you are planning to teach.

T2-1 S 3 Teach

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 to hand when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-1 S 4 Reflect Together

How does Questioning Support Learning in a Science Lesson?

After the lesson, reflect on how it went. If possible, reflect with a student teacher colleague who has also tried the activity. Consider the following questions:

- What effect did your questioning approach have on the learning?
- How well did you manage the questioning?
- Were you able to pause and give the pupils time to think longer?
- How did your questioning affect the pupils' participation? How do you know this?
- Who participated, responded or had greater involvement in the lesson?
- Did the pupils have opportunities to participate in the lesson?
- Did the less able pupils have opportunities to participate in the lesson?
- What did they say or do that made you think they were more interested?

Consider classroom situations where you can apply this kind of questioning to enhance pupils' learning. Also, encourage the pupils to consider how they could use this kind of questioning to enhance pupil learning.

- What were the biggest challenges during the lesson?
- What did you learn about how to improve your questioning?

In your learning journal, comment on your efforts to improve your questioning technique. Did you pause after each question you asked? Did you wait long enough before speaking again? If pupils have more time to think, do their responses improve?

Teaching Strategy 2
Open and Closed Questions

Have a look at the table below. It presents a number of different types of questions that we can ask.

	Question type	**Example**
(a)	Questions that are statements expressed as a question	Why are birds so clever they can weave nests with their beaks?
(b)	Questions requiring simple factual answers	Where was the bird's nest found?
(c)	Questions requiring more complex answers	Why do some birds nest in trees and some on the ground?
(d)	Questions that lead to enquiry by the pupil(s)	What is the nest made of?
(e)	Philosophical questions	Why are birds made so that they can fly but other animals cannot?

A common way of categorising questions is as closed versus open questions:

- **Closed questions** are factual and focus on a correct response. Some examples are: Can you name the different parts of a plant? What are the five nutrients that must be present in a balanced diet? How many sides does a triangle have? What is the formula for calculating the perimeter of a square? How many planets are there in the solar system? Can you name two sources of renewable energy?

- **Open questions** have many answers that are less predictable. Some examples are: What could be the consequences of water contamination? How does a balanced diet help us? How could we use the flowers of plants? Can you suggest ways of preventing the spread of malaria in your community? The difference between two numbers is five, what are the numbers?

It is the context of a question that often determines whether it is closed or open. For example, in a lesson about water contamination a teacher asks the question *"What could be the consequences of water contamination?"* The question is a closed one if the question is intended to check pupils' recall of the three consequences they have been told about or are in their textbook. It is open-ended if the question is intended to stimulate discussion about the consequences of pollution and no specific answers are expected.

You can think of closed questions as questions that prompt pupils to follow a set procedure (such as a specific calculation routine). By contrast, open questions stimulate thinking and open-ended tasks, thus engaging pupils with problem-solving activities.

The importance of making the distinction between open and closed questions is the kind of learning it supports: closed questions work well for recall, open questions are often needed to make pupils think further and more deeply.

Another way of considering a question is as 'surface' or 'deep'.

- **Surface questions** elicit one idea or some specific ideas. For example: *What is the difference between organic and inorganic fertilizers? What is the use of carbohydrates in a balanced diet? Which part of the sugar cane plant is eaten?*

- **Deep questions** elicit relations between ideas and extended ideas. For example: *What would happen if only inorganic fertilizers are used on growing plants? What connections do you see between the climate of a region and its vegetation?*

For example, consider this question: *What is the difference between a parallelogram and a rectangle?* The pupil will draw on their knowledge of the simple properties of these two quadrilaterals. It is a closed question. Now consider "*Can you give me reasons why $\sqrt{2}$ does not have an exact value?*" In order to answer this last question the pupil must have some understanding of rational and irrational numbers. It is an open question. If the teacher is just expecting to hear *"because it's an irrational number"* then the question is a closed one.

Again, the context determines whether the question is 'surface' or 'deep'. While many closed questions are also surface questions, there is not always a direct match between open/closed and surface/deep. For instance, many closed (true/false) questions in mathematics are very deep. As a teacher, the skill is to ask the right question, at the right time, so that it supports learning.

So how can you decide whether your question is an open or a closed one, and whether it is surface or deep? Here is a set of prompts that can help you to evaluate the questions you want to ask your pupils:

- Does this question have one correct answer?

- Is there more than one answer to this question?

- Are you using this question to get a pupil to give you a particular answer?

- Could pupils come up with the answer through their own thinking, or is it something that they either know or don't know?

- Could the expected response to a question be challenged with a different but justifiable answer?

- Does the expected response fit with the learning activity (recall/problem solving) you want to happen?

Student Teacher Discussion

Try to come up with a few questions you would want to ask your pupils and use this set of prompts to evaluate them.

Figure 5. Students discuss open and closed questions

Teaching Strategy 2
Open and Closed Questions for English Language Learning

Theme	Questioning
Links to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching English in Basic Schools (FDC 211)
Learning Outcomes for Student Teachers	By the end of the session student teachers will be able to: • Identify open and closed questions and when to use them. • Use different types of questions and strategies to help pupils participate in lessons. • Develop a lesson based on these questions and strategies.

T2-2 E 1 Example

Open and Closed Questions for English Language Learning

The following is an example of how 'open and closed' questions are used effectively by a student teacher to learn about Ghanaian music. She begins by asking pupils to work in pairs and write down all they know about the Ghanaian music scene. She then asks them to write down questions that they want to know more about regarding the Ghanaian music scene. Then, pupils read the passage below and find out if their questions have been answered.

Ghanaian Music: Past and Present

Ghanaians love to relax and dance to modern as well as traditional music. As far back as the 1920s Ghana had modern music which was called 'Highlife'. Highlife started in the 1920s with bands like Jazz Kings, Cape Coast Sugar Babies and the Accra Orchestra. The original founder of this style of music and 'King of Highlife' was E.T. Mensah. He was born in Accra and he formed his first band in 1930. The most famous band he performed with was the 'Tempos' which he formed in 1948. They developed 'Highlife' based on African rhythms.

In the late 1990s in Ghana, a new generation of artists discovered Hiplife. The person who started this style is Reggie Rockstone, a Ghanaian musician

who dabbled with hip-hop in the United States before finding his unique style. Hiplife basically was hiphop in the Ghanaian local dialect backed by elements of the traditional High-life. Some of the Hiplife artists include: Obrafour, Tinny and Ex-doe who further popularised the Hiplife music.

After they have read it the student teacher asks:

Did you find out anything new? What did you find out?

Were your questions answered? Which ones?

What new things did you learn from the article?

T2-2 E 2 Plan and Practise Together

Open and Closed Questions for English Language Learning

Before using open and closed questions in your teaching, it is important that you try the questions out yourself with your student teacher colleagues. Use the activity plan found in the Appendix. Trying out the questions will help you to determine their suitability for the lesson you are planning to teach.

For example, in groups, think of a lesson and a specific topic that you will teach this week. What open and closed questions will you use? Write down 10 open questions and 10 closed questions in preparation.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan.

T2-2 E 3 Teach

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 to hand when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-2 E 4 Reflect Together

Open and Closed Questions for English Language Learning

After you have taught the lesson activity, reflect on how it went. If at all possible, do the reflection together with a colleague who has also tried the activity. In your reflection, consider the following questions:

1. Which questions worked the best in your lesson? Why do you think this was?

2. What strategies can you use to make the lesson more interactive? Why is this important for your pupils' learning?

3. Which type of questions do you think can help the pupils say something meaningful?

4. What questions will you use to get your pupils to come up with different ideas?

Make brief notes about your reflections in your learning journal.

Teaching Strategy 2
Open and Closed Questions for Mathematics Learning

Theme	Questioning
Link to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching Basic School Mathematics (PFC 222)
	Primary: Year 2, Unit 2.14, specific objective 2.14.1 (collect data by counting different objects with specific attributes or characteristics, specific objective), 2.14.2 (collect data by measuring lengths/capacities of similar objects), specific objective 2.14.3 represent data as simple block graphs).
Learning Outcomes for Student Teachers	You will learn the difference between open and closed questions and the different nature of responses to them.

T2-2 M 1 Example

Open and Closed Questions for Learning Mathematics

The importance of making the distinction between open and closed questions is the kind of learning it supports: closed questions work well for recall, open questions are often needed to make students think further and more deeply. In mathematics it is closed questions that tend to be asked, for example in textbooks, or by asking pupils for the 'correct' answer to a calculation.

Teacher Saviour has noticed that in his teaching of mathematics he has tended to stick to asking closed questions. At the same time he notices his pupils seem to find it hard to make connections between certain mathematical ideas. They also have difficulty applying the mathematics they know already in another context. From discussion with colleagues and researching open questioning on the internet, he compiles a short list of question prompts that would help him to construct more open and deep questions to make his pupils think and understand mathematics. For his next lesson, which is on the real number system, he puts the general question prompts into a table, and writes how he could use them in the context of the lesson:

Question prompt	In the context of the real number system
This statement is always true. Can you change the statement so that it is sometimes/never true?	'The sum of a rational number and an irrational number is an irrational number' is a statement that is always true. Can you change the statement so that it is sometimes or never true?
What do you think is the same and what is different?	What do you think is the same and what is different between 3.41414141....(3.41 recurring) and 3.010010001...?
Why do you think....?	Why do you think that the quotient of an irrational number divided by an irrational number can be a rational or irrational number?
This is the answer. What could have been the question?	$3\sqrt{2}$ is the answer. What could have been the question?
Can you think of another example, and another, and another?	Can you think of another example of an irrational number greater than 1, and another, and another?

Student Teacher Discussion

Discuss with your colleagues the advantages and disadvantages of using these questions from the perspective of supporting pupils in the learning of mathematics.

Think of three closed questions that you use in your teaching practice. Can you re-phrase them using the question prompts in the table so that they become more open and deeper questions?

Make a note of your thoughts in your learning journal.

T2-2 M 2 Plan and Practise Together

Open and Closed Questions for Mathematics Learning

Before using open and closed questions in your teaching, it is important that you try the questions out yourself with your student teacher colleagues. Use the activity plan found in the Appendix. Trying out the questions will help you to determine their suitability for the lesson you are planning to teach.

With your colleagues, think of a lesson and a specific topic that you will teach this week. What open and closed questions will you use? Write down 10 open questions and 5 closed questions in preparation.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan.

T2-2 M 3 Teach

It is important for your professional learning that you actually teach the activity you have planned. Please make sure you have your own activity plan available when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-2 M 4 Reflect Together

Using Open and Closed Questions for Mathematics Learning

Now that you have taught the lesson activity, reflect on how it went. If at all possible, do the reflection together with a colleague who has also tried the activity. Remember to make a note in your learning journal.

Figure 6. Students enjoy a questioning activity.

Teaching Strategy 2
Open and Closed Questions for Science Lessons

Theme	Questioning
Links to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching Science (FDC) UP Integrated Science Syllabus (2012), P6, Section 4, Unit 4.
Learning Outcomes for Student Teachers	Use open questions and closed questions to assist pupil learning.

T2-2 S 1 Example

Using Open and Closed Questions when Learning about Electrical Circuits

Here is a record of a learning session in a Primary 6 class. Teacher Jocelyn is addressing one of the specific objectives of the Upper Primary 6 syllabus: Section 4, Unit 4, SO 4.3.1. 'list the components and functions of a simple electrical circuit'.To do this, Jocelyn has organised the resource materials needed to give the pupils practical experience of working with the components of a simple electrical circuit. One group of pupils is using the resources, and the other pupils are observing. The pictures show the resources Jocelyn has arranged. She uses a sequence of questions to guide the group doing the practical work.

To the whole class: "Do you know how this torch works?"

To the whole class: "How do you switch a torch on?"
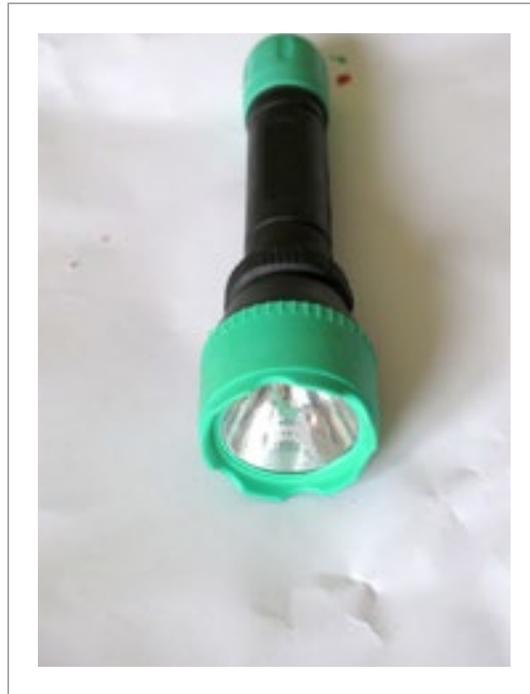
Figure 7. Simple torch

To the whole class: "Can you list the things that a torch must have, to make the bulb light?"

To the whole class: "If you do not have a battery, does the torch work?"

To the whole class: "If you do not have a bulb, does the torch work?"

To the whole class: "Why does the bulb light up?"

To the group: "Here is a torch, broken down into its separate parts."
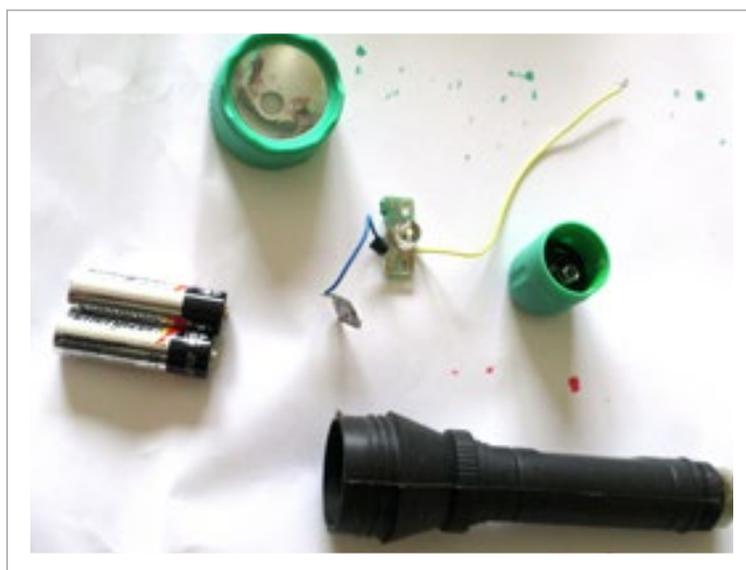
Figure 8. Parts of a torch

"What are the names of the bits?"

"Can you put the bits together, so that the bulb lights up?"

To the group: "So that we can play with the parts of the torch, we'll use a dry cell holder for the two dry cells. The dry cell holder will have two dry cells, like this."

"Why should you put the cells into a dry cell holder?"

Figure 9. Dry cell holder

To the group: "Experiment with the dry cell holder and the two dry cells. Examine the markings on the dry cell holder closely. Fit the dry cells into the dry cell holder. Try different ways."

To the whole class: "What is the correct way to fit the dry cells into the holder?"

To the whole class: "Why do you think the holder has two metal connectors at one end?"

To the group: "Here is a collection of items. Use them to make the bulb light. Try different ways."
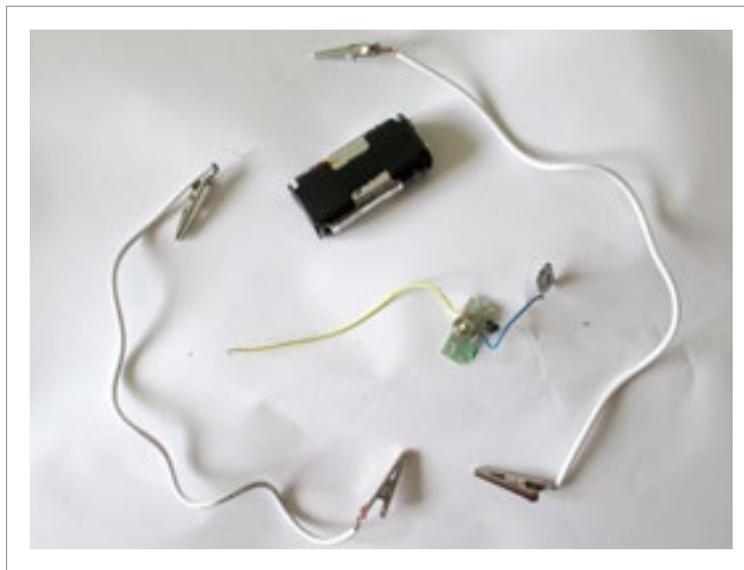
Figure 10. Simple circuit items

What would happen if you connected one end of each of the two white wires to the dry cell holder terminals, and the other ends to themselves?

Why does the bulb not light up if you do this?

What would happen if you now touched an end of one of the white wires to one of the contacts of the bulb – like this?
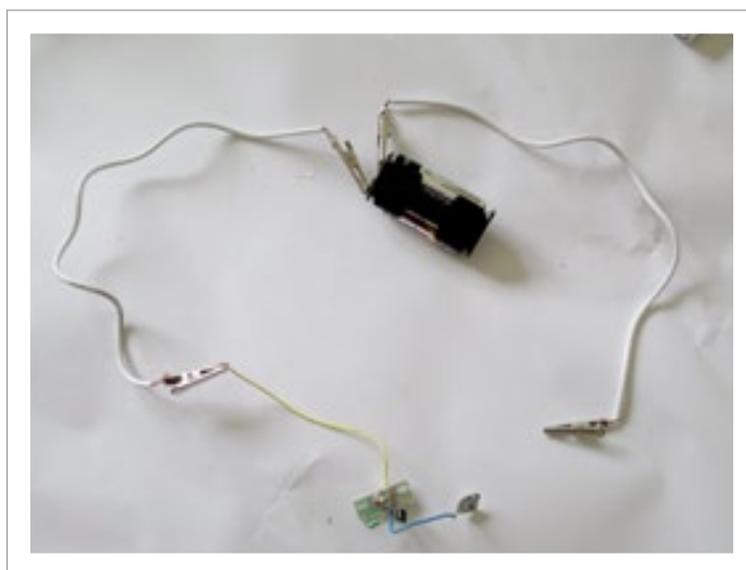
Figure 11. Incomplete circuit

Does the bulb light up?

What do you think you need to do to make the bulb light up?

Now, touch the other end of the white wire to the 2nd contact of the bulb – as in this picture. What happens?
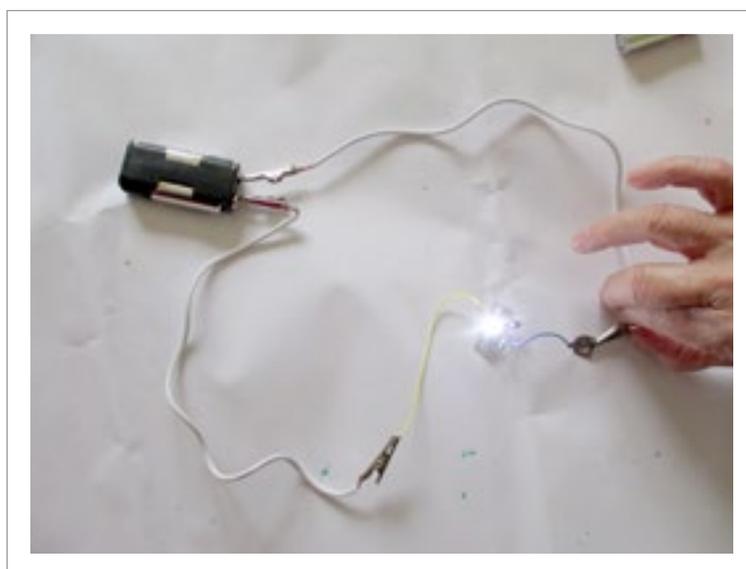
Figure 12. Completing an electric circuit

Can you write a sentence to explain, in your own words, why the bulb lights up now?

In this picture, the person is not holding the end of the wire. The bulb is lighting up. Why?
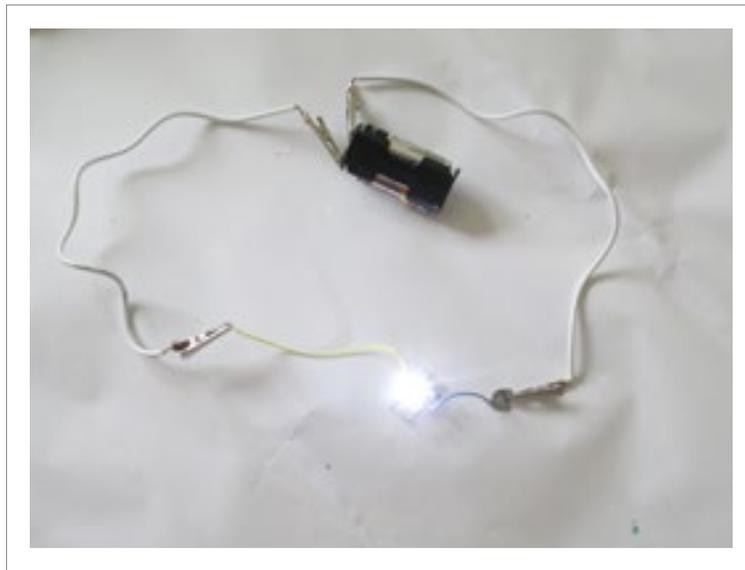
Figure 13. Complete circuit

Are all the items in the picture above necessary to make the bulb light up?

Look closely at the picture of the 'complete circuit'; then at the picture of the 'incomplete circuit'. What is the important difference between the two situations?

Student Teacher Discussion

With your colleagues, look at (some of) the questions teacher Jocelyn used and discuss which of those where open and which were closed questions.
You could use this table to help you:

Question	Open	Closed

Discuss the advantages and disadvantages of using these questions from the perspective of supporting pupils in the learning of science.

Make a note of your thoughts in your learning journal.

T2-2 S 2 Plan and Practisetogether

Identifying Open and Closed Questions

Before attempting to use the examples with your pupils, it is a good idea to complete some activities using this teaching strategy yourself. It would be even better if you plan them and try them out with your student teacher colleagues. Use the activity plan found in the Appendix.

Planning task: Asking closed and open questions.

- Identify a topic you will be teaching this or next week.
- Plan your lesson using the activity plan and write down explicitly what questions you will be asking.
- Identify which of these questions are closed and which are open-ended.
- If you have any closed questions in your activity plan, try and turn half of these into open-ended questions
- Discuss with your student teacher colleagues whether these are now the best questions you can ask in the lesson. Change accordingly.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan.

T2-2 S 3 Teach

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 to hand when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-2 S 4 Reflect Together

Challenges of Using More Open Questions

After the lesson, reflect on how it went. Consider the following questions:

- Was questioning like this the best way of assisting the pupils to learn the scientific concept you were teaching?
- Did you notice a difference in participation and the quality of the answers between using closed or open ended questions?
- Did you modify the sequence of questions that you planned?

Write down your thoughts and any specific outcomes from your reflection in your learning journal. For example, what did you find to be the most challenging aspects of teaching this lesson? What difficulties did you experience when trying to generate more open questions?

Figure 14. Students practise questioning

Teaching Strategy 3
Avoiding Common Mistakes when Questioning

Good questioning skills can increase classroom participation and enhance conceptual understanding and achievement of your pupils. At times questioning activities do not work as well as you may have hoped. There are some common reasons why this can happen, which can be remedied by making small changes to your practice.

One common issue is not giving the pupils sufficient "thinking time". Sometimes when a question is asked pupils are expected to answer instantly. Answers to questions are not always obvious and pupils need time to think. By increasing the "wait time" before responding to or re-phrasing a question you are giving the pupils the opportunity and time to think of answers.

Research shows that waiting longer after posing a question causes an increase in:

- the length of the response;
- the number of responses;
- the frequency of pupils' own questions;
- the number of responses from less able pupils;
- positive interactions between pupils.

The way responses to questions are handled will determine the quality and participation of pupils in responding to questions. Pupils will feel encouraged to volunteer more answers when they feel they are in a safe learning environment. This is a classroom free from fear and ridicule, in which it is fine to '*not know*', or to give a wrong or incomplete answer.

Below are some phrases ("talking points") which describe some teaching practices when using questioning. Discuss these with a colleague and decide whether you agree or disagree with each approach. This will help you with identifying common mistakes when questioning and how to avoid these.

Student teachers can support the learning of their pupils by:

- asking many questions at once;
- giving pupils enough time to think;
- asking a question and answering it themselves;
- asking a difficult question as soon as possible;
- always asking the same type of question;
- building on answers;

- asking a question in a threatening way;
- ignoring answers;
- correcting wrong answers.

Figure 15. Good questioning also requires good listening

Common Mistakes when Questioning

Here are some tips to avoid common questioning mistakes. If you were stuck above, these might help you get unstuck!

Give More Time for Pupils to Think

If you wait for a few seconds before expecting answers, the pupils have time to think. This has a positive effect on pupils' achievement. You will be amazed at how much your pupils know and how well you can help them progress their learning. They may well ask you follow-up questions so you should be prepared for this.

Respond Positively

The way incorrect responses are handled will determine whether pupils continue to respond to the teacher's questions. "That's wrong", "You are stupid" or other humiliation or punishment often stops pupils volunteering any more answers out of fear of further embarrassment or ridicule.

Instead, if you can pick out parts of the answers that are correct and ask them in a supportive way to think a bit more about their answer, you may encourage more active participation. This helps your pupils to learn from their mistakes in a way that negative behaviour towards them does not. The following phrase shows how you might handle an incorrect answer in a more supportive way:

"You have the correct verb but think about the tense. Is it present or past simple?"

Listen Carefully and Actively

The more positively you react to the answers given, the more pupils will continue to think and try. There are many ways of ensuring that wrong answers and misconceptions are corrected. If one pupil has the wrong idea, it is very likely that many more have it as well.

You must value all responses by listening carefully and asking the pupil to explain further. If you ask for further explanation for all answers, right or wrong, pupils will often correct any mistakes for themselves. You will develop a thinking classroom and you will really know what learning your pupils have done and thus how to proceed. If wrong answers result in humiliation or punishment, your pupils will stop trying for fear of further embarrassment or ridicule.

Improve the Quality of Responses

It is important that you try to adopt a sequence of questioning that does not always end with the right answer. Sometimes you should respond to a right answer with a follow-up question that extends their knowledge and provides pupils with an opportunity to engage with you. You can do this by asking for:

- a *how* or a *why question*
- another way to answer
- a better word
- evidence to substantiate an answer
- integration of a related skill
- application of the same skill or logic in a new setting.

Helping pupils to think more deeply about (and by so doing improve the quality of) their answer is a crucial part of your role. The following will help you to achieve this:

- **Prompting** requires appropriate hints to be given – ones that help pupils develop and improve their answers. You might first choose to say what is right in the answer and then offer information, further questions and other clues. ("So what do you think happened to the girl when she entered the cave? So why do you think this adjective sounds better than that one?")

- **Probing** is about trying to find out more, helping pupils to clarify what they are trying to say to improve a disorganised answer or one that is only partly right. ("So, can you tell me more about the character of x as you have described her so well?" "What other adverbs could you use to evoke the same atmosphere?")

- **Refocusing** is about building on correct answers to link pupils' knowledge to the knowledge that they have previously learnt. This broadens their understanding. ("What you have said is correct, but how does it link with the rest of the story?")

- **Sequencing** questions means asking questions in an order designed to extend thinking. Questions should lead pupils to summarise, compare, explain or analyse. Prepare questions that stretch pupils, but do not challenge them so far that they lose the meaning of the questions. ("Explain how you overcame your earlier problem. What difference did that make? What do you think you need to tackle next?")

- **Listening** enables you to not just look for the answer you are expecting, but to alert you to unusual or innovative answers that you may not have expected. It also shows that you value the pupils' thinking and therefore they are more likely to give thoughtful responses. Such answers could highlight misconceptions that need correcting, or they may show a new approach that you had not considered. ("I hadn't thought of that. Tell me more about why you think that way.")

Let Pupils Answer

Remember, questioning is not about what the teacher knows, but about what the pupils know. It is important to remember that you should never answer your own questions! After all, if the pupils know you will give them the answers after a few seconds of silence, what is their incentive to answer in the first place?

Teaching Strategy 3
Avoiding Common Mistakes when Questioning in English Language Learning

Theme	Questioning
Links to Syllabus	• Principles and Practice of Education (EPS 111) • Principles and Methods of Teaching in Basic Schools (EPS 211) • Methods of Teaching English in Basic Schools (FDC 211)
Learning Outcomes for Student Teachers	By the end of the session student teachers will be able to: • Recognise and describe the common mistakes in questioning (including their own) • Redesign a lesson to show how to avoid making these common mistakes.

T2-3 E 1 Example

Avoiding Common Mistakes when Questioning in English Language Learning

Read the following English Language classroom scenario. The student teacher is practising the question and response form of the **present perfect with 'ever'**, as in, *"Have you ever been to Accra?" – "Yes I have."*

After reading the scenario, work in pairs and write down in the table what you think are some of the mistakes in the student teacher's questioning.

Key: T = teacher; P = pupil; Ps= the pupils

T:	What's the most interesting thing you've ever done?
Ps:	Silence/no response
T:	Okay Regina, have you ever been to Accra? Yes, right, good. You, (points to another pupil) Have you ever seen snow?
P:	No
T:	Right, good. You (points to another pupil), have you ever eaten Fufu? Have you ever drunk beer? Have you ever seen the sea? Yes, right. Good.
P:	Yes (at the same time as teacher says "yes")
T:	What tense is this?
Ps:	Silence
T:	The present, the present . . .
Ps:	Perfect (whole class)
T:	Well done. Now write down 4 sentences using the present perfect with 'ever'. Just as we practised now! Do you understand?
Ps:	YES! (whole class)

Now in pairs write down some of the mistakes the student teacher made in their questioning. An example has been done for you:

Common Mistakes in Questioning
Asking a difficult question too early. E.g. What's the most interesting thing you've ever done?

Now join with another pair and share your ideas. Are they the same or different? If you are stuck, have another look at the introduction to this teaching strategy for some additional tips.

T2-3 E 2 Plan and Practise Together

Common Mistakes when Questioning in English Language Learning

Before attempting to use your lesson plans with your pupils, it is a good idea to complete some activities using this teaching strategy yourself. It would be even better if you plan them and try them out with your student teacher colleagues. Use the activity plan found in the Appendix.

In pairs or small groups **re-plan the lesson** above. To avoid such questioning mistakes remember that your pupils are meant to be practising the 'new' language. Use your answers above to help you, that is, you should think of doing the opposite to avoid making the same mistakes in the questions you plan to ask.

Now, think of a lesson you must teach this week. Decide on a specific class and topic. Plan how you will avoid these common mistakes when questioning. Other things to consider will be: your cues, your context, the model you will provide. Using meaningful and appropriate cues, contexts and models are important strategies to help your pupils be more involved.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan.

T2-3 E 3 Teach

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 to hand when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-3 E 4 Reflect Together

Common Mistakes when Questioning in English Language Learning

Now that you have taught the lesson activity, reflect on how it went. If at all possible, do the reflection together with a colleague who has also tried the activity. In your reflection, consider the following questions:

Thinking about the common mistakes in questioning – how many do you think you made in your own lesson? How can you help prevent making these mistakes in your questioning?

Look at the table below, and in pairs think back to what you did. Give specific examples of how you excelled!

Common mistake	My Solution
Asking too many questions at once	
Asking a question and answering it yourself or giving half the answer and the whole class completes it	
Asking a difficult question too early	
Always asking the same type of question	
Asking a question in a threatening way	
Not using probing questions	
Not giving pupils enough time to think	

Not checking understanding or asking the whole class, "Do you understand?"	
Ignoring answers	
Not correcting wrong answers	
Failing to see the implications of answers	
Failing to build on answers	

Remember to make a note in your learning journal if you have one.

Teaching Strategy 3
Common Mistakes when Questioning in Mathematics Learning

Theme	Questioning
Link to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching Basic School Mathematics (PFC 222) Primary: Year 4, Unit 4.3, specific objective 4.3.1 (use properties of basic operations), specific objective 4.3.2 (use basic operation to write number sentences).
Learning Outcomes for Student Teachers	The student teacher will become aware of mistakes that are frequently made when questioning.

T2-3 M 1 Example

Avoiding Common Mistakes when Questioning in Mathematics Learning

Mathematics teachers Mary and Ernest had been discussing the mistakes they thought they were making when using questioning in their lessons. They were very honest and open about their practice and came up with a long list of mistakes. To help themselves avoid making these in the future, they added their solutions. They planned to try these out, a couple at the time, in all their lessons in the next two weeks, and then to come together again to discuss. To remind themselves of their intentions they would put a printed copy of the list on their desk in the classrooms so they could refer to it and check how they were doing during the lessons.

This is the list student teacher Mary compiled:

Common mistake	My Solution
Asking too many questions at once	I will ask only one question at the time and give time to respond to that one question.
Asking a question and answering it yourself or giving half the answer and the whole class completes it	I will put my hands behind my back after I have asked a question and count on my fingers to 10, or even 20 before repeating or re-phrasing the question.
Asking a difficult question too early	I will first wait for at least 10 seconds (hands behind my back and counting in my fingers) before a) deciding that the question was to difficult; b) acknowledging to the pupils that maybe this question was to difficult to be asked now and then c) re-phrase and start with an easier question.
Always asking the same type of question	This I will find difficult to avoid, I know that. So I will write up the questions I intend to ask in my activity plan. Then check whether these are not all of the same type. I will also refer to the plan during the lesson to make sure I stick to asking more varied types of questions.
Asking a question in a threatening way	I never mean to ask questions in a threatening way, but sometimes that happens. I will try and smile more, and not wag my finger.
Not using probing questions	I can address this in the same way than 'always asking the same type of question': plan for it and stick to the plan.
Not giving pupils enough time to think	Again, I will put my hands behind my back after I have asked a question and count on my fingers to 10, or even 20 before repeating or re-phrasing the question.
Saying 'that is wrong' when a wrong answer is given, and moving onto another pupil to give the 'correct' answer	Another one I will find hard to address because in maths the answer is often right or wrong. What I can try to do is: Plan to ask more questions that can have multiple answers; Instead of saying 'that is wrong', saying something like 'that is interesting'. What makes you think so (with a smile)? Asking the class whether they agree or disagree; Give the pupil who said the wrong answer the chance to self-correct before asking someone else to answer.
Failing to build on answers	I will copy the list of suggestions that is in the introductory text of this teaching strategy, try them out and refer to the list during the lesson so I do not forget.

Summary – the main things I will change are:	Plan my questions, write it up in an activity plan and refer to it during the lessons Smile and not wag my finger Give pupils more thinking time by putting my hands behind my back after I have asked a question and counting on my fingers to 10, or even 20 before repeating or re-phrasing the question. Give pupils the time and opportunity to self-correct.

Student Teacher Discussion

Discuss this list with your student teacher colleagues. Do the common mistakes student teachers Mary and Ernest have identified resonate with your experiences? Do you have more mistakes to add? What would you write for your 'solutions'?

Make a note of your thoughts in your learning journal.

T2-3 M 2 Plan and Practise Together

Avoiding Mistakes when Asking Questions in Mathematics

Before attempting to use the examples with your pupils, it is a good idea to complete some activities using this teaching strategy yourself. It would be even better if you plan them and try them out with your student teacher colleagues. Use the activity plan found in the Appendix.

Planning Task 1: Improving questioning. Plan a strategy to guide you to improve the use of questions in your lessons this week. You could use a similar table to the one in the example, or come up with your own strategy. Discuss your ideas with your student teacher colleagues.

Suggestions of what could be removed from lessons are:

- not giving pupils sufficient time to respond;
- answering your own question.
- Suggestions of what could be included in lessons are:
- asking more questions that test understanding;
- building on the responses to questions.

Planning Task 2: In pairs or small groups, think of a lesson you are teaching this week. Decide on a specific class and topic. Think about how you will avoid these common mistakes when questioning. As you are developing your activity plan, make sure that you write down the questions you will

ask, adding reminders to avoid the common questioning mistakes we have discussed.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan and take the plan with you into the lesson so you can refer to it while teaching.

T2-3 M 3 Teach

It is important for your professional learning that you actually teach the activity you have planned. Please make sure you have your own activity plan available when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-3 M 4 Reflect Together

Common Mistakes when Questioning in Mathematics Learning

Now that you have taught the lesson activity, reflect on how it went. When you discussed questioning, how readily did your student teacher colleagues accept what you suggested were common mistakes? Was there total agreement about each of the issues that was raised or was there disagreement over some of the points?

When you were teaching, did your solutions to avoid common mistakes work? How come? Do you have to make amendments to your solutions?

Remember to write down any specific outcomes from your reflection in your learning journal. Was the importance of effective questioning generally appreciated? Also note down what you learned from this unit that was most effective in improving your teaching.

T2-3 M 5 Extension Task

Questioning Practice

If you want to take your questioning techniques further, here are two extension tasks that you can use for further discussion .

Extension planning task: Effective and ineffective practice. Look for video clips (e.g. on Youtube) in which a teacher is taking a lesson in mathematics, or another subject if no suitable examples from mathematics can be found.

Choose one video clip that you think is an example of either effective practice or ineffective practice.

Share your video clips with your student teacher colleagues. Observe each video clip and consider how the teacher created the classroom environment for the pupils to ask questions. In particular, observe how the teacher managed the responses of the pupils to either support their pupils' learning or discourage them from asking further questions. Select one example of effective practice and one example of ineffective practice from the clips observed for future reference.

What lessons did you and your student teacher colleagues learn from the teachers in the videos they watched? Were you able to identify examples of good practice and of poor practice? Did you identify instances where the questioning could have been handled better? Discuss your observations with your student teacher colleagues.

Extension reflection task: Learner-centred approach. Moving towards a more learner-centred approach requires changes to traditional classroom roles. Learners must take on more responsibility for their own learning while the role of the teacher moves from being the sole source of information to one of an organiser and adviser who directs the efforts of learners.

With your student teacher colleagues discuss whether a move towards a more learner-centred approach in the classroom increases or decreases the importance of two-way dialogue between teacher and learners.

Teaching Strategy 3
Avoiding Common Mistakes when Questioning in Science Lessons

Theme	Questioning
Links to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching Science (FDC) JHS Integrated Science Syllabus (2012), JHS2 Section 3 Unit 3
Learning Outcomes for Student teachers	Avoid common mistakes when framing questions to assist pupils to grasp concepts.

T2-3 S 1 Example

Avoiding Common Questioning Mistakes when Learning about Osmosis

Samson, a science teacher, taught a lesson using investigation to learn about osmosis. He set up the investigation as shown in these pictures:
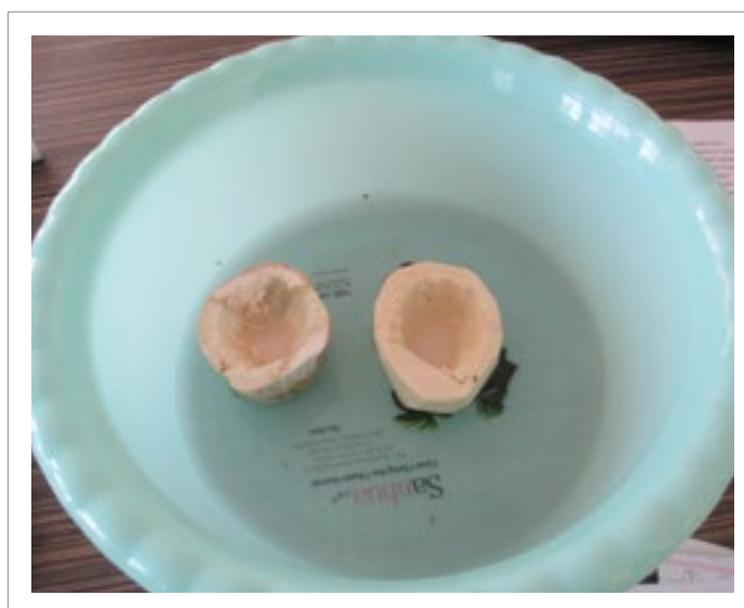

Figure 16. Osmosis experiment

He decided to use both yam and cassava. He wanted to show the pupils which tissue allowed osmosis to occur more rapidly.

Samson and the pupils decided to put a teaspoonful of salt into the cavity of the piece of yam and the piece of cassava. Then they dropped a little water onto the salt to dampen it. This resulted in the cavity having a very concentrated salt solution.

Samson's next science revision period with the class was the following day. He brought the completed experiment into class. This picture shows the water level marks on both the yam and cassava.

Figure 17. Osmosis marks on yam and cassava

Here are some questions that Samson asked about the investigation during the class discussion:

- Can you say how the water appears to have moved from the basin into the cavities?
- What is this investigation trying to show?
- Did the volume of water in the cavities of the yam and cassava rise?
- What happened to the levels?
- Can you say how the water appears to have moved from the basin into the cavities?
- Where else can the water from the basin go during the investigation period?
- Is there any way that the salt solution in the cavity might be lost?

- What would happen if there is salt in the cavities in the yam and cassava and also in the dish?

- What do you think might be the result if you had used boiled yam and cassava?

- Can you describe another experiment you can do to try this with boiled yam?

Discuss these Questions with your Student Teacher Colleagues

Identify Samson's strong questions.

Identify the questions that you think are weak.

In the introduction the following four common questioning problems were mentioned:

- Questions are repetitive;

- Teacher doesn't give enough 'thinking' time ('wait' time);

- There are too many questions of the same type;

- Questions follow a set pattern (e.g. initiation-response-feedback).

For each weak question you identify, try to say which of the four problems it has?

Make a note of your thoughts in your learning journal.

T2-3 S 2 Plan and Practise Together

Avoiding Common Questioning Mistakes when Teaching Science

Before attempting to use the examples with your pupils, it is a good idea to complete some activities using this teaching strategy yourself. It would be even better if you plan them and try them out on your student teacher colleagues. Use the activity plan found in the appendix.

Planning task: Improving questioning. Plan and prepare your own questions for the lesson you are planning to take with your pupils. Try to avoid the problems you identified in Samson's questions.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan.

T2-3 S 3 Teach

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 to hand when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-3 S 4 Reflect Together

Avoiding Common Questioning Mistakes when Teaching Science

After the lesson, reflect with your colleague student teachers how it went. Use these questions to prompt your reflection:

- What effect did your questioning have on your pupils' learning? Did you manage to avoid Samson's mistakes?
- Were you able to pause and let the pupils think longer about a question?
- How did this affect the pupils' participation? Did some respond more frequently? Did some have greater involvement in the lesson?
- Did your questions focus equally on those pupils who are less able as well as those who are more able?
- Did female and male pupils participating equally?
- Did you repeat questions?

Comment in your learning journal on the questioning mistakes.

Teaching Strategy 4
Using Questions to Promote Thinking

Questioning is a very powerful teaching technique that can used in any classroom to address a wide range of purposes and objectives. Here are some of the many reasons why a teacher you could use questioning:

- to interest, engage and challenge pupils;
- to assess prior knowledge and understanding;
- to assess learning and understanding in the lesson
- to stimulate recall
- to focus thinking on specific aspects;
- to make pupils think more deeply

Developing questioning skills requires you to think about what the purpose of your questioning is, and then to think about what questions are most effective to achieve that purpose. This teaching strategy *"Using questions to promote thinking"* focuses on asking questions with the purpose of developing the thinking skills of your pupils.

Questions to Address Different Types of Thinking

Thinking is often categorised as 'lower order' or 'higher order'. Bloom's taxonomy of cognitive skills, developed by Bloom and colleagues in 1956, has been used a lot in the last fifty years to describe 'thinking levels'. Although it has been criticised for over-simplifying human thinking, using Bloom's taxonomy can be a helpful tool to develop different questions to ask your pupils in order to trigger different kinds of thinking. The figure below shows Blooms' Taxonomy, a hierarchy of thinking skills with suggestions of questions to ask.

Student Teacher Discussion

Discuss these with a colleague and decide for each question whether you think they would trigger the kind of thinking skill that is intended. Would the question work in your subject area or how would you modify it? This will help you to develop a good bank of questions to ask your pupils to help them think.

Higher order thinking skills

Creating
What alternative would you suggest for ...?
What changes would you make to amend ...?
Predict the outcome if ...
What could you invent ...?
How would you compile the facts for ...?
If you had access to all resources how would you deal with ...?
Compose a song about ...
Write a story/poem/news article etc. about . . . .
Design a ... to ...

Evaluating
What criteria could you use to assess ...?
What data was used to evaluate ...?
What choice would you have made ...?
What is the most important...?
How could you verify ...?
Is there a better solution to ...?
What do you think about ...?
Do you think this is a bad or a good thing?

Analysing
How can you classify ... according to ...?
How can you compare the different parts ...?
What explanation do you have for ...?
Discuss the pros and cons of ...
What is the analysis of ...?
How is ... similar to ...?

Applying
How would you develop... to present ...?
wWhat would happen if ...?
How would you present ...?
How would you change ...?
Why does ... work?
Can you develop a set of instructions about ...?
What factors would you change if ...?

Understanding
How would you clarify the meaning ...?
How would you differentiate between ...?
What did you observe ...?
How would you identify ...?
What would happen if ...?
Can you give an example of ...?

Remembering
What do you remember about ...?
How would you define ...?
How would you recognise ...?
What would you choose ...?
Describe what happens when ...
How is ...?
Which one ...?
Why did ...?

Lower order thinking skills

Figure 18. Student teachers discuss use of ICT in conjunction with questioning

Teaching Strategy 4
Using Questions to Promote Thinking for English Language Learning

Theme	Questioning
Links to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching English in Basic Schools (FDC 211)
Learning Outcomes for Student Teachers	By the end of the session student teachers will be able to: • link their questioning to lower and higher order thinking skills • identify activities in terms of lower and higher order thinking skills and plan questions accordingly • plan their questions to promote thinking so as to develop analytical and discovery skills in their students.

T2-4 E 1 Example

Using Questions to Promote Thinking for English Language Learning

Different learning activities will require your pupils to use and develop different thinking skills, depending on the stage of their learning and the stage of the lesson. These thinking skills move from lower to higher order thinking skills, often referred to as Higher Order Thinking Skills (HOTS) and Lower Order Thinking Skills (LOTS).

Look at the following English Language activities that you can use in your classrooms. In pairs decide and discuss what level of thinking skills is required for each activity (see Plan and Practise Together, Task 1).

Example 1: Mapped Dialogue

A mapped dialogue is a prompt for pupils to conduct their own questioning dialogue. Look at the map below, and the dialogue that follows. You can easily create a dialogue map on your own whiteboard to practise any type of question or subject area you have to teach.

ACCRA

ABURI

...Aburi? → ...cool!

...Accra?

...hot! ←

...like?

...cool... ←

...Aburi!

...like? ←

...hot...
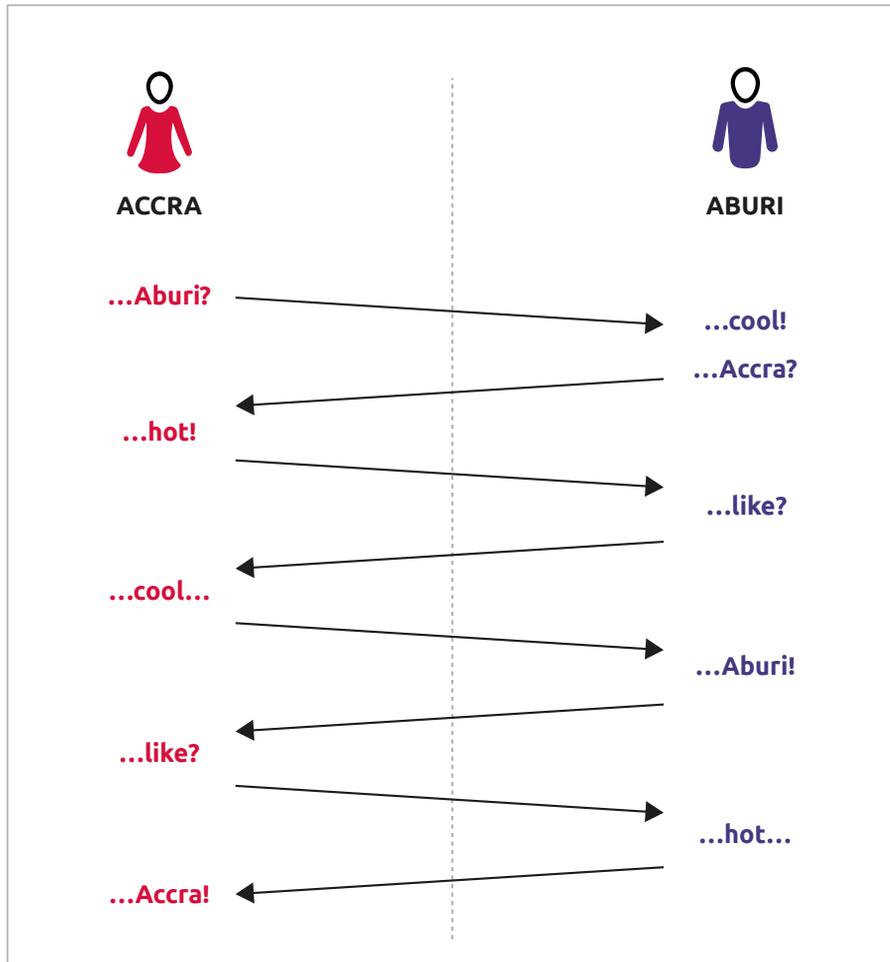
...Accra! ←

Key: T = teacher; Ps = pupils

T	Where is she?
Ps	In Accra
T	Where's he?
Ps	In Aburi
T	She asks a question about the weather in Aburi. What does she ask?
Ps	What's the weather like in Aburi?
T	What does he reply?
Ps	It's cool!
T	Now he asks about the weather in Accra. What does he ask?
Ps	What's the weather like in Accra?
T	And what does she reply?
Ps	It's hot!
T	Good. Practise that with your partner.
T	What's next? Make his next question

Ps	What kind of weather do you like?
T	And her reply?
Ps	I like cool weather
T	And where is it cool, in Accra or Aburi?
Ps	In Aburi.
T	So what does she say?
Ps	Come to Aburi!
T	Great, now practise the whole conversation with your partner

Example 2: What and Where?

Put any number of new vocabulary words all over the board, not in a list.

Call 2 pupils or 2 teams to the front of the class.

Ask them to stand an equal distance from the blackboard.

Call out in a loud voice a question with one of the new words.

The 2 pupils must run forward and slap the word on the board.

The one who slaps the correct word first is the winner.

If you are playing in teams, the winning team gets a mark.

Then ask 2 more pupils to come forward etc.

Example 3: Role-Play

> Work in pairs to make a conversation between an interviewer and Kofi Annan, using the following points to make questions and answers:
>
> · Born
>
> · Married
>
> · Children
>
> · Career
>
> · Number of books (written)
>
> · Type of books
>
> · Name of books
>
> · Plans for future

T2-4 E 2 Plan and Practise Together

Using Questions to Promote Thinking

Before attempting to use the examples with your pupils, it is a good idea to complete some activities using this teaching strategy yourself. It would be even better if you plan them and try them out with your student teacher colleagues. Use the activity plan found in the Appendix.

Task 1. Categorise examples 1, 2, and 3 above using the table below. What 'thinking skill' is each activity practising? Consider the level of 'thinking effort' required for the activity. Do you think it is a lower or higher order thinking skill? In some examples there may be more than one 'thinking skill'.

Activity	Thinking skills practised (developed)
Example 1: Mapped Dialogue	
Example 2: What and Where	
Example 3: Role-Play	

Thinking skills list:

- understanding
- remembering
- recalling
- creating
- evaluating
- analysing
- applying

Task 2. Now work in pairs with your student teacher colleagues. Write the 'thinking skills' from above into the table below. The first one 'remembering/recalling' has been done for you. Then match types of questions that can help your pupils develop these skills. See the first example in the table. Now do the other questions which are in the box below.

Task 3. Join up with another pair and share ideas.

Thinking skill	Questions we can use to help develop the skill	Examples
Remembering, recalling	Think of our last lesson. What do you remember about . . . ?	Tell me 3 adjectives that we learnt yesterday to do with the weather.

Types of questions we can use to help develop 'thinking skills':

- Can you give me an example of ...?
- Think of our last lesson. What do you remember about . . . ?
- What is the analysis of . . . ?
- How might you use . . . .?
- What is the most important..?
- Compose a song/poem on the topic . . .

Task 4. In groups, think about which classes you will teach this week. Plan how you will promote higher order thinking skills in one of your lessons. Make specific reference to a piece of syllabus material or subject.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan.

T2-4 E 3 Teach

It is important for your professional learning that you actually teach the activity that you have planned. Please make sure that you have your own activity plan to hand when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-4 E 4 Reflect Together

Using Questions to Promote Thinking for English Language Learning

Now that you have taught the lesson activity, reflect on how it went. If at all possible, do the reflection together with a colleague who has also tried the activity. In your reflection, consider the following questions:

- How did your lesson activity proceed? Were you able to practise using different types of questions?

- Which of the 'thinking skills' above are 'lower order thinking skills' (LOTS) and which are 'higher order thinking skills' (HOTS)? Write them in order using the box below:
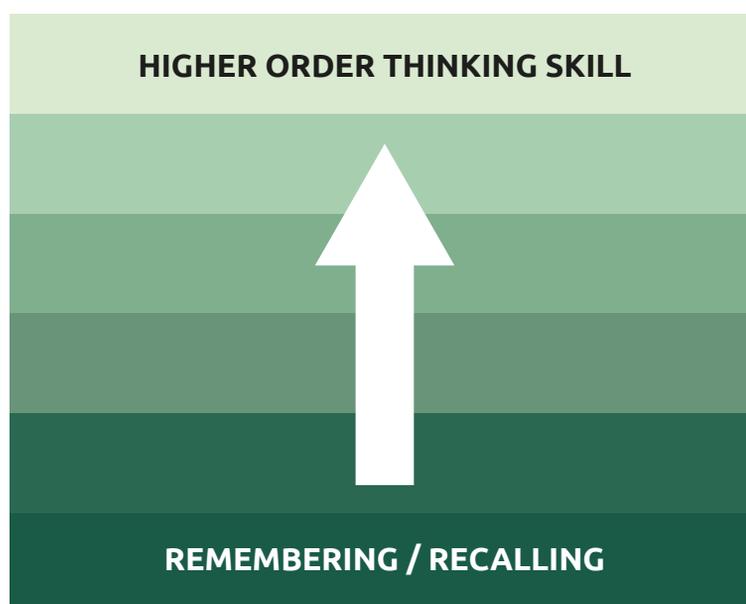
- Why do we need to use both LOTS and HOTS in teaching and learning?

- What are the implications for our questioning techniques as teachers?

Write down your thoughts and any specific outcomes from your reflection in your learning journal.

Teaching Strategy 4
Using Questions to Promote Thinking in Mathematics Learning

Theme	Questioning
Link to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching Basic School Mathematics (PFC 222) Primary: Year 5, Unit 5.8, specific objective 5.8.1 (identify plane shapes by the labels of their vertices), specific objective 5.8.2 (identify faces, edges and vertices of solid shapes), specific objective 5.8.3 (identify edges which are at right angles in solid shapes)
Learning Outcomes for Student Teachers	Use questions to promote thinking.

T2-4 M 1 Example

Using Questions to Identify Similarities of Solid Shapes

A group of pupils were provided with the following solid shapes:

CUBE   CUBOID   HEXAGONAL PRISM   TRIANGULAR-BASED PYRAMID   SQUARE-BASED PYRAMID   TRIANGULAR PRISM
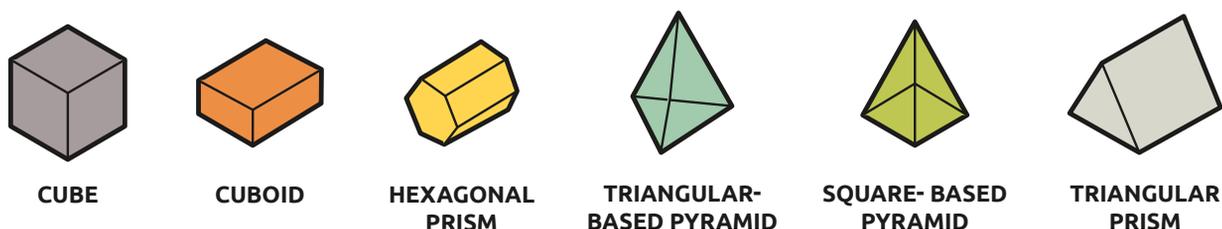
Figure 19. Solid shapes

They were told that there is a property shared by all of the shapes. Their challenge was to find out what that property is by asking questions.

They started by asking simple questions like:

> **"Do the shapes all have the same number of faces?" - "No, that isn't it."**
> **"Do all the shapes have the same number of edges?" - "No, that isn't it either."**

Eventually, the teacher suggests they ask themselves questions not just about faces, vertices or edges, but the relationship between them.

Eventually the pupils were able to deduce Euler's formula:

> **Number of faces + number of vertices = Number of edges + 2**

Student Teacher Discussion

Discuss with your colleague student teachers the advantages and disadvantages of asking pupils to come up with their own questions to help them in their learning.

- Would you do it in the same way? Would you make any changes in your approach?
- Make a note of your thoughts in your learning journal.

T2-4 M 2 Plan and Practise Together

Preparing Suitable Questions

Before attempting to use the examples with your pupils, it is a good idea to complete some activities using this teaching strategy yourself. It would be even better if you plan them and try them out with your student teacher colleagues. Use the activity plan found in the Appendix.

The following is a useful task that can help you prepare to use questions to promote thought. There are further ideas in the Extension Tasks section below.

Planning task. Posing questions that stimulate thought is not easy, so as a student teacher it is important to prepare questions ahead of time for an effective lesson. Below is a list of types of questions that a student teacher could ask during a lesson:

- Questions to find out what a pupil knows
- Questions that provide the pupil with guidance or a hint
- Questions to help a pupil explain their reasoning
- Questions that require a pupil to defend their ideas
- Questions to help a pupil consider alternative strategies
- Questions that help the pupil to reflect.

Source: *http://nzmaths.co.nz/sites/default/files/images/ALiM_Resource06.pdf*

Plan a lesson in which your pupils will work in groups. Assign each group a mathematical topic that you will be teaching this or next week. With your student teacher colleagues, generate one question from each of the above categories within the context of your topic. Share, discuss and refine your questions.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan.

T2-4 M 3 Teach

It is important for your professional learning that you actually teach the activity you have planned. Please make sure you have your own activity plan available when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-4 M 4 Reflect Together

How do We Devise Suitable Questions?

Now that you have taught the lesson activity, reflect on how it went. If at all possible, do the reflection together with a colleague who has also tried the activity. In your reflection, consider the following:

How easy did you and your student teacher colleagues find it to create the different types of questions identified in the planning task? Did some categories of questions generate more problems than others? Discuss with your student teacher colleagues which types of questions you found most difficult to formulate and what helped to overcome the difficulties.

Write down your thoughts and any specific outcomes from your reflection in your learning journal. What are the most challenging aspects of provoking thinking through questioning? Also note down what you have learnt from this unit that was most effective in improving your teacher education programmes.

T2-4 M5 Extension Tasks

Euler's Formula and Fractions

If you want to take your questioning techniques further, here are two extension tasks that you can use for further discussion.

Extension planning task 1. Based on the model example in which pupils apply their knowledge of shape and space to derive Euler's formula, plan a lesson which extends a concept beyond that which is normally taught. For example, with Euler's formula this could be the plan for a lesson where you explore the formula for solid shapes which have one or more curved edges e.g. a cylinder or a cone.

By asking suitable questions, pupils should be able to determine whether Euler's rule is valid for all solid shapes or only those that do not have curved edges.

Extension planning task 2. In the preamble to the 2012 Primary and Junior High School syllabuses, six profile dimensions were identified: knowledge, understanding, application, analysis, synthesis and evaluation.

The table below shows questions that could be asked about fractions and solid shapes in the different categories:

Fractions	Shapes
Knowledge List the fractions you know and can show.	**Knowledge** List the attributes of your shape.
Understanding Find items that you can use to show the fractions.	**Understanding** Find items that you can use to show the shape.
Application Draw a diagram which shows these fractions or take photographs of the fractions.	**Application** Construct basic shapes using a ruler and measurement.
Analysis Design a survey to find out which fractions are easy and which are hard. Produce a graph to show your results.	**Analysis** Identify where the shape is found in the classroom and school.
Synthesis Create a PowerPoint presentation fractions game for others to play.	**Synthesis** Create an item that includes all or part of your shape. Draw and label your design.
Evaluation Choose a diagram or picture to represent the most difficult fractions to use in a game.	**Evaluation** Tell why your shape is used in the places it is.

**Source:** *https://www4.uwm.edu/Org/mmp/ACM201213-files/ACM-March15-BloomRevisedMath.pdf*

Learning to recognise the categories of questions listed in the table takes practice. With your student teacher colleagues relate examples of each of the categories above that you have asked in one of your lessons, or that they have been asked by other student teachers.

Extension reflection task 1: Expected answers. Student teachers are sometimes frustrated when pupils fail to answer questions in sufficient detail or sufficient depth. However the problem sometimes lies with the student teacher because they have not asked the question that would give the expected answer.

Reflect with student teacher colleagues on how best to advise about wording questions in order to obtain the desired response. For example, when devising a question is it sometimes wise to start with the required answer and then word the question in a way that will solicit this?

Extension reflection task 2: Visual stimuli. While the student teacher may often use questions alone to provoke thought, sometimes a visual stimulus will make the process more effective.
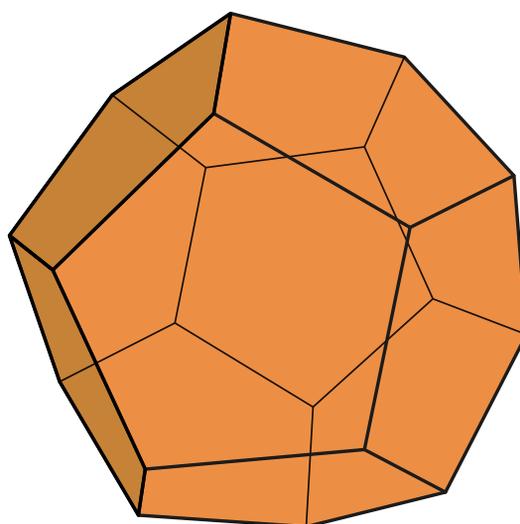
Figure 20. Dodecahedron

For example, the solid shape above is a dodecahedron. It has straight edges but the whole solid has a curved shape. Asking the 'Should we expect a dodecahedron to follow Euler's formula or not?' while showing the pupils the picture, can help them in their learning and understanding.

Discuss this with colleagues. Think of other examples you can pass on to your pupils where a visual stimulus of some kind can be usefully used to support a thought-provoking question.

Teaching Strategy 4
Using Questions to Promote Thinking in Science Lessons

Theme	Questioning
Links to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching Science (FDC) UP Integrated Science Syllabus (2012), UP4, Section 5, Unit 1.
Learning Outcomes for Student Teachers	Use questions effectively to promote pupils' thinking.

T2-4 S 1 Example

Questions to Promote Thinking about Forces

Matilda is preparing to do a science lesson on forces. The objective is that pupils will be able to explain the term 'force'. The syllabus refers to 'Definition and types of forces, their effects and application'.

Matilda organises the practical activities listed in this table.

Activity	Force used	Direction	Size
Lifting a big stone	Pull	Upwards	large
Lifting a small stone			
Hammering a nail into wood			
Screwing a screw into wood			
Stirring water			
Separating two magnets			

Activity	Force used	Direction	Size
Blowing up a balloon			
Squeezing a sponge			
Twisting a hose			
Stretching a rubber band			
Pulling a bowstring			

She organises the pupils into mixed-ability groups to work on the tasks.

The first activity asks pupils to do a series of physical tasks. They then have to decide which kind of force is at play (push, pull, turn or twist). After the pupils have done the tasks, Freda questions them to check for understanding. During the discussion part of the session, she asks this sequence of questions:

- Did each group identify the types of force correctly?
- What is the difference between the force you applied when lifting the big stone and lifting the small stone?
- In what direction did you apply the force to lift the stones?
- Why is the upward force you applied on the big stone greater than that for the small stone?
- What did you have to do to hammer the nail into the piece of wood?
- What kind of force is this? Why is it possible for the nail to push through the wood?
- Do you think you could hammer the nail through a piece of stone? Why not?
- Did you hammer with the same force each time you struck the nail into the wood?
- What do you think would happen if we found a strong man to hammer the nail into the wood?
- Compare the size of the force you used to push the screw into the wood with the size of the force you used to hammer the nail into the wood.
- What tool did you use to push the screw in?
- What comment would you make about the force you used to screw the screw into the piece of wood?
- Why is the force needed to screw something different from the force needed to hammer something?
- Examine the screw and the nail. Can you explain how they are different?
- The screw has a spiral track on it. Can you explain why this helps you to push the screw into the wood?

- When you stirred the water, did you use a push or a pull force?
- What did you observe as you stirred the water faster?
- What happened when you suddenly stopped stirring the water?
- What would happen if you stirred the water with a straw instead of a spoon?
- Which ends of the two bar magnets pull each other together?
- Which ends of the two bar magnets push each other apart?
- How do you explain this magnetic 'push' and 'pull'?
- Where does the force to blow up the balloon come from?
- How is this force different from using a pump to inflate a bicycle tube?
- Can you describe in one sentence what happens as you blow into the balloon?
- How are stretching the rubber band and blowing up the balloon similar?
- In what way are those two forces different?
- Where is the water stored in the 'full' sponge?
- Why does squeezing the sponge push the water out?
- Can you name an everyday activity where you use the same 'squeezing' force?

Matilda ends the series of questions by writing a summary of the experiences on the blackboard.

With your student teacher colleagues, go through the list of questions that Matilda used. Discuss how to answer each of Freda's questions. Discuss your opinions of Matilda's efforts to get the pupils thinking.

T2-4 S 2 Plan and Practise Together

Generating 'Thinking' in Science

Before attempting to use the examples with your pupils, it is a good idea to complete some activities using this teaching strategy yourself. It would be even better if you plan them and try them out with your student teacher colleagues. Use the activity plan found in the Appendix.

Asking 'thinking' questions:

- Identify a topic you will be teaching this or next week.
- Plan your lesson using the activity plan and write down explicitly what thinking questions you will be asking. Consider what questions to ask, so that your pupils would be helped to think about the concepts. Think of the questions that Matilda asked.

- Try to create other questions which might follow on to make the pupils think more deeply. For example, for the question Matilda asked "How is this force different from using a pump to inflate a bicycle tube?" there might be a good follow-on question "What kind of force is pushing back against you when you pump up the inner tube of the bicycle?", and "Why does the work of pumping become harder and harder as the tube inflates?"

- Identify which of these questions you are sure will trigger your pupils to think, and which you are unsure about.

- Discuss with your student teacher colleagues whether these are now the best thinking questions you can ask in the lesson. Pay particular attention to the questions you are not too sure about. Try them out and then refine the questions.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan.

T2-4 S 3 Teach

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 to hand when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-4 S 4 Reflect Together

Analysing 'Thinking' Questions

Now that you have taught the lesson activity, reflect on how it went. If at all possible, do the reflection together with a colleague who has also tried the activity.

The figure below shows Blooms' Taxonomy, a hierarchy of thinking skills. The six levels of the hierarchy move from 'lower order' thinking skills to 'higher order' thinking skills.
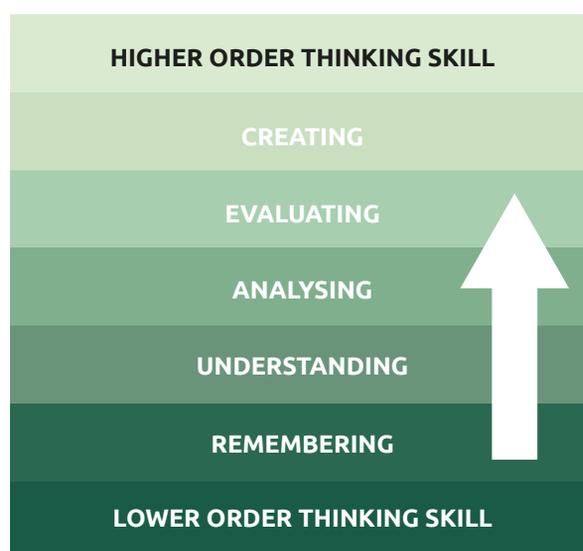
Figure 21. Levels of thinking skills

Consider each of the questions you used during your lesson. Ensure that you have all the resources for the activities ready for use during the discussion about the questions. For each question, try to identify which of the six levels it might be. As you reach a conclusion for each one, label the question with Remembering, Understanding, Applying, Analysing, Evaluating, or Creating.

Give opinions on the questions:

- What proportion of the questions were Remembering or Understanding?
- What proportion were at the higher levels – Applying, Analysing, Evaluating, or Creating?
- How many questions do you consider to be at the Creating level?

As discussion points come up, repeat some of the activities. With your student teacher colleagues you will raise issues that did not come up during the lesson you took with pupils.

In your learning journal, record the results of your analysis of the questions. Give the data on the proportion of questions at the various levels of the hierarchy. This information is an indication of how the questioning promotes thinking skills.

Figure 22. Students practise asking questions and discussion

Teaching Strategy 5
Using Questions to Investigate Misconceptions

Pupils come to the classroom with pre-existing knowledge and skills. When a teacher introduces a new topic or concept pupils may well have some prior knowledge about it. At times, this knowledge could be incomplete, partially misinformed or simply wrong. Erroneous understanding of something is called a misconception and is a normal part of the learning process. Ideas and understanding are formed from everyday experiences. Many correct ideas arise from previously incomplete understanding – this is even true for some ground-breaking ideas in science. It is a fact of life that not all ideas are based on a fully correct explanation of natural phenomena, and indeed, some concepts and ideas are very difficult to grasp. Research even tells us that this is the case: many people have ideas about our natural world that are misconceptions.

Pupils are unaware that some of their ideas are misconceptions. Such misconceptions make it very difficult to process new information about the concept. Misconceptions thus need to be overcome, and "re-learning" needs to take place, including replacing and reorganising exiting ideas.

How do you do this? Often, reading pieces of text, listening to lectures, or even learning by discovery, are not successful at challenging and changing misconceptions. Often what is needed is the support of a teacher, who can make pupils aware of their misconceptions. Constructivist models talk about the role cognitive conflict in challenging misconceptions. Cognitive conflict is the mental discomfort a person feels when she faces new information that contradicts prior beliefs and ideas. A person usually tries to reduce this discomfort, for example by re-organising their ideas.

Questions are a great way to challenge: Good questions encourage learners to engage with the way of thinking about something. Here are some strategies in which to use questioning to assess and address misconceptions:

- Engage in argument and debate to strengthen newly-acquired correct knowledge;
- Find hands-on ways of presenting the new concepts;
- Use analogies to make a bridge from the previous understanding to the new one;
- Use models to help with reasoning;
- Use case studies;
- Initiate cognitive conflict;

- Use interactive experiences to help pupils to grasp concepts;
- Use probing questions to make pupils challenge their existing understanding.

In the following sections you will explore some of those strategies.
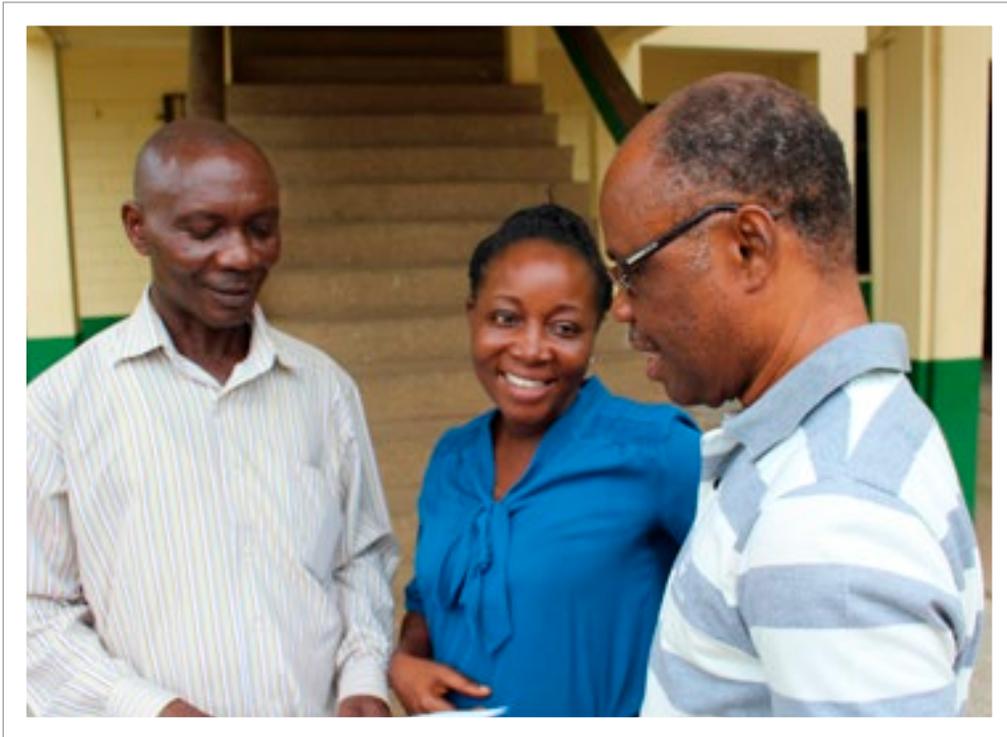
Figure 23. A group of tutors discuss inclusive questioning

Teaching Strategy 5
Using Questions to Investigate Misconceptions

Theme	Questioning
Links to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching English in Basic Schools (FDC 211)
Learning Outcomes for Student Teachers	By the end of the session student teachers will be able to include strategies and questioning techniques in their classrooms to improve their pupils' understanding of concepts and content.

T2-5 E 1 Example

Using Questions to Investigate Misconceptions in English Language Learning

Read the scenario below and then, in a group, discuss the possible strategies and questioning techniques Regina could use to improve her pupils' understanding of her lessons.

Regina asked her friend and peer, Freda, to observe her English Language lesson as she felt she was having problems getting her pupils to talk. She felt they often did not understand her. So she asked Freda to focus on the questions she used in the classroom and how she responded to them.

Regina started her lesson immediately with no introduction or review of what had gone before. She was introducing a new activity to practise the language ('can' for ability) she had presented the day before. She gave the instructions for the activity and then asked "do you understand?" All her pupils said "Yes." So she asked them to stand up and move around the classroom and talk to each other. She listened to the two pupils nearest to her who are always top in the English exams. They were doing the activity as Regina wanted. She was happy so went to sit at the front of the class to time the activity. After about 10 minutes she clapped her hands and asked them to sit down again. Then she asked the following questions:

"Who can play an instrument?"

"Who can speak another language?"

The whole class shouted out different names. Regina smiled and said "Very good", "Well done." Then she asked:

"Who has the most names on their sheet of paper?"

Several pupils shout out, "Me, I have 5, I have 7 etc."

"Good, you are the winners!"

When the class was over Regina and Freda sat together to discuss the lesson. Here are some of the things Freda observed that she felt needed improving and was going to give feedback on.

Here are some of the things Freda will give feedback on:

- Clarity of introduction
- Clarity of instructions
- Variety of questioning techniques
- Checking understanding
- Monitoring
- No system of signals for pupils
- Listening and responding

Student Teacher Discussion

Do you agree with Freda's observations? Why? Why not?

In pairs look at the list of things that need improving and write down the feedback you would give Regina. Use the table below where there are two already done for you.

What needs improving	Feedback to Regina
Clarity of introduction	
Clarity of instructions	
Variety of questioning techniques	
Checking understanding	If you ask the whole class, "Do you understand?" they will always say "Yes", so I suggest you check understanding by asking more questions and getting examples from your pupils so you can see how much they have understood.
Monitoring	
No system of signals for pupils	

Listening and responding	I think you can listen more actively because this will enable you to not just look for the answer you are expecting, but to alert you to unusual or innovative answers that you may not have expected. It also shows that you value the pupils' thinking and therefore they are more likely to give thoughtful responses. Such answers could highlight misconceptions that need correcting, or they may show a new approach that you had not considered. ("I hadn't thought of that. Tell me more about why you think that way.")

With your student teacher colleagues, discuss how you might use this scenario with your own pupils to raise awareness of the importance of questions for investigating misconceptions.

T2-5 E 2 Plan and Practise Together

Using Questions to Investigate Misconceptions in English Language Learning

Before attempting to use lesson plans with your pupils, it is a good idea to complete some activities using this teaching strategy yourself. It would be even better if you plan them and try them out with your student teacher colleagues. Use the activity plan found in the Appendix.

In groups, think about which classes you will teach this week. What are some common misconceptions that your pupils have about your subjects?

In your group, plan how you will use questions to investigate a common misconception in one of your lessons. Make specific reference to a piece of syllabus material or subject.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan.

T2-5 E 3   Teach

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 to hand when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-5 E 4   Reflect Together

Using Questions to Investigate Misconceptions in English Language Learning

Now that you have taught the lesson activity, reflect on how it went. In your reflection, look back at the ideas above, and then consider the following questions:

- What are the implications for your own professional learning, and for the education of pupils?
- What measures can you put in place to avoid, as much as possible, misunderstanding and confusion of concepts and content?

Make a note of all the ideas and, if you have not done so already, try them out in another lesson.

Now, use your experience to make a poster for the common room wall! It will remind you on a daily basis of some useful teaching strategies to use in your classes.

PRACTICAL IDEAS FOR DEALING WITH MISCONCEPTIONS IN OUR CLASSROOMS

Write down your thoughts and any specific outcomes from your reflection in your learning journal.

Teaching Strategy 5
Using Questions to Investigate Misconceptions in Mathematics Learning

Theme	Questioning
Links to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching Basic School Mathematics (PFC 222) Junior High School: Year 1, Unit 1.2, specific objective 1.2.2 (describe and write sets of objects and numbers), specific objective 1.2.3 (distinguish between different types of sets), specific objective 1.2.4 (distinguish between equal and equivalent sets).
Learning Outcomes for Student Teachers	How questions can be used to identify and address misconceptions of the pupils.

T2-5 M 1 Example

Using Sets to Investigate Misconceptions

This is an example of an activity that uses simple questions to check learners' understanding of the concept of sets, to identify misconceptions and to address these.

At the start of the lesson the student teacher asks the pupils to each gather a set of objects from inside the classroom. The pupils are then put into groups and given the following instructions and questions:

- Put these objects into different sets. How do you know these are sets?

- Describe each set using mathematical language. How do you know your description makes sense?

- Compare the sets using mathematical language. How do you know your comparison is mathematically valid? How can you be sure?

- Re-organise the objects into different sets and repeat the instructions above. Make sure that in your explanations you use the words: elements, sets, equivalent sets, equal sets, disjoint, overlapping.
- Share your explanations and descriptions with the whole class.

Student Teacher Discussion: Anticipating Misconceptions

Pupils will have misconceptions about many mathematical concepts. The issue as a student teacher is to find out what these are so that they can be addressed.

- What do you think could be the misconceptions that the pupils have about sets?
- What do you think are the advantages and disadvantages of organising the classroom like the student teacher in the example did and asking these questions?

With your student teacher colleagues, identify some classic misconceptions in mathematics that your pupils could have. Then think of simple questions like the ones used in the example that you could ask the pupils so that these misconceptions can come to light and be dealt with. Anticipating misconceptions will help you in planning effective lessons.

Make a note of your thoughts in your learning journal.

T2-5 M 2 Plan and Practise Together

Identifying and Dealing with Misconceptions

Before attempting to use the examples with your pupils, it is a good idea to complete some activities using this teaching strategy yourself. It would be even better if you plan them and try them out with your student teacher colleagues. Use the activity plan found in the Appendix.

Planning task: Plan an activity, with special emphasis on anticipating misconceptions on a mathematical topic you will teach next week.

With your student teacher colleagues (if possible), write down misconceptions you anticipate your pupils will have about a topic you will teach next week. Discuss simple but powerful questions you could ask in

your lesson to identify and address these. On the activity plan write down the sequence of instructions you will give and questions you will ask your pupils for that lesson.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan and refer to it during your lesson.

T2-5 M 3 Teach

It is important for your professional learning that you actually teach the activity you have planned. Please make sure you have your own activity plan available when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-5 M 4 Reflect Together

Are Questions Effective for Identifying and Addressing Misconceptions?

Now that you have taught the lesson activity, reflect on how it went. If at all possible, do the reflection together with a colleague who has also tried the activity.

Reflection task: Were you, and your pupils, able to identify misconceptions? Reflecting on how the lesson went, particularly the activities, instructions and questions you devised and asked, what worked and what did not work so well? Make a list of these in your learning journal. Next to it, write down what it was that made it work and any changes you would make to your lesson plan to make it an even better lesson.

In your learning journal, remember to write down any specific outcomes from your reflection. For example, what the most challenging aspect of identifying misconceptions through dialogue was. Also note down what you learned from this unit that was most effective in improving your teaching.

Teaching Strategy 5
Using Questions to Investigate Misconceptions in Science Lessons

Theme	Questioning
Links to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching Science (FDC) LP Natural Science Syllabus (2012), LP3, Section 2, Unit 1: Day and Night.
Learning Outcomes for Student Teachers	The student teacher will learn how questions can be used to identify and address misconceptions of the pupils.

T2-5 S 1 Example

📖 Identifying and Addressing Misconceptions about Day and Night

Appiah is a science teacher, and is planning to teach on 'day and night' in the Primary 3 Syllabus. The syllabus objective states that the pupils should demonstrate that the sun does not move. Instead, the Earth turns round and round. They also should be able to demonstrate day and night.

In the textbook, there is text about the sun rising in the east and setting in the west. The text talks about the day-time sky and the night-time sky. It mentions rotation. It shows an illustration of a model of the Earth – as a globe that spins at a tilt. This picture shows the kind of illustration.
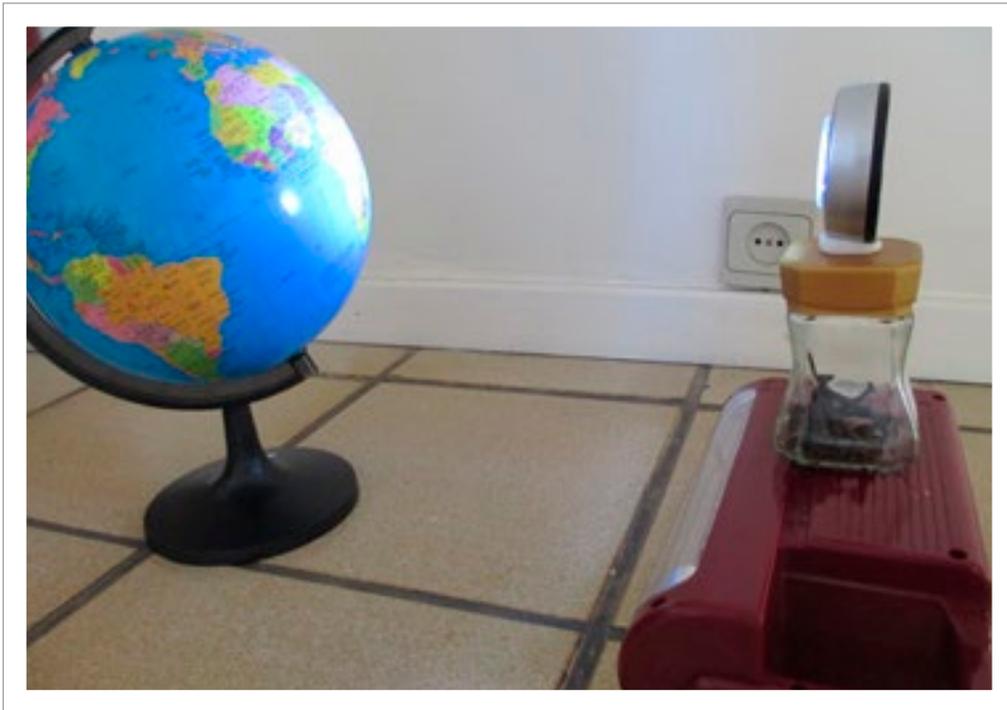
Figure 24. Globe and torch

There is also a photograph in the textbook, taken from space, showing night-time on part of Earth's surface.

Appiah realises that his pupils have misconceptions. He knows he has to organise a practical demonstration of day and night. He wants to use using a model Earth and Sun. He wants to help the pupils to grasp the concept of the rotation of the Earth.

He starts with a question:

> *How do you think day and night happens?*

Appiah has prepared a 'globe and torch' model'. He has set up a torch and a globe as in the picture. He uses a hand torch to provide a beam of light. This beam of light models the sunlight.

He spins the globe. The pupils observe. Does Ghana move as the globe spins?

He asks a series of questions about the model to help the pupils notice what is happening as the globe spins:

- What happens when you spin the globe?
- Does the light shine onto the whole globe at the same time?
- How much of the globe did the light shine on at one time?
- How many African countries are in the light?

We say that one side of the globe is in 'shadow'.

Look at the globe. This is what our earth looks like from space. He asks more questions:

- Are we able to spin the globe until Ghana is in the path of the beam from the torch?
- What does the dark area of the globe show? What do you think the bright part shows?
- What can we say about Ghana now? Is it day-time or night-time?
- What do you notice about Ghana as you turn the globe slowly on its axis?
- Why does one half of the globe not get light from the torch?

Student Teacher Discussion

Discuss with your student teacher colleagues the questions teacher Appiah asked his pupils. Compare and identify which of these would give you a good insight into the kind of misconceptions the pupils have, and which ones would not give such a good insight. For example, compare the questions '*How do you think day and night happens?*' and *'Is it day-time or night-time?'*

Discuss which questions you would keep if you were to teach this lesson, which you would change or not use and why. Remember the aim is to identify and then address misconceptions.

Make a note of your thoughts in your learning journal.

T2-5 S 2 Plan and Practise Together
Identifying and Dealing with Misconceptions in Science Lessons

Before attempting to use the examples with your pupils, it is a good idea to complete some activities using this teaching strategy yourself. It would be even better if you plan them and try them out with your student teacher colleagues. Use the activity plan found in the Appendix.

Planning task: Plan an activity, paying special attention to anticipating misconceptions on a science topic you will teach next week.

With your student teacher colleagues identify a science topic you will teach next week. Discuss the misconceptions you think pupils might have about this topic. Brainstorm some questions based on the probable misconceptions that you identify. Make a note of these questions in the activity plan to use in the lesson you will take with your pupils.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan and refer to it during your lesson.
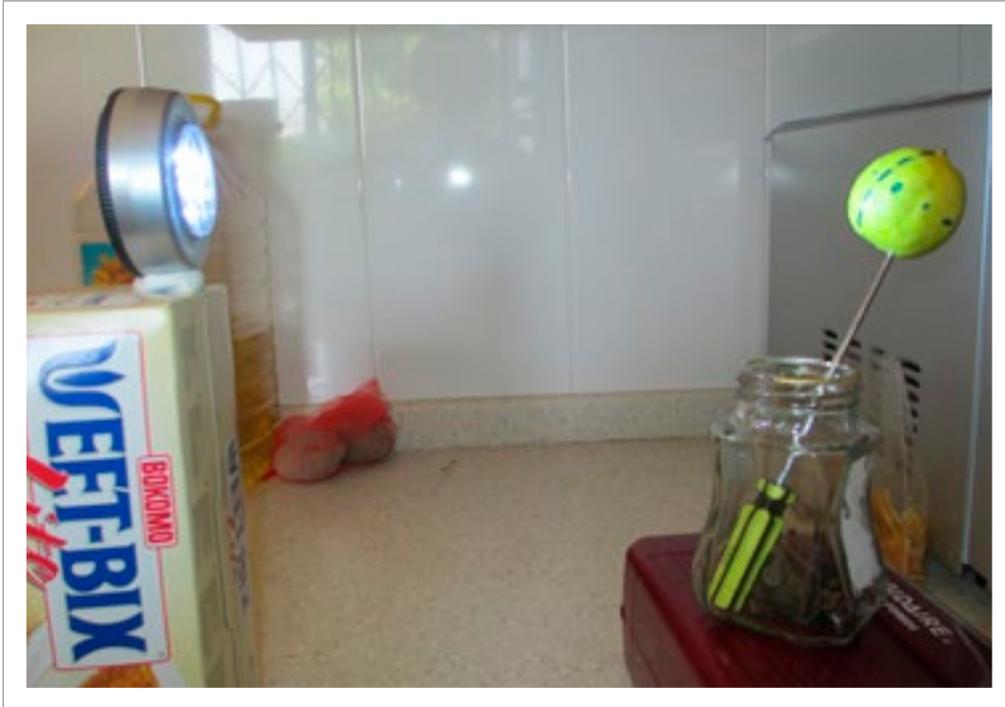

Figure 25. A model of the globe

T2-5 S 3 Teach

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 to hand when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-5 S 4 Reflect Together

Are Questions Effective for Identifying and Addressing Misconceptions?

Now that you have taught the lesson activity, reflect on how it went. If at all possible, do the reflection together with a colleague who has also tried the activity.

Reflection task: Were you, and your pupils, able to identify misconceptions? Reflecting on how the lesson went, and the activities, instructions and questions you devised and asked: what worked and what did not work so well? Make a list of these in your learning journal. Next to it, write down what it was that made it work and any changes you would make to your lesson plan to make it an even better lesson.

In your learning journal, remember to write down any specific outcomes from your reflection. For example, what the most challenging aspect of identifying misconceptions through dialogue are. Also note down what you learned from this unit that was most effective in improving your teaching.

Teaching Strategy 6
Involving everybody in Questioning

Usually, a teacher wants as many pupils as possible to respond to questions. Also, it is important that all pupils get an opportunity to answer both low and high level questions. Analysis of classroom interactions shows that it is often a minority of pupils who dominate question and answer sessions. Some pupils do not respond because they do not feel comfortable to do so. At other times, it is high-attaining pupils who don't participate in question and answer sessions.

To make sure all pupils get the same excellent opportunities for learning, teachers need to have strategies for making all pupils participate in responding to questioning. Questioning should motivate all pupils, whatever their attainment, gender or background.

Here are some strategies to achieve this:

- **Selecting volunteers.** Asking pupils who know the answer to raise their hands and selecting one who does not put up their hand to answer.
- **Random selection.** Writing the name of every pupil on separate pieces of paper, putting them into a container; then pulling out a name (without looking) to select a pupil to answer;
- **Teacher nominations (or "no hands up"**). Choosing specific pupils to answer a question; selecting pupils who generally volunteer as well as pupils who avoid volunteering;
- **Pupil nominations.** Asking a pupil who has just answered to nominate the next speaker;
- **Talking tokens.** Giving 2-5 tokens per pupil, depending on the duration of the activity or lesson; with every answer the pupil gives up a token, ensuring that everybody has a chance to contribute;
- **Mini-blackboard display.** Pupils writing answers on mini-blackboards and holding up their answers; selecting pupils with different answers to share their answers and question this further;
- **Advance selection.** Telling pupils who are less confident some of the questions that you will ask before the lesson; asking them to think of an answer and then selecting them for answering;
- **Eye contact.** Avoiding eye contact with dominant pupils; making eye contact with shy pupils indicates that an answer is expected;
- **Talking about participation.** Having a discussion that explains how participation is beneficial can eliminate fear of giving wrong answers; asking pupils to suggest ideas that will increase participation, without compromising classroom management;
- **Criteria-based.** Setting a criterion to select pupils for answering; for example, answer if "your name ends with s", or "you are the first child in the family", etc.

Teaching Strategy 6
Involving everybody in Questioning for English Language Learning

Theme	Questioning
Links to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching English in Basic Schools (FDC 211)
Learning Outcomes for Student Teachers	By the end of the session student teachers will be able to: Use questions effectively to involve all pupils in answering questions Use a variety of teaching and learning strategies to get all pupils involved Plan a lesson plan using questioning techniques that involve all their pupils.

T2-6 E 1 Example

Strategies for Involving everybody in Questioning for English Language Learning

Below are some of the techniques from the introduction to this teaching strategy. In pairs read through each technique and discuss the advantages and disadvantages for your teaching and learning context. Then fill in the table below.

Compare your ideas with another pair. In your new pair: Can you think of any other ways to involve everyone in questioning and answering? Think about your subject: English and English Literature. How might you be able to adapt some of these techniques?

- **Talking tokens.** Giving 2-5 tokens per pupil, depending on the duration of the activity or lesson; with every answer the pupil gives up a token, ensuring that everybody has a chance to contribute.

- **Mini-blackboard display.** Pupils writing answers on mini-blackboards and holding up the answers; selecting pupils with different answers to be questioned further about their answers.

- **Advance selection.** Telling less confident pupils some of the questions to be asked, before the lesson; asking them to think of an answer and then selecting them for answering.

- **Eye contact.** Avoiding eye contact with pupils who always answer; making eye contact with less confident pupils indicates that an answer is expected.

- **Talking about participation.** Having a discussion that explains how participation is beneficial and can eliminate fear of wrong answers; asking pupils to suggest ideas that will increase participation, without compromising discipline.

- **Criteria-based.** Setting a criterion to select pupils for answering; for example, answer if, 'your name ends with s', or 'you are the first child in the family', etc.

Technique to involve everyone in questioning	Advantages	Disadvantages
Talking Tokens		
Mini-blackboard display		
Advance selection		
Eye contact		
Talking about participation		
Criteria-based		

Can you think of any other ways to ask questions and manage answers from pupils?

T2-6 E 2 Plan and Practise Together

Involving everybody in Questioning for English Language Learning

Using the activity plan found in the Appendix, think of a lesson that you have to teach this week. Plan how you will use at least one of the strategies above in your lessons. Make specific reference to a piece of syllabus material or subject. Before attempting to do an activity with your pupils, it is a good idea to try the teaching strategy with your colleagues.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan and refer to it during your lesson.

T2-6 E 3 Teach

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 to hand when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-6 E 4 Reflect Together

Involving everybody in Questioning for English Language Learning

Now that you have taught the lesson activity, reflect on how it went. If at all possible, do the reflection together with a colleague who has also tried the activity. In your reflection, consider the following questions:

Having used strategies listed in the Questioning theme, how do you think it has changed your teaching?

How has it changed your attitude towards questioning?

In your learning journal write down some of the changes you have made, specifically to do with how you use questioning to involve all in your classroom.

Teaching Strategy 6
Involving everybody in Questioning in Mathematics Learning

Theme	Questioning
Link to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching Basic School Mathematics (PFC 222) Junior High School: Year 2, Unit 2.3, specific objective 2.3.1 (identify mapping as a special relation), specific objective 2.3.2 (deduce the rule for a mapping), specific objective 2.3.3 (find the inverse of a given mapping), specific objective 2.3.4 (table of values for a rule of a mapping).
Learning Outcomes for Student Teachers	Strategies for encouraging all learners to fully participate in classroom activities.

T2-6 M 1 Example

Involving everybody in Questioning

A teacher was concerned that some of the pupils in her class were not being involved in responding to questions or taking part in class discussions. She decided to use some of the following strategies to encourage wider participation in her next lessons:

- **Selecting volunteers.** The teacher asked those pupils who think they know the answer to raise their hands. This is an approach she has already used often. To increase participation she would increase the 'wait time' or 'thinking time' after each question and only then ask the pupils to raise their hands to volunteer an answer.

- **'No hands up'.** The teacher thought this could reduce the pressure for pupils who feel intimidated by 'hands up' questioning. The teacher asked a question and said 'no hands up'. She then asked the pupils to discuss their answers first in groups or pairs. Then she chose a single pupil **or** a group **or** a pair for the answer, allowing anyone in the group or pair to respond. This strategy involved more pupils in preparing an answer to her question, which the teacher regarded as good.

- **Avoiding eye contact with dominant speakers.** Instead the teacher made eye contact with pupils who were less confident - indicating that she expected them to respond and volunteer to answer.

- **Random selection.** The teacher wrote the name of each pupil on a stick or strip of paper and kept these in a container. When she had asked a question she picked out one name at random. Once a pupil has answered a question their name was kept out of the container.

- **Pupil nomination.** The teacher asked a pupil a question. This pupil was then allowed to nominate another pupil to answer the next question.

- **Talking tokens.** The teacher gave each pupil two cardboard tokens which they had to spend during the lesson by asking or answering questions.

- **Advance selection.** The teacher told some pupils who were less confident and reluctant to answer the questions that she intended to ask them during the lesson in advance. This allowed them time to think about and plan their responses.

Student Teacher Discussion

In your student teacher group discuss each of these strategies. Decide which would be most effective and which would be least effective in your own lessons. Additional ideas for involving everybody in questioning can be found in Extension Tasks below. Make a note of your thoughts in your learning journal.

T2-6 M 2 Plan and Practise Together

Planning to Involve everybody in Questioning

Before attempting to use the examples with your pupils, it is a good idea to complete some activities using this teaching strategy yourself. It would be even better if you plan them and try them out with your student teacher colleagues. Make use of your own classroom experience to devise strategies that will enable you to involve all your pupils in questioning in your lessons. Use the activity plan found in the Appendix.

T2-6 M 3 Teach

It is important for your professional learning that you actually teach the activity you have planned. Please make sure you have your own activity plan available when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In

particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-6 M 4 Reflect Together

How Easy Was It To Involve everybody?

Now that you have taught the lesson activity, reflect on how it went. If at all possible, do the reflection together with a colleague who has also tried the activity.

Reflection task 1: Classroom layout. Some pupils show a reluctance to become involved in class dialogue and use the classroom set-up not to be noticed. For example, by sitting at the back of the classroom. As a student teacher you can take positive steps to ensure this doesn't happen.

Discuss with other student teachers how the layout of the classroom and the place where you stand in the room when teaching the class can help to ensure that quiet, less-confident pupils are not forgotten about. For example, is standing behind a table at the front of the classroom always the best position for a student teacher to encourage whole-class participation?

Reflection task 2: Disadvantaged pupils. For some pupils, participation in class dialogue can be hampered by physical disability such as impaired hearing or impaired eyesight.

Discuss with other student teachers what plans can be made in advance of teaching a class to ensure that no pupil is disadvantaged or denied the opportunity for full participation in the class.

Remember to write down any specific outcomes from your reflection in your learning journal. Which strategies for involving whole-class discussion worked best? Also note down what you have learnt from this unit that was most effective in improving your teaching practice.

T2-6 M 5 Extension tasks

Magic Microphone, Discussion and Role Reversal

If you want to take your questioning techniques further, here are two extension tasks that you can use for further discussion.

Extension task 1: Magic microphone. Devise an activity using a 'magic microphone' to encourage the whole group of pupils to become involved in asking and answering questions.

An actual microphone (which is not connected) or a model made from something like a short length of brush handle will give the activity more appeal.

The microphone will be passed between pupils in the class. Each pupil who receives it must ask another pupil a question about a mathematical topic that you will be teaching. This could be supported by another pupil writing the questions, or a spider diagram, on the board.

Reflection: Was the lesson using a 'magic microphone' successful? Did it encourage pupils in your class, whom you know to be rather reserved and reluctant to respond, to be more outgoing? Discuss with other student teachers how you were able to encourage your pupils to become more involved.

As a result of using the 'magic microphone' strategy did you or your colleagues have any ideas about how the strategy could be modified, or if a similar but different strategy could be used to encourage pupil participation?

Extension task 2: Prompting class discussion. Plan a lesson on a topic you will be teaching this week.

In your lesson plan, mark down places where you intend to pause for class discussions. Make a note of the questions you will ask pupils and what your strategy will be to promote a whole-class discussion of the lesson content. Leave space on your lesson plan to note down any unexpected pupil responses or responses that indicate a lack of understanding that you might take into account when adapting your lesson plan for future use.

Extension task 3: Role reversal. Role reversal can provide a means of stimulating class dialogue. Organise an activity in which groups of pupils are required to teach the rest of the class about different aspects of one mathematical concept or topic.

For this activity you, the student teacher, should take your place at an empty desk with the rest of the pupils. This will give you a 'pupil's eye' view of teaching and will increase your awareness of issues e.g. how easy it is to see the board from different parts of the room, or how well sounds travel from the front to the back of the room.

At the end of each group's presentation you should ask a question or two in order to stimulate other pupils to ask questions. The idea is to encourage dialogue between the 'teachers' and the 'pupils'.

Teaching Strategy 6
Involving everybody in Questioning in Science Learning

Theme	Questioning
Links to Syllabus	Principles and Practice of Education (EPS 111) Principles and Methods of Teaching in Basic Schools (EPS 211) Methods of Teaching Science (FDC) JHS Integrated Science Syllabus (2012), JHS 1, Section 1, Unit 1: Introduction to Science
Learning Outcomes for Student Teachers	The student teacher will learn strategies for encouraging all learners to fully participate in classroom activities.

T2-6 S 1 Example

Involving everybody in Questioning while Teaching how to Measure the Volume of Irregular Solids

Teacher Eunice is an experienced science teacher who loves teaching science using laboratory equipment because she believes this is an effective way to ensure that pupils understand scientific principles. However, the class is large and there is normally only just enough equipment for one 'demonstration' of the scientific experiment. Over the years, Eunice has developed strategies to involve her pupils actively in these demonstrations by asking open questions, inviting the pupils to show and not just say what they are thinking by using the equipment, and even asking groups of pupils to prepare and co-teach the lesson with her. Still, she has noticed that she always asks the same type of pupils: those that are confident and volunteer a lot of answers. She has also noticed they tend to be male, and fluent in speaking English and Twi.

Eunice wants to change this in order to give everybody in her class the same opportunities for learning, something her pupils should also do when they are teaching in schools. She examines the list of approaches suggested in

the introduction of this 'involving everybody in questioning' strategy to select two she will focus on in her next lesson. She only wants to focus on two because she prefers to make step by step changes to her teaching that she can reflect properly on their effect. The topic of that lesson is how to measure the volume of irregular solids. She selects the following approaches and writes these in her activity plan:

- **Talking about participation.** Having a discussion that explains how participation is beneficial and can eliminate the fear of giving wrong answers; asking pupils to suggest ideas that will increase participation, without compromising classroom management;

- **Random selection.** Writing the name of every pupil on a piece of paper, putting them into a container; then pulling out a name (without looking) to select a pupil to answer. Because Eunice does not know who will be present in the lesson, she asks each pupil to write their name on strips of paper she has prepared and drop it in a plastic container.

Student Teacher Discussion

With your student teacher colleagues discuss the approach teacher Eunice takes to work on changing her practice. Would you make small steps using some of the ideas you read or hear about, or would you approach it differently? Can you also give specific examples of where you in your teaching could use the approaches that teacher Eunice used to involve all in questioning?

T2-6 S 2 Plan and Practise Together

Involving everybody in Questioning for Science Learning

Before attempting to use the examples with your pupils, it is a good idea to complete some activities using this teaching strategy yourself. It would be even better if you plan them and try them out with your student teacher colleagues. Use the activity plan found in the Appendix.

With your student teacher colleagues, think of a lesson that you have to teach this week. Plan how you will use at least one of the strategies that you can find in the introduction section of this teaching approach 'Involving All In Questioning' in your lessons. Make specific reference to a piece of syllabus material or subject.

Please make sure that you have noted down everything you need to remember for your lesson in your activity plan and refer to it during your lesson.

T2-6 S 3 Teach

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 to hand when you teach. Also make sure that you note down any issues that arose during the lesson immediately after you have taught. In particular, remember to fill in your observations section of the activity plan immediately after you have taught.

T2-6 S 4 Reflect Together

Involving everybody in Questioning for Science Learning

Now that you have taught the lesson activity, reflect on how it went. If at all possible, do the reflection together with a colleague who has also tried the activity. In your reflection, consider the following questions:

Having used strategies listed in the Questioning theme how do you think it has changed your teaching?

How has it changed your attitude towards questioning?

In your learning journal write down some of the changes you have made, specifically to do with how you use questioning to involve all in your classroom.

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Further Materials

- The introduction to Questioning for Misconceptions (T2-5) was inspired by: *How Do I Get My Students Over Their Alternative Conceptions (Misconceptions) for Learning? Removing barriers to aid in the development of the student* . By Joan Lucariello, PhD, City University of New York, with David Naff, Virginia Commonwealth University.

- The planning task in T2-4 Maths draws on: Accelerated Learning in Mathematics (2012), by New Zealand Ministry of Education

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Appendix
Activity Plans

The appendix contains activity plan templates. You can use them to plan your classroom activities (during the Professional Development session, but of course also outside the PD sessions).

We really appreciate your feedback about the Professional Development sessions, and it would be really helpful if you could share this with us online at

http://tiny.cc/TTELfeedback

where you can also register and join social media.

Activity Plan

Aspect	Details
Theme	
Teaching strategy	
Student level (year and/or course)	
Syllabus reference	
Specific Objective(s) of the activity	
Activity focus	
Activity description	
Textbook title and pages (if available)	
Materials / resources	
Observations (after lesson)	
Date (written):	Date (taught):

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