7

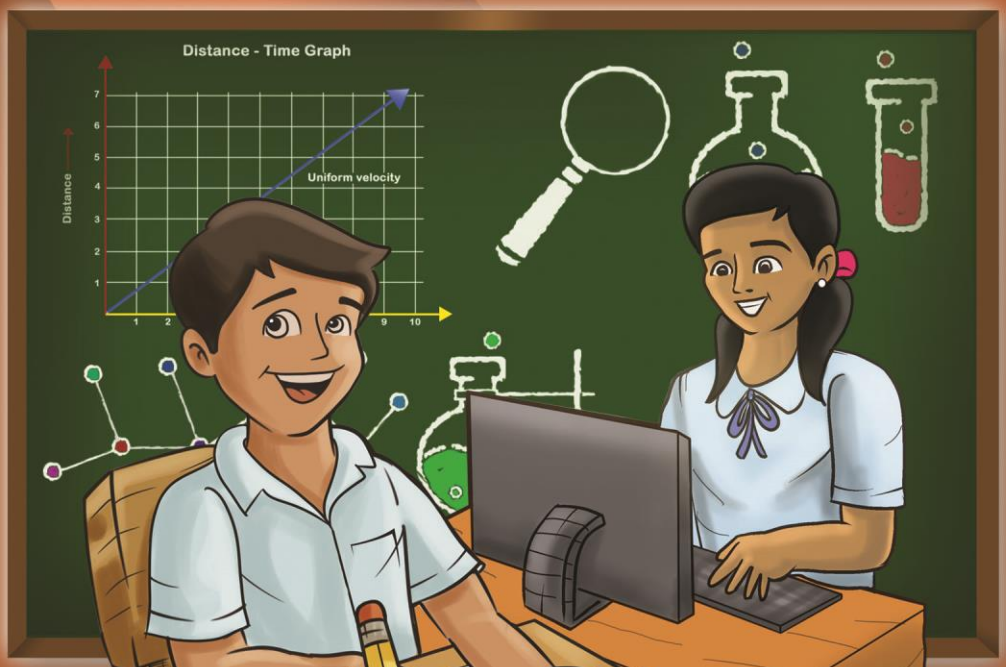
NATIONAL LEARNING CAMP

DepED DEPARTMENT OF EDUCATION

Science

Enhancement Learning Camp

Lesson Plans



Enhancement Learning Camp
Lesson Plans Booklet

Science Grade 7

Weeks 1 to 3

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Dear Reader

Every care has been taken to ensure the accuracy of the information provided in this Booklet. Nevertheless, if you identify a mistake, error or issue, or wish to provide a comment we would appreciate you informing the **Office of the Director of the Bureau of Learning Delivery** via telephone numbers (02) 8637-4346 and 8637-4347 or by email at bld.od@deped.gov.ph

Thank you for your support.

National Learning Camp Overview

Overview

The National Learning Camp (NLC) aims to enhance student and teacher learning through interactive lessons based on prior educational content. The program focuses on consolidating student knowledge, updating and expanding teacher expertise, and applying research-based strategies to improve learning teaching outcomes.

The NLC offers grade-level review lessons that are directed by the teacher and designed to be highly interactive among:

(i) students with their teacher; and
(ii) students with their peers.

The Camp lessons are grounded in the 'Science of Learning' framework, focusing on cognitive research and practical applications to enhance learning outcomes. Lessons are structured to reinforce foundational knowledge and skills, involve real-world problem-solving activities, and encourage higher-order thinking. The Camps also offer teachers opportunities for reflection and professional growth, encouraging the adoption of new teaching approaches and the extension of student learning through systematic review and application of knowledge.

Design Basis

A strength of the design is the focus on both student and teacher learning. The intentions and expectations of the NLC are for:

- students to consolidate and enhance their thinking in topics already covered;
- teachers to update, strengthen and expand their subject knowledge in ways that encourage students to be involved in learning activities at different levels including those considered as higher order; and
- teachers to enhance their pedagogical practices by focusing on selected skills, which include 21st century skills.

Under the framework of 'Science of Learning', research-evidence is used to ground teaching and learning decisions around cognition research and features of a learning brain such as working memory demands, cognitive load, valuing errors, and domain specific skills. This framework highlights a *learning-focused approach* where teachers go beyond what might be considered current practice in the Philippines and incorporate brain-based ideas and approaches, including 21st Century skills, to make teaching more effective in enhancing learning for all.

To further support this direction, teachers are provided with resources, time and the opportunity to further extend their skills, knowledge and understandings of teaching and how students learn. The review lessons are designed to apply subject content already encountered by students. Because of this, lessons do not contain repetitive, routine questions of a particular subject aspect.

Review lessons

The review lessons are based on content already encountered by students in their current grade. All lessons *involve an exploration of ideas, concepts and content*. The purpose of the review lessons is two-fold:

(i) to establish in students a stronger basis for future learning development (prior to enrolling in a new Grade after the summer break); and

(ii) to enable teachers to strengthen and enrich their teaching practice in a research-based, learning-focused professional program (prior to a new academic year).

The primary focus of the review lessons concerns revising, clarifying and then applying previously-taught subject content with real-world problem-solving and/or comprehension activities. Each lesson begins by a focused content review and clarification of material needed in the lesson to come. For students, this initial review enables them to practice retrieving and practicing important basics relevant to the lesson to come.

For Teachers this information is designed to help determine learners' subject background knowledge and skills relevant to the lesson as well as help teachers identify where to build on previous learning. This approach is different to 'teaching' students anew as if they have not been taught previously.

Lesson Overview

All lessons in each of the three subjects, English, Mathematics and Science, contain five components. These are 1. Short Review, 2. Purpose/Intention, 3 Language Practice, 4 Activity and 5 Conclusion.

Timing

Approximate component timings are indicated as advice to guide the teacher in pacing the lessons. Time management involves:

- moving through components at a pace that is appropriate for learners;
- ensuring that all components are completed in a timely, efficient and constructive manner.

Research on student-learning quality and 'time' are related through student 'time-on-task'. Time-on-task refers to when students are actively involved (engaged) in some aspect of the learning process. The suggested times for each component are intended to maximize the time available for student involvement. This will encourage the student and teacher to work efficiently, timewise, through the lesson without jeopardizing the importance of student activities such as to:

- answer routine and non-routine questions,
- respond to verbal questions and explanations,
- interpret and use appropriate terminology,
- discuss aspects with their peers,
- explain or justify his/her approaches and thinking,
- work productively on their own, and
- listen carefully to the teacher or peers.

Establishing what is on-task time is more problematic when the teacher talks and students passively listen, such as in didactic teaching. With such an approach it is difficult to determine whether students are listening or even paying attention. Often in lessons identifying time-on task can also be problematic in case of problem-solving or intense reading and comprehension. Here, student activity is often more subtle and cerebral as students need to think quietly by themselves.

Ultimately, however, the time allocated to components will be determined by learners' needs and strengths, but not completely. There needs to be practical limits on the duration of the components to prevent major disruption to lessons which can have a detrimental impact on student learning. Often, teacher should not expect too much learning to occur on an initial meeting of unfamiliar content. It is repeated exposure associated with elaboration, addressing errors, and deliberately practicing key aspects where most learning occurs.

When times are allocated appropriately, and students become familiar with the approach and teacher expectations, concept development and student skill levels are improved as well as student engagement.

Note: Care needs to be exercised in determining what engagement means. Engagement is clearer when **students are doing the learning** through answering questions, writing, discussing and reading.

Key Ideas and Questioning

Critical aspects of the NLC for the teacher include questions related to learning areas, based around a *key idea*. The questions are offered at different levels of difficulty involving lower- to higher-order thinking, starting with questions of modest complexity up to those that require more developed reasoning.

In the lessons, students are provided with opportunities to practice solving non-routine questions to help improve their conceptual understanding by applying known content to subject-related problems.

Teacher Reflection

Teacher reflection on the lessons offer important insights to stimulate teachers and their peers to enhance their own practice and the learning of their students. This includes:

- new teaching approaches encouraged by lesson components that can contribute in different ways to student learning and lesson success;
- the use of review lessons that help review learnt material and extend student abilities in problem solving by utilizing known information;
- a focus on student concept and skill acquisition, pedagogical approaches, student errors, time-on-task, deliberate practice and working memory demands.

Enhancement and Consolidation Camps

The Enhancement Camp and the Consolidation Camp offer students the chance to review their subject background knowledge by consolidating previously taught material. The intention is:

- for students to have opportunities to review past work and to practice applying this knowledge of concepts and ideas through grade-related sets of questions of developing difficulty; and
- for teachers to follow the given format of components with some flexibility to adjust parts of a lesson to meet the learning needs of students in their class, particularly, if students are having difficulties.

Camp Differences

In the case of lessons for students in either the Enhancement Camp or Consolidation Camp, the materials, including the lesson plans and the sets of questions, are, on the surface, the same. These questions range from those of modest difficulty to those which require more insight and more knowledge and understanding.

There are important reasons for both Camps sharing the same content. Exploring and answering these question sets has value to students from both Camps, albeit in different ways. It enables students to work through a range of ideas on their own before hearing from their peers and teacher concerning the same questions – a very rich learning environment. Also, similar questions mean that expectations for students in both Camps is not limited and students have the same potential for growth.

The difference between Camps concerns the teaching focus, which is related to the breadth and depth of conceptual knowledge of students. It is anticipated that based on student performance within a lesson, the teacher will decide whether the class needs more practice and discussion of straightforward questions or whether extension material is more appropriate for the class.

In particular, questions marked as **Optional** (typically high-order questions) are more likely to be addressed in the Enhancement Camp than the Consolidation Camp, but not exclusively. It is the teacher who decides whether to include 'optional' questions and this will depend on student-learning success and understanding at that time.

If Optional questions are not used, teachers would spend that time productively. This includes reinforcing the concepts by increasing the focus on student errors and/or increasing student-student, and student-class directed conversations.

Lower- and Higher-order Skill and Knowledge Development

In all learning, lower-order thinking is a pre-requisite for higher-order skills and knowledge development. Many students are disadvantaged in their attempts to move forward in their learning through a lack of practice and conceptual development of needed lower-order skills, knowledge and understandings. Hence, *all* students benefit from a stock-take on relevant lower-order skills from previously addressed content. This helps establish a basis upon which student learning should build.

In both the Enhancement and Consolidation Camps important lower-order content skills, knowledge and understandings are re-visited at the beginning of each lesson. This helps ensure that potential learning obstacles are made visible to the student and the teacher. It also means that some errors in understanding or misconceptions are identified. This information is important to teachers in helping all students move forward regardless of their achievement levels.

As many questions posed are about applying content already encountered to a new problem, students have the opportunity to use their current knowledge, skill and understanding in a practical way at their level, further developing their conceptualization and understanding of the subject matter.

Both Camps offer students the opportunity to improve their learning and conceptual development by a stepped approach that involves:

(i) reminding students of relevant lower-order skills through practice,
(ii) having students use and discuss their knowledge in sets of graded questions with an emphasis on straightforward questions,
(iii) expecting students to apply their knowledge leading to more breadth in learning,
(iv) beginning an initial focused practice on higher-order skill development.

The approach advocated to solve problems or comprehend passages extends student learning beyond simple repetitive exercises sets. For these students the teaching part of the lesson requires teachers reviewing closely student solution attempts through student explanation, discussion and questioning of fundamental aspects of topics that are typically found in the earlier questions. Teachers should be sensitive to students' self-perceptions here as they may meet the ideas, presented in the lessons, maybe after many failures with these concepts in the past.

Nevertheless, these students should become aware of the more difficult questions as teachers allow them to consider links or connections between concepts previously taught. There is great value in problem solving for students to have time to read the problem and then be able to indicate in their own words, what the problem is about.

Finally, it is important that students in the Enhancement and Consolidation Camps become aware of what their students know, where it is progressing and how to build on student skills and knowledge. Teachers need to be nurturing and supportive of this development and continually look for evidence of success and growth. Teachers also need to encourage students to persist, continue to practice individual aspects, and use any mistakes/errors they make as an opportunity to learn more. These are important features of a successful learning journey.

Lesson Components: Short Overview

Lesson Component 1 (Lesson Short Review)

Component 1 offers teachers the chance to:

- settle the class quickly;
- review previously encountered information;
- address previous content in the form of a few targeted questions that are *relevant to the current lesson;*
- note what students already know;
- elicit answers from the class to reinforce the important content needed for the lesson; and
- address briefly issues that may arise.

The questions set for the Short Review section of a lesson are designed to *remind* students of knowledge and skills developed when first studying the topic area, which are relevant to the lesson.

Lesson Component 2 (Lesson Purpose/Intention)

This component offers teachers a chance to acquaint students with the purpose/intention of the lesson. It is valuable if students see a link here with their prior knowledge or experience, especially if the teacher can connect it to the responses and levels of student understanding evident in Component 1.

In addition, this component is an appropriate time to address what students might expect/aim to achieve, i.e., their lesson goal(s). Teachers should clarify, in clear language, the learning intention for the students as well as what success will look like. (Note**:** The degree of success or partial success of student learning in the lesson should occur as part of Component 5.)

Lesson Component 3 (Lesson Language Practice)

Component 3 concerns language use – speaking, hearing, listening and comprehending. The focus is on words or phrases that are to be used in the lesson.

The language practice suggested has been identified by considering the whole lesson and identifying those words/phrases that have the potential to cause difficulties for students through speech, or listening, or understanding. Typically, the language identified is restricted to less than 6 words/phrases so that there is enough time to use a variety of approaches of practice within the time available.

Lesson Component 4 (Lesson Activity)

Component 4 has three aspects, 4A, 4B, and 4C.

In the case of the Learning Camp activity, Component 4 addresses the key idea for the lesson. It is about students applying known content to solve real-world problems. This requires students to interpret/understand the correct meaning of the 'stem', a stimulus, (such as a passage/text or diagram or the first part of the problem or story) before answering questions of differing degrees of complexity related to the stem.

Students are first presented with the stem in 4A and are given the time/chance to interpret its meaning. Then in 4B and 4C, two separate sets of questions related to the same stem are asked.

4A Reading and Understanding the Stem

4A involves understanding the language of the stem. The purposes here are for the teacher:

- to model fluent reading of the stem (first)

- to identify any unfamiliar language for the student (possibly addressed in Component 3)
- to read the passage or describe the figure, etc.
- to hear and experience fluency in reading the stem.

4B Solving the First Set of Questions

4B involves a set of questions associated with the stem. Students will need to refer to the stem as they prepare to answer the set of questions. Students write down responses or attempts at each question. It is important that every student in the class is expected to have a response for each question. It is expected and acceptable that students would make errors, which provide teachers with important information concerning students' learning needs. A critical procedural action here for teachers is the importance of **all** students starting on the same set of questions, *at the same time*.

When the students are finished, or sufficient time has been allocated, the teacher marks the questions. This can be achieved by student answers or approaches to the questions and by explaining or justifying their reasons. Time should be allocated to student discussion, explanation, and reasoning about answers.

4C Solving the Second Set of Questions

4C offers a new start for students regardless of how they performed in Component 4B. The structure is very similar to Component 4B, i.e., undertaking a new set of questions related to the same stem. In addition, the lesson structure allows a refresh as 4C presents a new starting point for the student. This structure also allows all students in the class to start a new activity at the same time.

This approach serves two purposes for teachers. *First,* it enables teachers to bring all students back together to proceed as a group with issues able to be directed to and considered by every student at the same time. *Second,* it offers teachers a way to extend their students problem solving practice where *a different set of questions* can be used with a single Stem. This is an efficient way to incorporate more problem-solving or comprehension practice on specific content into a lesson.

Lesson Component 5 Lesson Conclusion

Component 5 has a high metacognitive aspect for students – students thinking about their own thinking – which can be further enhanced by teacher modelling. Component 5 is designed to offer a student-focused overview to the main intentions of the lesson. In particular, the focus is about helping students reflect on their progress and achievement (or partial achievements) of the lesson intention as well as their understanding development during the lesson.

It builds on comments from Component 2 about teacher expectations. There is the chance here to confirm student progress during the lesson. A teacher may use a diagram, picture or some aspect of the lesson as a catalyst to stimulate student discussion and reflection.

NOTE: A fuller description of the Components and features of the lessons is provided in the **Learning Camp – Notes to Teachers Booklet.** It is recommended that these notes are read and discussed by teachers as they provide a further basis to understanding the structure of lessons and the pedagogy.

Science Grade 7 Lesson Plan 1

Scientific investigations – The Importance of Fair Testing

Key Idea

Scientific investigations use fair tests and are written up in a standard way, with sub-headings for the key parts.

Component 1: *Short Review*

Time: 7 mins

- Ask students to answer the questions and write them down on their worksheet.

  Q1. Name one of the important components of a scientific investigation.

  Q2. How can you make sure your experiment is fair and gives reliable results?

  Q3. Why is it important that experiments we do in science are fair and reliable?

- Ask students to volunteer to read out their answers, giving positive feedback. Read out a sample answer for all students to listen to and write down. This may come from the students or from the sample answers:

Sample answers:

Q1. Many answers such as Aim/ask a question, Method/ what to do/procedure, Results/what you measured/data, Conclusion/what you learned.

Q2. To make sure your test is fair, you need to change one thing, measure something and keep everything else the same. To make sure your test is reliable, you measure everything accurately. You also measure things at least three (3) times.

Q3. Experiments in science have to be fair tests otherwise the results might not be valid.

Component 2: ***Lesson purpose /Intention***

Time: 3 mins

- Explain to the students that this lesson aims to teach them about the essential parts of a scientific investigation, especially fair testing. They will learn how to describe these components using scientific language They will also understand why fair testing is important for getting reliable results, which is crucial for learning and answering question in science.

- *E.g., Today, we are going to learn about the key parts of a scientific investigation, focusing on something called fair testing. Pay close attention because understanding this will help you become better at doing science experiments.*

Component 3: *Lesson Language Practice*

Time: 5 mins

- Read out the following names of headings for a science investigation (from the students' worksheets) and ask the students to read them to themselves and then out loud as a class.

Results, Aim, Conclusion

- Ask the students to complete the task below by matching the headings with their role/purpose. Explain that they are to use arrows to complete the matching/task. Ask students to provide answers

and discuss where needed.

Heading	Role/Purpose
Results	What you are trying to prove
Conclusion	What you measured
Aim	What you learned from your results

Sample answer:

Heading	Role/Purpose
Results	What you are trying to prove
Conclusion	What you measured
Aim	What you learned from your results

Component 4*: Lesson Activity*.

Time: 25 mins

Component 4A

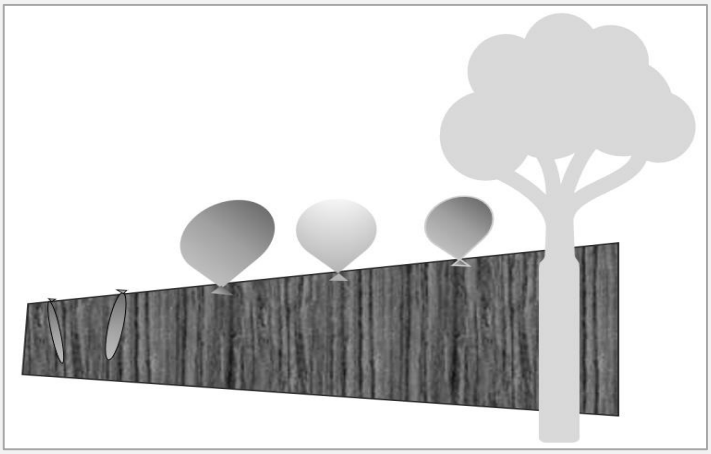
- Refer students to the main lesson stimulus and read out the text.
- Ask students to read the text to themselves.
- Ask students if there are words that they are not familiar with (such as, *balloons, backyard*) and give descriptions of any words that may be problematic.

Fair testing

Gabriel blew up some balloons with air and tied them along a fence in his backyard to see what happened to them in sunlight. Some balloons were in the shade of the tree.

Gabriel wondered why some balloons started to get bigger – some even got so big that they popped when they got very hot. *"I think the balloons are getting bigger when the temperature is getting higher."*

He said to himself. "*I wonder what experiment I could do to find out the answer and make sure it's a fair test?"*



Component 4B

- Students Read the following questions and provide answers on their worksheet.

  Q1. What should Gabriel use to measure the air temperature?

Q2. What methods can Gabriel use to ensure precise measurement of the balloons' sizes?

Q3. What variables does Gabriel need to keep constant throughout his experiment to ensure fairness and reliability in his results?

- Observe students' answers and encourage them to volunteer. Provide positive feedback.
- Select a sample answer for all students to write down. This answer may come from one of the students of from the following sample answers.

Sample answers:

Q1. He should use a thermometer.

Q2. He should measure the long and short diameters (using a ruler), or circumference/s (using a tape measure).

Q3. All the balloons he is using must be the same type and the same size to begin with. He must use the same method to measure the size of the balloons and the same thermometer to measure the temperature each time. He must do the experiment all on the same day so that the weather conditions are the same for all the measurements.

Component 4C

- Students read the following questions and answer on their worksheet.

Q1. How should Gabriel record all of his measurement to ensure clear presentation of all his measurements?

Q2. What do you think was Gabriel's aim for the experiment?

Q3. **(Optional)** *If Gabriel's experiment works out how he thought it would, what should he write as his conclusion?*

- Walk around giving encouragement and looking at students' answers. Ask the students to volunteer their answers, giving positive feedback.
- Select a sample answer for all students to write down for each question. This may come from one of the students or from the following sample answer.

Sample answers:

Q1. Gabriel should write down all his measurements neatly in a notebook or on a data sheet. He should label each measurement, like how sunny it was and the temperature. It's important to use units like centimeters for balloon size and degrees Celsius for Temperature. He should also add any important notes or observations. This will make it easier to understand the results. If he wants, he can organize the data in a table to make it even clearer.

Q2. His aim is to prove that balloons expand and even burst when the temperature goes up.

Q3. In his conclusion he should write that the results showed that as the temperature outside increased the size of the balloons increased till they burst.

Component 5: Lesson Conclusion

Time: 5 mins

- The focus of this lesson was to describe the components of a scientific investigation and *we want to be sure we know and understand about fair testing.*
- Ask students to answer the following questions either by class discussion or writing the answers in

their worksheet.

Q1. Has this lesson helped you to better understand what fair testing means in science? If so, how?

Q2. Has this lesson helped you to remember the components of a scientific investigation? If so, how?

- Let students know that good learners reflect on their learning.

REMINDER: Collect student worksheets to review and analyze student's learning

Science Grade 7 Lesson Plan 2

What's in the Bucket?

Key Idea

Scientists use flow charts to summarize the processes in separating substances.

Component 1: *Short Review*

Time: 7 mins

- Ask students to answer the questions and write them down on their worksheet.

Q1. What piece of equipment would you need to separate a mixture of sand and water?

Q2. When would you use magnets to separate things?

Q3. What is the difference between the processes of evaporation and filtering?

- Ask students to volunteer to read out their answers, giving positive feedback. Read out a sample answer for all students to listen to and write down. This may come from one of the students or from the sample answer:

Sample answers:

Q1. You would need something like a sieve or a strainer.

Q2. Magnets would be useful to separate small things made of metal from other solids or liquids.

Q3. The difference is that in evaporation you need to heat the liquid so that it evaporates from the mixture and leaves the solid behind, whereas in filtering, the solid is removed from the mixture when you pour the mixture through a filter paper and the solid stays behind in the filter paper.

Component 2: ***Lesson purpose/intention***

Time: 3 mins

The focus of this lesson is to introduce students to the concept of flow charts and their significance in summarizing processes, particularly in separating substances.

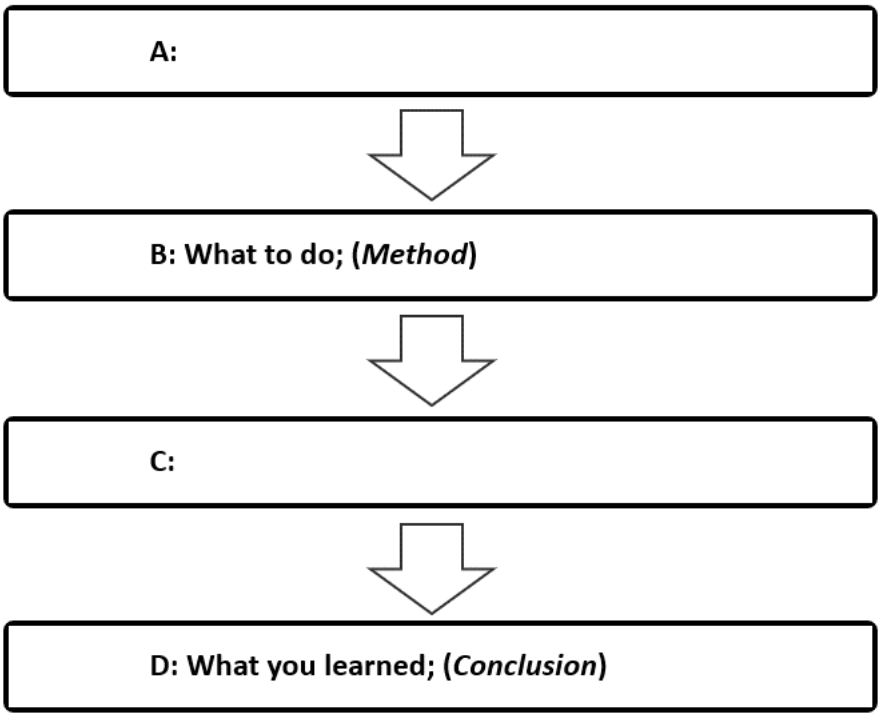
E.g., By the end of the lesson, students will learn how to create and utilize flow diagrams effectively. Through this understanding students will enhance their ability to comprehend and illustrate the steps involved in scientific investigations and separation processes.

Component 3: *Lesson Language Practice*

Time: 5 mins

- Begin by displaying the provided flow diagram, which illustrates a common method scientist use to outline the steps in a science experiment or investigation. Instruct students to describe the flow diagram accurately, emphasizing the importance of interpreting it correctly. Encourage students to share their interpretations aloud, facilitating a discussion to ensure understanding.

- Direct students' attention to the blank boxes labeled A and C in the flow chart and explain that they will be completing these sections. Provide guidance on how to fill in the boxes. Use the provided samples for B and D as guides for students' answers. Encourage students to actively participate and share their thoughts as they complete the flow diagram.



- Read out some answers for all students to write down. This may come from one or several of the students or from the following sample answer.

Sample answers:

Step	Blank Box	Missing label
1	*A*	*Ask a question (Aim)*
3	*C*	*What you measured (Results)*

- Help students understand that some words they use every day can have different meanings when used in science. It's important for them to recognize these differences in how words are used in English, especially when they are learning about science.

Component 4*: Lesson Activity*

Time: 25 mins

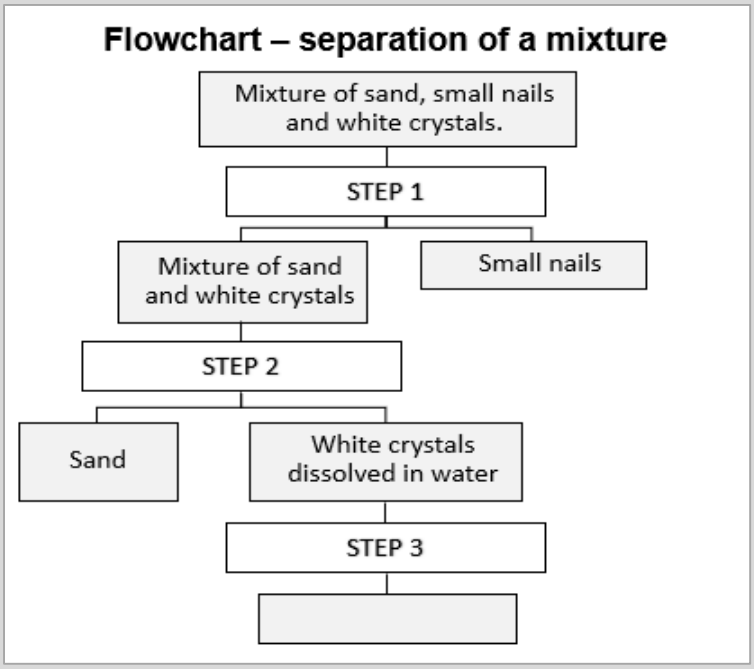
Component 4A

- Refer students to the main lesson stimulus and read out the text.
- Ask the students to read the text to themselves.

What's in the bucket?

A group of high school students were playing on the beach and found a small bucket of some interesting materials. The students found that the bucket contained a lot of sand but also some small nails, some large broken shells, and some white crystals.

A group of high school students playing on the beach stumbled upon a small bucket filled with various materials: sand, small nails, large broken shells, and white crystals, the students aimed to separate them from the mixture. They began by manually removing the large shells. To plan their next steps, the students created the following flowchart to guide their process. Their problem was to separate the mixture of materials in the bucket down to the white crystals. They started by picking out the large shells by hand. The students drew the following flowchart to help them work out what to do next.



- Ask the students if there are any words that they are not familiar with (or suggest examples such as, *nails, shells, crystals*) and give descriptions of any words that may be problematic.

Component 4B

- Read out the following questions and ask students to answer in the space on their worksheet.

  Q1. What piece of equipment would the students need to do STEP 1?

  Q2. What two separating techniques should the students do in STEP 2?

  Q3. How would the students be able to separate the white crystals from the water?

- Observe students' answers. Ask the students to volunteer their answers and reasons, giving positive feedback.
- Select a sample answer for all students to write down. This may come from one of the students or from the following sample answer.

Sample answers:

Q1. The students would need a magnet to separate out the nails from the rest.

Q2. The students should add water and then filter the sand out.

Q3. The students would need to heat the solution of white crystals to drive off the water and then they would be left with the white crystals.

Component 4C

- Read out the following questions and ask students to answer in the space on their worksheet.

  Q1. What equipment would the students need to complete STEP 3?

  Q2. What three processes of separation would the students use to complete their experiment to separate out all the different materials in the bucket?

  Q3. **(Optional)** *What if the students mixed up the steps and did STEP 2 instead of STEP 1 to begin their experiment – how could they fix up their mistake?*

- Walk around giving encouragement and looking at students' answers. Ask the students to volunteer their answers, giving positive feedback.
- Select a sample answer for all students to write down. This may come from one of the students or from the following sample answer.

Sample answers:

Q1. To complete STEP 3, the students would need a heat source like a Bunsen burner or stove, as well as an evaporating basin or dish to facilitate evaporation.

Q2. The students utilized the processes of filtration, evaporation, and magnetic separation to conduct their experiment and separate the different materials in the bucket.

Q3. If the students added the water in STEP 1, then they could still filter out the sand and the nails but the nails would probably tear the filter paper. They would still have to use the magnet to get rid of the nails.

Component 5: Lesson Conclusion

Time: 5 mins

- The focus of this lesson was to use flow diagrams to summarize the processes of separation and describe several separation techniques.

- Ask students to answer the following questions either by class discussion or writing the answers in their worksheet.

  Q1. Has this lesson helped you to better understand the use of flow diagrams? If so, how?

  Q2. Has this lesson helped you to recall a number of different separation techniques? If so, how?

- Let students know that good learners reflect on their learning

REMINDER: Collect student worksheets to review and analyze student's learning.

Science Grade 7 Lesson Plan 3

A Seawater Fish Tank

Key Idea

Scientific processes are used to accurately determine the concentration of a solution.

Component 1: *Short Review*

Time: 7 mins

- Ask students to answer the questions and write them down on their worksheet.

  Q1. What is one example of a solution?

  Q2. What are two common examples of heterogenous mixtures that you would find in your kitchen?

  Q3. Why is seawater a homogenous mixture.

- Ask students to volunteer to read out their answers, giving positive feedback. [Read out a sample answer for all students to listen to and write down. This may come from one of the students or from the sample answer:

Sample answers:

Q1. An example of a solution is seawater, a cup of tea or coffee or a soft drink.

Q2 One example would be orange juice another would be sago or fruit yoghurt or a bowl of cereal with milk.

Q3. Seawater is a mixture of two pure substances: water and salt. The salt dissolves in the water to make a clear (uniform) homogenous solution/mixture.

Component 2: ***Lesson purpose /Intention***

Time: 3 mins

- In this lesson, students will explore the concept of solutions will explore the concept of solutions and their concentrations through scientific processes. They will learn to accurately determine the concentration of a solution. They will learn to accurately determine the concentrations of a solution.

Component 3: *Lesson Language Practice*

Time: 5 mins

- Read out the following words or phrases (from the students' worksheets) and ask the students to read them to themselves and then out loud as a class.

Mixture, solution, uniform

- Ask the students to select one of the words above and write one sentence using that word in everyday language.
- Ask students to volunteer their answers and reasons, giving positive feedback.
- Ask the students to select one of the words above and write one sentence using the scientific meaning of that word.
- Read out some answers for all students to write down. This may come from one or several of the students or from the following sample answer.

Sample answers:

The mixture looks uniform.

The soldier is wearing a uniform.

Sea water is a solution.

I don't know the solution to that problem.

Salt is not a mixture.

The crowd is a mixture of adults and children.

- Explain to students that some everyday words have different meanings when used in Science – it is very important to recognize these differences in word use in the English language.

Component 4*: Lesson Activity*

Time: 25 mins**Component 4A**

- Refer students to the main lesson stimulus below and read out the text.
- Ask the students to read the text to themselves.

How much salt?

Joshua asked permission from his mother to have a fish tank, suggesting the use of seawater since they reside near the sea. Agreeing to his request, Joshua's mother said that he must manage the tank independently and maintain cleanliness, allowing him to utilize kitchen for this purpose.

Curious about the salts content in seawater and considering the possibility of needing to replenish the water without access to the beach, Joshua thought, "I wonder just how much salt it is in a bucket of seawater. In case I can't get to the beach, if I need to replace the water, I should be able to make my own." Motivated by this curiosity, Joshua decided to conduct an experiment to separate the water from the salt, aiming to precisely determine the salt concentration in 200 mL of seawater.

- Ask the students if there are any words that they are not familiar with (or suggest examples such as, *fish tank, 200 mL*) and give descriptions of any words that may be problematic.

Component 4B

- Read out the following questions and ask students to answer on their worksheet.
  Q1. What would be the best process that Joshua could use to separate the salt from the sea water?
  Q2. What are two very important measurements Joshua must make in his experiment?
  Q3. What other important things does he have to do to make sure his experiment is fair?
- Observe students' answers. Ask the students to volunteer their answers, giving positive feedback.
- Select a sample answer for all students to write down. This may come from one of the students or from the following sample answer.

Sample answers:

Q1. The best process would be evaporation/ he should heat the seawater until the water evaporates, leaving behind the salt
Q2. He has to measure the volume of sea water and the mass of salt left behind.
Q3. To make sure his experiment is fair he must make sure that all the conditions are the same while he does the measurements and that he uses the same measuring devices and seawater from the same source.

Component 4C

- Read out the following questions and ask students to answer them on their worksheet.

  Q1. What equipment does Joshua need to measure the amount of salt in the 200 mL of sea water?
  Q2. Joshua's three readings for the mass of salt after evaporation are 6.5 g, 7.0 g and 7.5 g. What value for the mass of salt should he use?
  Q3. **(Optional)** *Joshua was very accurate with his measurement of the volume of sea water, so what is the concentration of the seawater in his experiment? Give your answer in grams per liter.*

- Walk around giving encouragement and looking at students' answers. Ask the students to volunteer their answers, giving positive feedback.
- Select a sample answer for all students to write down. This may come from one of the students or from the following sample answer.

Sample answers:

Q1. He needs a set of weighing scales, like those in the kitchen, that measure grams or parts of kilograms.

Q2. He should use 7.0 g [the average of the three measurements].

Q3. Joshua's three readings for the mass of salt after evaporation are 6.5 g, 7.0 g, and 7.5 g. To calculate the concentration of seawater, we will use the average mass of salt, which is 7.0 g. Now, we need to convert the volume of seawater from milliliters (mL) to liters (L) since concentration is typically expressed in grams per liter (g/L). 200 mL of seawater is equal to 0.2 L (since there are 1000 mL in 1 L). Now, we can calculate the concentration of seawater using the formula: Concentration (g/L) = Mass of salt (g) / Volume of seawater (L) Concentration = 7.0 g / 0.2 L = 35 g/L. So, the concentration of seawater in Joshua's experiment is 35 grams per liter (g/L).

Component 5: Lesson Conclusion

Time: 5 mins

- The focus of this lesson was determining the concentration of a solution. In this case, seawater.
- Ask students to answer the following questions either by class discussion or writing the answers in their worksheet.

  Q1. Did you find Joshua's experiment interesting? If so, Why?

  Q2. Did you find the questions in component 4C harder than the questions in component 4B? If so, Why?

- Let students know that good learners reflect on their learning

REMINDER: Collect student worksheets to review and analyze student's learning.

Science Grade 7 Lesson Plan 4

Why Cells?

Key Idea

Cells are the basic structure of all living things.

Component 1: Short Review

Time: 7 mins

- Ask students to answer the questions and write them down on their worksheet.

Q1. What is the biggest cell in a human body?

Q2 What do you have to do so that you can see cells using a compound microscope?

Q3. Why do scientists say that cells are the basic structure of all living things?

- Ask students to volunteer to read out their answers and justifications, giving positive feedback. Read out a sample answer for all students to listen to and write down. This may come from one of the students or from the sample answer.

Sample answers:

Q1. The OVUM, the female egg, is the largest cell in the human body.

Q2. You should stain the specimen on the slide and focus carefully.

Q3. Scientists believe that every living thing is made up of cells and that cells come from other cells. This idea highlights the important role of cells as the basic units of life.

Component 2: ***Lesson purpose/Intention***

Time: 3 mins

The lesson aims to emphasize the significance of cells as the basic structure of all living organisms. Through reading scientific texts, students will enhance their understanding of this fundamental concept in biology, thereby strengthening their scientific literacy and ability to respond to related questions effectively.

Component 3: ***Lesson Language Practice***

Time: 5 mins

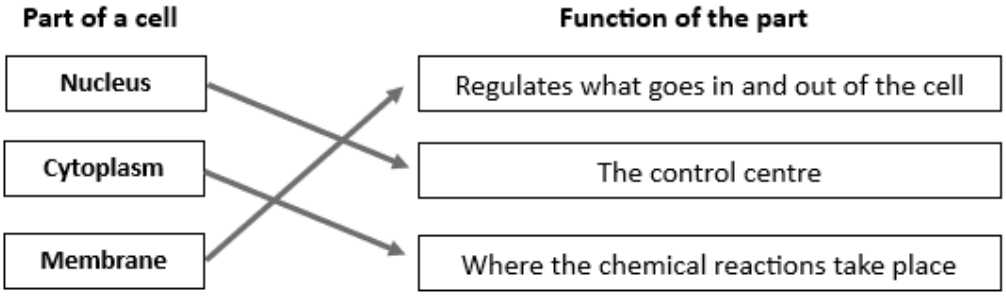
- Read out the following words or phrases (from the students' worksheets) and ask the students to read them to themselves and then out loud as a class.

Cytoplasm, membrane, nucleus

- Ask students to complete the task in their worksheet to match the *part of a cell* to its function. Explain that students should use arrows to correctly match the part to its function. Ask students to provide answers and discuss where needed.

Parts of a cell	Function of the part
Nucleus	*Regulates what goes in and out of the cell.*
Cytoplasm	*The control center*
Membrane	*Where the chemical reactions take place.*

Sample answer:



Component 4A*: Lesson Activity*

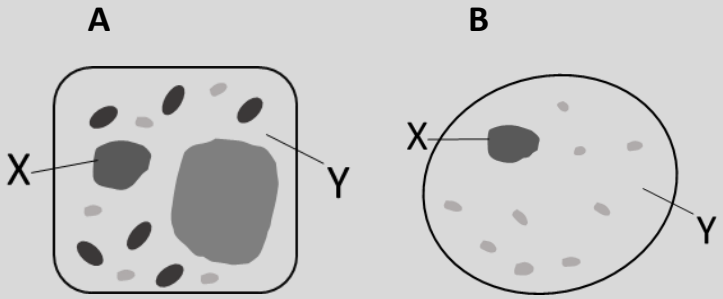
Time: 25 mins

- Refer students to the main lesson stimulus and read out the text.
- Ask the students to read the text to themselves.
- Ask the students if there are any words that they are not familiar with (or suggest examples such bacteria, trillion) and give descriptions of any words that may be problematic.

All about cells

Althea, a Grade 7 student, found her teacher's lesson on cells interesting but felt she didn't fully grasp the concept.

To test her understanding, she decided to explain cells to her younger brother Angelo. She began, "Hey Angelo, did you know that every living thing, including us humans, is made up of cells? Some tiny creatures like bacteria consist of just one cell, but we humans are made up of 75 trillion cells! Most cells have three main parts, but plant cells differ a bit from animal cells. Let me draw them for you."



Component 4B

- Read out the following questions and ask students to answer in the space on their worksheet.

  Q1. Which of the two cell diagrams A and B is a plant cell?

  Q2. What is the name of the parts labelled X and Y in the two cells?

  Q3. Are the cells in our heart the same as the cells in our brain? Why or why not?

- Observe students' answers. Ask the students to volunteer their answers, giving positive feedback. Select a sample answer for all students to write down. This may come from one of the students or from

the following sample answer.

Sample answers:

Q1. Diagram A is a plant cell.

Q2. The part labelled X is the nucleus, and the part labelled Y is the cytoplasm.

Q3. Not quite the same because cells in our body are specialized, so there are types of cells that have different structure, size, shape, and function.

Component 4C

- Read out the following questions and ask students to answer in the space on their worksheet.
  Q1. What do the cells in the organisms of similar species have in common?

  Q2. Name three essential functions of the human cell.

  Q3. **(Optional)** *What are the structures inside the nucleus called and why are they so important?*

- Ask the students to volunteer their answers, giving positive feedback.
  Select a sample answer for all students to write down. This may come from one of the students or from the following sample answer.

Sample answers:

Q1. They have the same DNA.

Q2. The function of cells includes to provide support and structure, take in nutrients from food, convert nutrients to energy, helps in reproduction and growth.,

Q3. The structures inside the nucleus are the chromosomes and they contain our genes which determine our characteristics, and this gets passed on when the cell makes copies of itself.

Component 5: Lesson Conclusion

Time: 5 mins

- The focus of this lesson was to read scientific texts to explain the importance of cells as the basic structure of all living things.
- Ask students to answer the following questions either by class discussion or writing the answers in their worksheet.

  Q1. The questions in component 4B were based on the text and diagram. Did you find these questions easier than those in component 4C? If so, why?

  Q2. Has this lesson helped you to remember and or understand the basic structure of the cell. If so, how?

- Let students know that good learners reflect on their learning.

REMINDER: Collect student worksheets to review and analyze student's learning.

Science Grade 7 Lesson Plan 5

From Cells to the Biosphere

Key Idea

Scientific diagrams are used to describe the levels of biological organization.

Component 1: Short Review

Time: 7 mins

- Ask students to answer the questions and write them down on their worksheet.

Q1. What is one example of a level in the biological organization?

Q2. What is the lowest level of the organization and what is the highest level?

Q3. How do scientists benefit from using diagrams to represent biological organization?

- Ask students to volunteer to read out their answers, giving positive feedback. Read out a sample answer for all students to listen to and write down. This may come from one of the students or from the sample answer.

Sample answers:

Q1. One example would be cells, and many others such as tissues, organs, organ systems, organisms, populations, communities, ecosystems, biosphere.

Q2. The lowest level is cells and the highest level is the biosphere.

Q3. Scientists use diagrams to make it easier to organize and share complex information.

Component 2: ***Lesson purpose/Intention***

Time: 3 mins

In this lesson, learners will explore how scientific diagrams help us understand the different levels of biological organization. By studying these diagrams, learners gain insights into how living things are structured and organized. They will learn why these diagrams are important tools in biology and deepen their understanding of how living things function.

Component 3: ***Lesson Language Practice****.*

Time: 5 mins

- Read out the following words or phrases (from the students' worksheets) and ask the students to read them to themselves and then out loud as a class.

cells, organ, tissues

- Ask the students to select one of the words above and write one sentence using the word in everyday language. Ask students to provide answers and discuss where needed.
- Ask the students to select one of the words above and write one sentence using its scientific meaning. Encourage the students to think carefully before they begin. Give encouragement to students' answers.
- Read out some answers for all students to write down. This may come from one or several of the students or from the following sample answer.

Sample answers:

Our body is made up of cells.

Prisons have cells where a person is held.

The heart is an organ in the human body.

I have a friend who plays the organ in a church.

Tissues are groups of cells in the body that have a similar function.

We have lots of boxes of tissues in our house when we have a cold or hay fever.

- Explain to students that some everyday words have different meanings when used in Science – it is very important to recognize these differences in word use in the English language.

Component 4*: Lesson Activity*

Time: 25 mins

Component 4A

- Refer students to the main lesson stimulus and read out the text.

Biological Organization Chart

Jasmine is in Grade 7 and has been learning about Biology and her teacher showed the class the diagram below. Jasmine is interested in plants and animals but is not sure how the plants and animals she likes fit into this diagram. Jasmine has a pet dog and a fish tank with small fish in it.

Diagram A

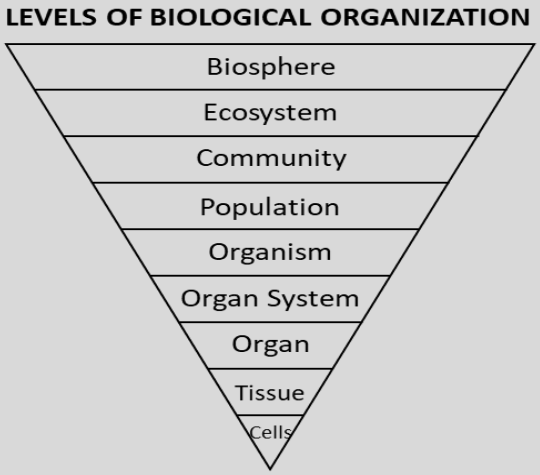
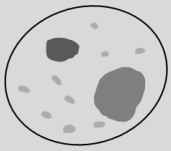


Diagram B



- Ask students to read the text to themselves.
- Ask students if there are any words that they are not familiar with (or suggest examples such as biological, organization) and give descriptions of any words that may be problematic.

Component 4B

- Read out the following questions and ask students to answer in the space on their worksheet.

  Q1. Describe the shape of Diagram A.

  Q2. At which level of the diagram (starting with cells) do organs appear? Provide an example of an organ.

  Q3. Which level of the diagram would Jasmine's dog and fish belong to and why?

- Observe students' answers. Ask the students to volunteer their answers, giving positive feedback.
- Select a sample answer for all students to write down. This may come from one of the students or from the following sample answer.

Sample answers:

Q1. It is an inverted pyramid.

Q2. Organs are in Level 3 and examples include heart, lungs, brain, stomach etc.

Q3. Jasmine's dog and fish would be in Level 5 because they are organisms.

Component 4C

- Read out the following questions and ask students to answer on their worksheet.

  *Q1. Name the level of organization that **diagram B** belongs to.*

  Q2. Name three ecosystems common to the Philippines.

  Q3. **(Optional)** *Why is the biosphere the biggest and highest level in the diagram?*
- Ask the students to volunteer their answers, giving positive feedback.
- Select a sample answer for all students to write down. This may come from one of the students or from the following sample answer.

Sample answers:

Q1 Diagram C is a cell so would be level 1.

Q2 Common ecosystems in the Philippines include rainforests, mangrove swamps and coral reefs.

Q3. The biosphere includes all the parts of the Earth where life exists that is why it is the largest and at the top level.

Component 5: Lesson Conclusion

Time: 5 mins

- The focus of this lesson was to u*se diagrams to describe the levels of biological organization.*
- Ask students to answer the following questions either by class discussion or writing the answers in their worksheet.

  Q1. Has this lesson helped you to better read and understand diagrams? If so, how?

  Q2. Has this lesson helped you to remember and or understand the levels of biological organization? If so, how?
- Let students know that good learners reflect on their learning.

REMINDER: Collect student worksheets to review and analyze student's learning.

Science Grade 7 Lesson Plan 6

Scientific investigation – How much Watering?

Key Ideas

Plants need certain abiotic conditions to grow.

Component 1: ***Short Review***

Time: 7 mins

- Ask students to answer the questions and write them down on their worksheet.
- Ask students to write down their answer in the space provided on their worksheet.

Q1. What are some of the abiotic conditions that plants require to grow in a garden?

Q2. Why is it important to identify these conditions before conducting an experiment?

Q3. How does ensuring fairness in experiments help us understand the effects of different conditions on plant growth?

- Ask students to volunteer to read out their answers, giving positive feedback. Read out a sample answer for all students to listen to and write down. This may come from one of the students or from the sample answer:

Sample answers:

Q1. Some abiotic conditions that plants need to grow in a garden include sunlight, water, soil nutrients, and suitable temperature.

Q2. It is important to identify these conditions before conducting an experiment because they serve as essential factors affecting plant growth. By understanding and controlling these conditions, we can create optimal environments for plant growth and accurately assess the impact of other variables.

Q3. Ensuring fairness in experiments helps us accurately determine the effects of specific conditions on plant growth by minimizing the influence of other factors. By keeping all variables constant except the one being tested, we can confidently attribute any changes in plant growth to the condition being investigated. This ensures reliable and meaningful results in our experiments.

Component 2: ***Lesson purpose /Intention***

Time: 3 mins

This lesson aims to explore the essential abiotic conditions required for plant growth and the importance of conducting fair experiments to accurately assess their effects. Through this lesson, students will deepen their understanding of the relationship between abiotic conditions and plant growth, enhancing their ability to cultivate healthy gardens and conduct meaningful scientific investigations.

Component 3: ***Lesson Language Practice***

Time: 5 mins

- Read out the following words (from the students' worksheets) and ask the students to read them to themselves and then out loud as a class.

sprout, germinate, valid

- Ask students to complete the task below by matching the words with their meaning in science. Explain that they are to use arrows to complete the matching/task. Encourage students to read the information carefully to think about what each word means. Ask students to provide answers and discuss where needed.
-

Word	Meaning
sprout	*How well an experiment determines what it set out to do.*
germinate	*Puts out shoots.*
valid	*Begin to grow.*

Sample answer:

Word	Meaning
sprout	*How well an experiment determines what it set out to do.*
germinate	*Puts out shoots.*
valid	*Begin to grow.*

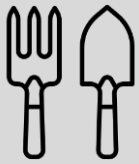
Component 4*: Lesson Activity*.

Time: 25 mins

Component 4A

- Refer students to the main lesson stimulus and read out the text.
- Ask the students to read the text to themselves.

Fair testing



Angela wanted to find out if radish seeds would sprout if she watered them every day about as much as it rains usually. *"I think the seeds will not germinate if I water them too much."* She thought to herself "*I wonder what experiment I could do to find out the answer and make sure it's a fair test?"*

Angela bought a packet of radish seeds and then collected some containers and some garden soil from her father's garden shed. She decided that she would test two different amounts of water to see which amount made the seeds germinate/sprout quicker. Angela worked out that she needed 500mL a day to keep the soil moist in her containers. So, she decided she would use 500mL in containers marked sample A and 250mL in the containers marked sample B.

- Ask students if there are any words of which they are not familiar (such as radish) and give descriptions of any words that may be problematic.

Component 4B

- Read out the following questions and ask students to answer in their worksheet.

  Q1. What should Angela use to measure the amount of water she intends to use each day?

  Q2. How should Angela prepare the containers she will put the seeds in?

  Q3. Suggest a method that Angela should now use to put the seeds in the containers and set up a schedule for watering.
- Observe students' answers. Ask students to volunteer their answers, giving positive feedback.
- Select a sample answer for all students to write down. This may come from one of the students or from the following sample answer.

Sample answers:

Q1. She should use a 500mL measuring jug or cup.

Q2. She should put the same amount of soil into 6 containers that are the same size and made of the same material.

Q3. Angela should very carefully sprinkle the same number of seeds into each container using the same spoon and then mark three containers as sample A and the other three as sample B.

Component 4C

- Read out the following questions and ask students to answer in the space on their worksheet.

  Q1. How should Angela measure which seeds sprouted more quickly?

  Q2. Where should Angela place the containers that she will water each day?

  Q3. **(Optional)** *Why did Angela need to have three containers in each sample and why did they all have to be in the same position outside?*
- Walk around giving encouragement and looking at students' answers. Ask the students to volunteer their answers, giving positive feedback.
- Select a sample answer for all students to write down for each question. This may come from one of the students or from the following sample answer.

Sample answers:

Q1. Angela should position the containers in an area where they will receive the same amount of sunlight and environmental conditions each day, ensuring consistency in the growing conditions.

Q2. Angela needs to put all the containers outside where they will all get the same amount of light and under shelter so that the only water, they get is what she gives them.

Q3. Angela needed to have three containers in each sample to ensure the reliability of her results and account for any variability. Placing them in the same position outside helps maintain consistent environmental conditions, such as sunlight and temperature, across all containers. This ensures that any differences in germination rates between the samples can be attributed solely to the varying amounts of water applied, making the experiment more controlled and accurate.

Component 5: Lesson Conclusion

Time: 5 mins

- The focus of this lesson was to describe the components of a scientific investigation and *we want to be sure we know and understand about fair testing in the context of the abiotic conditions needed by plants to grow.*
- Ask students to answer the following questions either by class discussion or writing the answers in their worksheet.

  Q1. Has this lesson helped you to understand what fair testing means in science? How?

  Q2. Did you find Angela's experiment interesting? If so, why?

- Let students know that good learners reflect on their learning.

REMINDER: Collect student worksheets to review and analyze student's learning

Science Grade 7 Lesson Plan 7

Biotic and Abiotic

Key Idea

It is important in Science to be able to interpret and convert everyday language read in texts into more technical scientific language because technical language helps communicate complex scientific ideas more succinctly.

Component 1: Short Review

Time: 7 mins

- Ask students to answer the questions and write them down on their worksheet.

Q1. Name a living thing that is not a plant or an animal.

Q2. Name three important things in your immediate environment that are abiotic.

Q3. Why do scientists use the term "biotic" when they talk about living things?

- Ask students to volunteer to read out their answers, giving positive feedback. Read out a sample answer for all students to listen to and write down. This may come from one of the students or from the sample answer.

Sample answers:

Q1. A bacteria or algae are living things, but they are neither plant nor animal.

Q2. The air, the building/house/school, the ground/floor, the windows/doors, the roof.

Q3. They use the term biotic because it means living things and things that once were living.

Component 2: ***Lesson purpose/Intention***

Time: 3 mins

In this lesson, students will develop their ability to interpret and convert everyday language into technical scientific language. By mastering this skill, students will enhance their capacity to communicate complex scientific concepts more effectively and succinctly.

Component 3: ***Lesson Language Practice****.*

Time: 5 mins

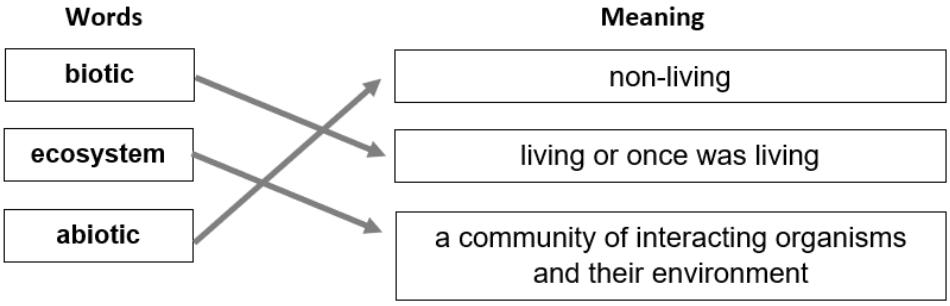
Read out the following words or phrases (from the students' worksheets) and ask the students to read them to themselves and then out loud as a class.

biotic, abiotic, ecosystem

- Ask the students to complete the task below by matching the words with their meaning in Science. Explain that they are to use arrows to complete the matching task. Encourage the students to read the information carefully to think about what each word means. Ask students to provide answers and discuss where needed.

Words	Meaning
biotic	non-living
ecosystem	living or once was living
abiotic	a community of interacting organisms and their environment

Sample answer:



- Explain to students that some everyday words have different meanings when used in Science – it is very important to recognize these differences in word use in the English language.

Component 4*: Lesson Activity*

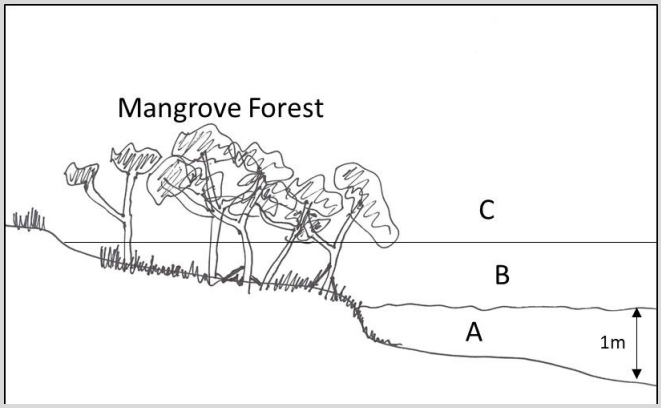
Time: 25 mins

Component 4A

- Refer students to the main lesson stimulus and read out the text.
- Ask the students to read the text to themselves.
- Ask the students if there are any words that they are not familiar with (or suggest examples such as tidal, subtidal, supratidal) and give descriptions of any words that may be problematic.

A Mangrove Swamp

Jacob and his friends often go down to the mangroves near where he lives just to explore and maybe catch some fish. He told his mother that crabs and lobsters can live in the mangroves. His mother said he should be careful because there could be sharks and stingrays there.



Component 4B

- Read out the following questions and ask students to answer in the space on their worksheet.

  Q1. Which label A, B or C on the diagram shows where Jacob would find crabs in the mangroves?

  Q2. Name the abiotic features of a mangrove swamp ecosystem shown in the diagram.

  Q3. If trees, like other plants, need water, how do the mangrove trees survive in salt water?

- Observe students' answers. Ask the students to volunteer their answers, giving positive feedback.
- Select a sample answer for all students to write down. This may come from one of the students or from the following sample answer.

Sample answers:

Q1. The crabs would live in Zone A.

Q2. The abiotic features of the mangrove swamp include the water, the soil, the air and possibly rocks and sand.

Q3. The mangrove roots together with the seagrass reduce the level of salt in the water.

Component 4C

- Read out the following questions and ask students to answer in the space on their worksheet.

  Q1. What is the biggest threat to the mangrove forests of the Philippines?

  Q2. What other abiotic factors are a threat to the mangrove swamps?

  Q3. **(Optional)** *How do the mangrove forests and swamps help protect the biotic and abiotic features of the Philippines?*

- Ask the students to volunteer their answers, giving positive feedback.
  Select a sample answer for all students to write down. This may come from one of the students or from the following sample answer.

Sample answers:

Q1. The biggest threat is the clearing of the forests for artificial shrimp farming.

Q2. The rising sea levels, increase in global temperature, air and water pollution are all threats to the mangrove swamps.

Q3. The mangrove forests reduce soil erosion from waves and tides, storm surges, and may even reduce the effect of tsunamis. The mangrove forests/swamps provide shelter to many living things which are a food source for humans and other animals.

Component 5: Lesson Conclusion

Time: 5 mins

- The focus of this lesson was to use technical language in complex scientific texts about the differences between the biotic and the abiotic features in an ecosystem.
- Ask students to answer the following questions either by class discussion or writing the answers in their worksheet.

  Q1. Has this lesson helped you to use more technical language when talking about ecosystems? If so, give an example.

  Q2. Has this lesson helped you to remember and or understand the differences between biotic and abiotic factors in an ecosystem? If so, how?

- Let students know that good learners reflect on their learning.

REMINDER: Collect student worksheets to review and analyze student's learning.

Science Grade 7 Lesson Plan 8

Scientific investigation – Using Water from the Sea?

Key Idea

Separating mixtures can result in providing basic needs.

Component 1: *Short Review*

Time: 7 mins

- Ask students to answer the questions and write them down on their worksheet.

Q1. What are the basic needs of all living things?

Q2. What are some of the things that plants grown in a garden need to make sure they grow?

Q3. What are some separation techniques that we could use to separate water from mixtures?

- Ask students to volunteer to read out their answers, giving positive feedback. Read out a sample answer for all students to listen to and write down. This may come from one of the students or from the sample answer:

Sample answers:

Q1. They need air, food, water, and shelter.

Q2. They need water, light, or the sun, air, and nutrients in soil.

Q3. We could use filtration, decantation or evaporation.

Component 2: ***Lesson purpose /Intention***

Time: 3 mins

This lesson aims to demonstrate how separating mixtures, such as sea water, can fulfill basic needs, like providing water for plant growth.

Component 3: *Lesson Language Practice*

Time: 5 mins

- Read out the following words (from the students' worksheets) and ask the students to read them to themselves and then out loud as a class.

Seedling; Separate; Equipment

- You might suggest that students can practice saying the words.

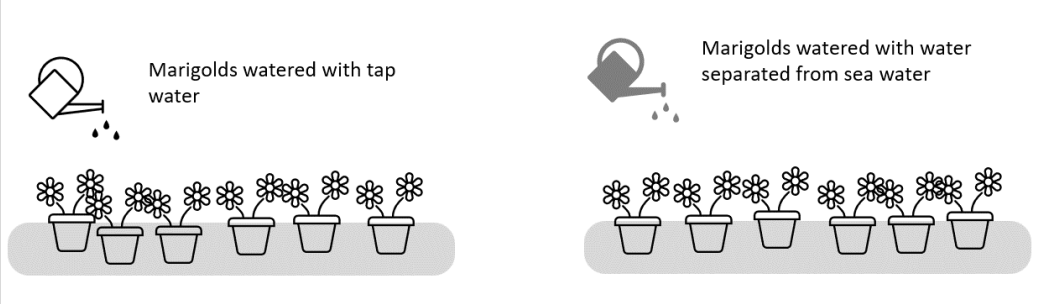
Component 4*: Lesson Activity*.

Time: 25 mins

Component 4A

- Refer students to the main lesson stimulus and read out the text.
- Ask the students to read the text to themselves.

Water, water everywhere



Angela wanted to find out if some marigold (Amarillo) seedlings would grow just as well if she watered them with some water separated out from sea water.

She collected some water from the ocean in a bucket. Her mother agreed that she could use the kitchen but that she had to clean up after herself. She set up some simple equipment to evaporate and then condense water from some sea water.

She decided to buy some marigold seedlings and placed equal numbers into 12 small containers of garden soil. *"I think those plants that I water with ordinary tap water will grow better than those where I use the water that I have separated from the sea."*

She decided that she would use the same amount of each type of water and water all the containers at the same time each week. All the containers were kept in the same area of the garden so that they had the same light and air and shelter. Angela's father helped her set up the equipment and use it safely. She was able to collect enough water each week to continue her experiment for one month.

- Ask students if there are any words with which they are not familiar, such as marigold (Amarillo), and give descriptions of any words that may be problematic.

Component 4B

- Read out the following questions and ask students to answer in their worksheet.

  Q1. What should Angela use to measure the amount of water she intends to give the plants each day?

  Q2. How should Angela prepare the containers she will put the seedlings in?

  Q3. Suggest a method that Angela should now use to put the seedlings in the container and set up a schedule for watering.

- Observe students' answers. Ask students to volunteer their answers, giving positive feedback.
- Select a sample answer for all students to write down. This may come from the students or from the following sample answer.

Sample answers:

Q1. She could use a 1-liter garden watering can and fill it up each time.

Q2. She should put the same amount of soil into 6 containers that are the same size and made of the same material.

Q3. Angela should very carefully count the same number of seedlings into each container and then mark three containers as sample A and the other three as sample B.

Component 4C

- Read out the following questions and ask students to answer in the space on their worksheet.

  Q1. How should Angela measure which seedlings were growing better?

  Q2. How can Angela evaporate the liquid sea water to convert it into a gas, and what steps are required to condense it back into a liquid?

  Q3. **(Optional)** *Why did Angela use the processes of evaporation and condensation?*

- Walk around giving encouragement and looking at students' answers. Ask the students to volunteer their answers, giving positive feedback.
- Select a sample answer for all students to write down for each question. This may come from the students or from the following sample answer.

Sample answers:

Q1. Angela should measure the height of the seedlings before she starts the experiment and then measure them again each week.

*Q2. Angela needs to **heat** the liquid sea water and then **cool** the gas down so that it condenses back to a liquid.*

Q3. She first had to heat the sea water so that the water would evaporate leaving the salt behind. She then had the equipment set up to capture the water vapor and cool it so that it turned back into pure liquid water.

Component 5: Lesson Conclusion

Time: 5 mins

- The focus of this lesson was to describe how a scientific investigation can solve everyday problems.

- Ask students to answer the following questions either by class discussion or writing the answers in their worksheet.

  Q1. Has this lesson helped you to understand how useful separating techniques are?

  Q2. Did you find Angela's experiment interesting? If so, why?

- Let students know that good learners reflect on their learning.

REMINDER: Collect student workbooks after each lesson to review and analyze student's learning.

Science Grade 7 Lesson Plan 9

The Atmosphere of Earth

Key Idea

The atmosphere is a layer of air that surrounds the solid Earth, but the layer is very, very thin compared to the size of the Earth.

Component 1: Short Review

Time: 7 mins

- Ask students to answer the following questions on their worksheet.

  Q1. What is the atmosphere?

  Q2. What is the atmosphere made of?

  Q3. What are some good and bad ways that humans interact with the atmosphere?

- Ask students to volunteer their answers, giving positive feedback. Read out a sample answer for all students to listen to and write down. This may come from the students or from the sample answers below.

Sample answers:

Q1. • The blanket (or layer) of air around the Earth.

Q2. • *Air* or *Gases*

- *Clouds.* or *Fog* or *Mist*
- *Pollution* or *Dust*
- *Oxygen.* or *Carbon dioxide.* or *Nitrogen.* or *Argon,*
- *Rain.* or *Snow*.

Q3. • *Humans breathe in air to get oxygen, but at the same time they breathe out carbon dioxide that with large populations of humans, can contribute to global warming;* and/or

- *Humans use the atmosphere to transport people in airplanes over long distances, however the exhaust from planes pollute the atmosphere.*

Component 2: **Lesson Purpose/Intention**

Time: 3 mins

The lesson is about understanding more deeply that the atmosphere is made of air that covers the whole Earth. We will be recalling the features of the atmosphere and developing a better understanding of how it influences the Earth and life on the planet.

Component 3: Lesson Language Practice

Time: 5 mins

- Read out difficult or unfamiliar words or phrases and ask the students to read them to themselves and then out loud as a class; e.g.:

  Atmosphere; Atmospheric; Diameter; Approximately; Carbon dioxide; Oxygen

- Discuss with students what might be the origin or original meaning of the word *Atmosphere***.**

  Sample discussion: *atmos* is Greek for 'vapor, steam' and *sphaera* (Latin) and *sphaira* (Greek) means 'globe' or 'ball'. Lots of languages have similar meanings.

Component 4: Lesson Activity

Time: 25 mins

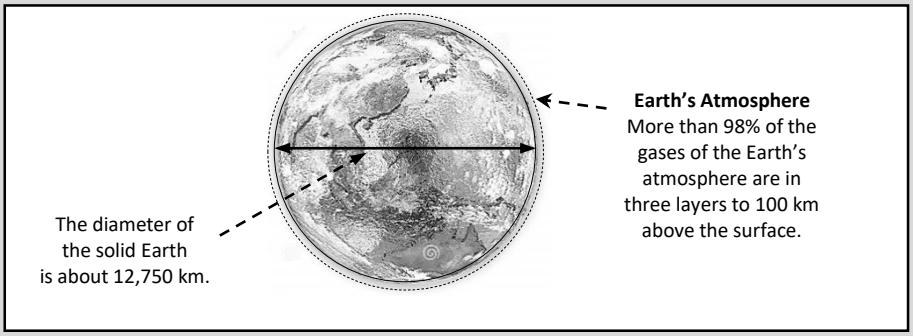
- Refer students to the lesson stimulus below and **orient them to the text** [the *heading*, the *three paragraphs*, and the *diagram*). **Read the textual paragraphs**.

Component 4A

The Atmosphere of Earth

The Earth's *Atmosphere* surrounds our planet and is mostly composed of air.

The atmosphere is essential to living things – it provides *carbon dioxide* for plants and *oxygen* for animals. The two main gases that make up the atmosphere are *nitrogen* (approximately 78%), and *oxygen* (approximately 21%). *Carbon dioxide*, *argon* and traces of other gases make up the rest. The total content of water in the atmosphere is about 0.25%, mostly made up of water vapor.



The amount of air in the atmosphere gets less as the height of the atmosphere increases above the Earth's surface. Scientists have identified five or six distinctive layers in the atmosphere, but the boundary between each layer is not sharp and can be hard to measure precisely. They know that about 98 percent of the gases in the atmosphere are in the lowest three layers.

Component 4B

- Read out the following questions and ask students to answer in the space on their worksheet.

Q1. What is the *Atmosphere*?

Q2. What are the main gases that make up the atmosphere?

Q3. Why are the gases in the atmosphere important for life?

- Observe students' answers. Ask the students to volunteer their answers, giving positive feedback. Select a good sample answer for all students to write down. This may come from one of the students or from the following sample answers.

Sample answers:

Q1. • *The layer of air around the Earth.*

Q2. • *Nitrogen.*
- *Oxygen.*
- *Carbon Dioxide.*
- *Argon.*
- *Water vapor.*

Q3. • *Plants need carbon dioxide for photosynthesis; and/or Animals need oxygen to breathe.*

Component 4C

- Read out the following questions and ask students to answer in the space on their worksheet.

  Q1. What is the approximate diameter of the solid Earth?

  Q2. How far is it approximately to the center of the Earth?

  Q3. **(Optional)** Use the numerical information provided in the Information Box to work out how well the diagram provided represents the relative thickness of the *Atmosphere* compared to the overall size of the *Earth*.

- Watch students answering, giving encouragement. Ask the students to volunteer answers. Select a good sample answer for all students to write down. This may come from one of the students or from the following sample answers.

Sample answers:

Q1. • *approx. 12,750 km* [Directly read from the diagram]

Q2. • approx. 6,375 km. (12,750 km ÷ 2 = approx. 6,375 km).

Q3. There are many ways that students might solve this problem; Here are some possibilities. The key is for students to recognize that the actual atmosphere is thinner than the diagram is representing:

- *The Earth has an actual diameter of 12750 km. The diagram is drawn with the Earth's diameter as 35 mm and the Atmosphere is drawn with a thickness of about 1 mm.*
- *For the diagram, the ratio of the atmosphere to Earth's diameter as drawn is = 1 mm/35 mm =* ***0.028;*** *The ratio of the real atmosphere to Earth's diameter is 100 km/12750 km =* ***0.0078;*** *so the layer should be 3 time thinner than drawn.*
- *To find the correct scale of the atmosphere for the representation of Earth as having a 35mm diameter, we can use the following mathematical analysis:* $\frac{x}{35\ mm} = \frac{100\ km}{12750\ km}$ *= 0.27 mm.*
  So, the atmosphere should be drawn to be about **0.27 mm thick**. The diagram misrepresents how thin the atmosphere really is. In the diagram, it is drawn about three time thicker than the atmosphere really is.

Component 5: Lesson Conclusion

Time: 5 mins

The focus of the lesson was on understanding more deeply about the atmosphere that surrounds the solid Earth.

1. How has the lesson helped you to better understand the atmosphere?
2. Which questions were easy to answer – the ones in Component 4B or Component 4C? Why?
3. What strategies do you use to answer the harder questions?

NOTE: Remember to collect student worksheets to review and analyze student's learning.

Science Grade 7 Lesson Plan 10

The Layers of the Atmosphere right above the Philippines

Key Idea

The atmosphere is composed of layers which interact with the Sun. There is less and less air as altitude increases from the surface. This and the Sun's energy affect the temperature of the layers in different ways.

Component 1: Short Review

Time: 7 mins

- Ask students to answer the following questions on their worksheet.

  Q1. What is the atmosphere composed of?

  Q2. The atmosphere is composed of 'layers' - what are some other things that have layers?

  Q3. What might you see or feel if you could just float vertically up into the sky kilometers above the clouds? [A SUGGESTION: Close your eyes and just visualize what that might be like.]

- Ask students to volunteer their answers, giving positive feedback. Read out a sample answer for all students to listen to and write down. This may come from one of the students or from the sample answers below.

Sample answers:

Q1. • *It is composed of air*; or *It is made of gases*; or *It has clouds and sometimes rain.*

Q2. • *Like in a layered cake.*
- *A bed has layers of sheets and blankets.*
- *Rocks can form in layers. (strata)*
- *The layers of building are the levels.*
- *You can sometimes see layers of clouds.*

Q3. • *You would begin to see above the buildings, have a chance to look down on your school or house, and as you go up you could see your whole village, town or city and region. As you keep going up it would get colder and be hard to breathe. As you go higher you would be looking down on the clouds and maybe the islands of the Philippines! There might be airplanes flying past you. It would be impossible to breathe now. As you go higher, you would be in Space!*

Component 2: **Lesson Purpose/Intention**

Time: 3 mins

The lesson is about understanding more deeply that the atmosphere has layers of varying thicknesses. We will be recalling the features of the layers such as their composition and the changes in temperature and pressure as you go out to space.

Component 3: Lesson Language Practice

Time: 5 mins

- Read out difficult or unfamiliar words or phrases and ask the students to read them to themselves and then out loud as a class; e.g.:

Boundaries; Troposphere; Stratosphere; Mesosphere; Thermosphere; Exosphere

- Ask students why they think all the words that describe ***zones*** of the atmosphere end in 'sphere', given that the meaning of 'sphere' is "*an area bounded by a spherical surface (including the space it encloses)*"?

  Sample discussion: *Five of our practice words end in '-sphere'. Given that the meaning of 'sphere' is "an area bounded by a spherical surface (including the space it encloses)", we can interpret what some of the words mean from their* ***beginnings****, such as 'Tropo-', 'Meso-', or 'Exo-'.*

  [**For teacher background:** ***Tropo***- means 'changing' and refers to the layer with storms and turbulence; ***Strato***- means 'layer' and refers to different and steadily increasingly warmer temperature layers it has; ***Meso***- means 'middle; ***Thermo***- means 'heat'; '***Exo***- means 'outside' or 'outer. ']

Component 4: Lesson Activity

Time: 25 mins

Component 4A

Layers of the Atmosphere above the Philippines

Scientists believe that the atmosphere has five distinctive layers, but the boundaries between layers are not sharp and can be hard to measure precisely. The layers and some of their features are:

Troposphere: This layer extends from the Earth's surface up to about 13 kilometers (km). This layer holds 75% of the atmosphere's mass of gases. As you go higher up the troposphere, temperature drops from an average of about 13^0C near the Earth's surface to -50^0C at the top of the layer. The air pressure drops from 1000 millibars (mb) near the Earth's surface to 100 mb at the top of the layer.

Stratosphere: This layer lies directly above the troposphere. It extends from about 13 km to about 48 km above the Earth's surface. The temperature of the bottom of the layer is -50^0C but at the top it is only -3^0C. The air pressure at the bottom of the layer is about 100 mb but at the top of the layer the air pressure is only 1 mb.

Mesosphere: This layer lies directly above the stratosphere. It extends from about 48 km to about 100 km above the Earth's surface. The temperature of the bottom of the layer is -3^0C but at the top it is only -90^0C. The air pressure at the bottom of the layer is about 1 mb but at the top of the layer the air pressure is only 0.01 mb.

Thermosphere: This layer lies directly above the mesosphere. It extends from about 100 km to about 700 km above the Earth's surface. The temperature of the bottom of the layer is -90 ^{0}C but at the top of the thermosphere it can be 350 ^{0}C or higher. The air pressure at the bottom of the layer is about 0.01 mb but at the top of the layer the air pressure is very weak at about 0.000001 mb.

Exosphere: This layer is the uppermost layer, and it extends 10,000 km into space. In fact, it blends with what scientists consider to be outer space! The pull of Earth's gravity is so small in this layer that molecules of gas escape into outer space. It would feel very cold as there are not enough molecules of gas to transfer heat.

Component 4B

- Read out the following questions and ask students to answer in the space on their worksheet.

  Q1. How many layers do scientists think make up our atmosphere?

  Q2. What *features* of the layers does the Information Box present measurements for?

  Q3. Which layer would feel the hottest? How do you know from the information Box?

- Observe students' answers. Ask the students to volunteer their answers, giving positive feedback. Select a good sample answer for all students to write down. This may come from the students or from the following sample answers.

Sample answers:

Q1. • Five.

Q2. • Altitude. [in kilometers (km)]
- Thickness. [in kilometers (km)]
- Temperature. [in degrees Celsius (^{0}C)]
- Air Pressure. [in millibars, (mb)]

Q3. • The *Thermosphere* – because it gets to 350 ^{0}C, but the other layers are all much colder.

Component 4C

- Read out the following questions and ask students to answer in the space on their worksheet. There may be a need to explain the table in Q2.

Q1. How far above the land's surface of the Philippines will you find the top of the Troposphere?

Q2. Use the information provided in the Information box, ***Layers of the Atmosphere above the Philippines***, to complete the following table to summarize the features of the layers of the atmosphere – there are 10 white cells to complete:

		ATMOSPHERIC LAYER			
FEATURES	*Marker*	**Troposphere**	**Stratosphere**	**Mesosphere**	**Thermosphere**
Altitude	Top of layer	13 km	48 km	85 km	700 km
	Bottom of layer	0 km	13 km	48 km	85 km
Layer thicknesses	Thickness	13 km	35 km		
Typical Temperature	Top of layer	-50 ^{0}C	-3 ^{0}C	-90 ^{0}C	350 ^{0}C
	Bottom of layer				
Air Pressure	Top of layer			0.01 mb	0.000001 mb
	Bottom of layer			1 mb	0.01 mb

Q3. **(Optional)** Study your completed table, and/or the Information box, and then describe how ***temperatures*** and ***air pressures*** of the atmosphere change as ***altitude*** increases from the Earth's surface to 700 kilometers above the Philippines?

- Watch students answering, giving encouragement and direction where needed. Ask the students to volunteer answers. Select a good sample answer for all students to write down. This may come from the students or from the following sample answers.

Sample answers:

Q1. • 13 km

Q2. • see the 10 added measures in the table:

		ATMOSPHERIC LAYER			
FEATURES	*Marker*	**Troposphere**	**Stratosphere**	**Mesosphere**	**Thermosphere**
Altitude	Top of layer	13 km	48 km	85 km	700 km
	Bottom of layer	0 km	13 km	48 km	85 km
Layer thickness	Thickness	13 km	35 km	**37 km**	**615 km**
Typical Temperature	Top of layer	-50 ^{0}C	-3 ^{0}C	-90 ^{0}C	350 ^{0}C
	Bottom of layer	**13 ^{0}C**	**-50 ^{0}C**	**-3 ^{0}C**	**-90 ^{0}C**
Air Pressure	Top of layer	**100 mb**	**1 mb**	0.01 mb	0.000001 mb
	Bottom of layer	**1000 mb**	**100 mb**	1 mb	0.01 mb

Q3. • The **temperature** of each layer goes down and up. The temperature of the *Troposphere* drops from about 13^{0}C to about -50^{0}C at the bottom of the *Stratosphere*, then it rises again in the *Mesosphere* from -50^{0}C to -3^{0}C. In the *Thermosphere* it rises rapidly from -3^{0}C at the bottom to 350^{0}C at the top.

- The **air pressure** drops continuously as altitude increases from the Earth's surface. The air pressure at the Earth's surface is about 1000 mb, at the top of the troposphere it is about 100 mb, at the top of the stratosphere it is about 1 mb, at the top of the mesosphere it is about 0.01 mb and at the top of the thermosphere it is about 0.0000001 mb.

Component 5: Lesson Conclusion

Time: 5 mins

1. Has the activity helped you to think more about the atmosphere and its layers of varying thicknesses?
2. What did you enjoy about the lesson?
3. What is something you would like to learn more about in this topic?

NOTE: Remember to collect student worksheets to review and analyze student's learning.

Science Grade 7 Lesson Plan 11

The Sun Interacts with our Atmosphere

Key Idea

Energy from the Sun interacts with the Earth's surface and the layers of the atmosphere which helps to produce an environment on Earth that allows life to flourish. This is a **good** greenhouse effect.

Component 1: Short Review

Time: 7 mins

- Ask students to answer the following questions on their worksheet.

  Q1. What is the Earth's *Atmosphere*?

  Q2. What forms of energy come from the Sun?

  Q3. How does the Sun affect our weather?

- Ask students to volunteer their answers, giving positive feedback. Read out a sample answer for all students to listen to and write down. This may come from one of the students or from the sample answers below.

Sample answers:

Q1. • *The layer of air around the Earth.*

Q2. • *Light.*
- *Heat.*
- *UV.*
- *IR.*

Q3. • *If the Sun is out or is showing, we have good weather.*
- *The light energy from the Sun transforms to heat in the atmosphere.*
- *When Sunlight hits the Earth's surface, it heats the air which then rises – this moving air causes a wind.*

Component 2: **Lesson Purpose/Intention**

Time: 3 mins

The lesson is about understanding more deeply how the atmosphere reacts to the energy received from the Sun. It builds explanations of the gases and processes that create the greenhouse effect that is important for life on Earth. The lesson is about establishing that the Earth has a delicate energy balance. The lesson builds understanding of how the Sun affects our weather.

Component 3: Lesson Language Practice

Time: 5 mins

- Read out difficult or unfamiliar words or phrases and ask the students to read them to themselves and then out loud as a class; e.g.:

  Ultraviolet radiation; Transparent; Infrared energy; Kinetic energy

  The teacher might like to help students recall that all these terms relate to ***energy*** in some way. The *Information Box* will provide the details.

Component 4: Lesson Activity

Time: 25 mins

Component 4A

The Sun Interacts with our Atmosphere

The Sun is the Earth's primary source of external energy. Energy from the Sun heats our planet to the point where life can flourish.

Most of the energy from the Sun is transmitted to the Earth as light energy. Because the atmosphere is mostly transparent, much of the light reaches the Earth's surface where it is firstly absorbed, converting to heat energy. Much of this heat energy is re-radiated into the atmosphere, warming the gases of the atmosphere.

Some atmospheric gases, including *carbon dioxide*, *ozone*, *nitrous oxide* and *water vapor*, are naturally occurring gases that absorb and emit heat energy very effectively. These gases are called *greenhouse gases*.

The naturally occurring greenhouse gases have a positive effect as they hold just the right amount of heat in the atmosphere for life to exist, and they allow excess heat to radiate back into space. This keeps the average temperature of the atmosphere to about 13^0C. The atmospheric warming effect is called *the greenhouse effect*.

Without the greenhouse effect, the Earth's surface temperature would be about -23^0C, and life probably could not exist.

The weather we experience on Earth is a direct result of absorbing energy from the Sun. The Sun heats the Earth's surface unevenly, and this sets up convections current in the troposphere, producing winds and influencing ocean currents. In the warmer months in both the northern and southern hemispheres, tremendous storms form (including typhoons, hurricanes, and cyclones) which help the Earth get rid of excess energy. The weather effects convert heat energy into kinetic energy (e.g., wind).

Component 4B

- Read out the following questions and ask students to answer in the space on their worksheet.

  Q1. What is the main form of energy that is transmitted from the Sun to the Earth?

  Q2. Name some greenhouse gases?

  Q3. How are naturally occurring greenhouse gases good for the Earth?

- Observe students' answers. Ask the students to volunteer their answers, giving positive feedback. Select a good sample answer for all students to write down. This may come from the students or from the following sample answers.

Sample answers:

Q1. • *Light*; or *Light energy*.

Q2. • *Carbon dioxide*.
- *Ozone*.
- *Nitrous oxide*.
- *Water vapor*.

Q3. • They hold just the right amount of heat in the atmosphere.
- They help keep a healthy balance of heat absorbed and emitted by the atmosphere.
- They keep the temperature of the atmosphere in a range that allows life to exist.

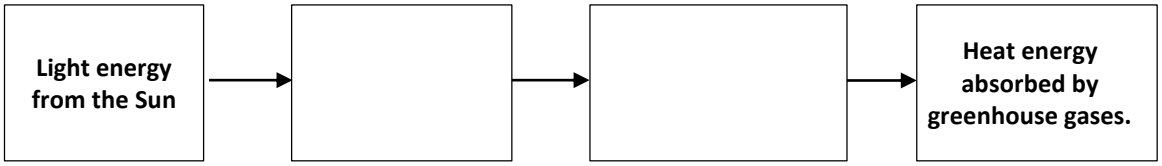
Component 4C

- Read out the following questions and ask students to answer in the space on their worksheet. There may be a need to help students understand the features and use of flow charts.

  Q1. What would the Earth's surface temperature be without the greenhouse effect?

  Q2. What are some weather effects that are caused by the Earth absorbing energy from the Sun?

  Q3. **(Optional)** Complete the following flow chart to show how the Sun's energy is responsible for the natural warming of the Earth's atmosphere.



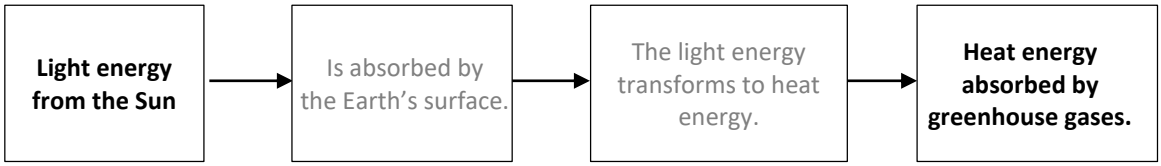
- Watch students answering, giving encouragement. Ask the students to volunteer answers. Select a good sample answer for all students to write down. This may come from one of the students or from the following sample answers.

Sample answers:

Q1. • About -23^{0}C

Q2. • winds, breezes, storms
- tremendous storms (including typhoons, hurricanes, and cyclones)

Q3. •



Component 5: Lesson Conclusion

Time: 5 min

1. Has the activity helped you to understand more deeply how the atmosphere reacts to the energy received from the Sun?
2. What did you enjoy using flow charts to summarize information?
3. What was hard to do or understand in the lesson?

NOTE: Remember to collect student worksheets to review and analyze student's learning.

Science Grade 7 Lesson Plan 12

Are Humans Upsetting Earth's Delicate Energy Balance?

Key Idea

The Earth's delicate energy balance can be upset by human activities. Rapidly adding greenhouse gases to the atmosphere might be producing a bad greenhouse effect, which will likely lead to global warming. Global warming can result in changes to climate, polar ice, sea levels and weather patterns.

Component 1: Short Review

Time: 7 mins

- Ask students to answer the following questions on their worksheet.

  Q1. What is a 'fossil fuel'?

  Q2. How can factories that use fossil fuels affect our environment?

  Q3. What are some energy changes that occur when fossil fuels are used to power factories?

- Ask students to volunteer their answers, giving positive feedback. Read out a sample answer for all students to listen to and write down. This may come from one of the students or from the sample answers below.

Sample answers:

Q1.
- Fuels that were formed millions of years ago in ancient sediments from the remains of dead plants and animals.

Q2.
- Puts smoke in the air.
- Adds heat to the air.
- Areas of land need to be mined to extract coal.
- Large-scale transport systems are needed to move raw materials and products.

Q3.
- ***Stored chemical*** energy (in coal or oil) burns→ ***heat*** (in power plants)
- ***Heat*** (in power plants) → ***mechanical*** energy (to turn generators)
- ***movement*** energy (in generators) → ***electricity*** (in powerlines)
- ***Electricity*** (from powerlines) → ***mechanical*** energy (to run machines in factories).

Component 2: **Lesson Purpose/Intention**

Time: 3 mins

The lesson is about reinforcing the fact that the Earth has a delicate energy balance. Students have an opportunity to describe that the balance can be upset by human activities that add greenhouse gases to the atmosphere too quickly for it to react, which will lead to *global warming*.

Component 3: Lesson Language Practice

Time: 5 mins

- Read out difficult or unfamiliar words or phrases and ask the students to read them to themselves and then out loud as a class; e.g.:

  Energy balance; Industrial Revolution; Greenhouse gas emissions; Impact; Excess

  Ask students to recognize and consider why science uses complex terms. They might also discuss the meaning of *Impact* and *Excess,* as they have special meanings in science contexts.

Component 4: Lesson Activity

Time: 25 mins

Component 4A

Are humans upsetting Earth's delicate energy balance?

Since the middle of the Industrial Revolution, which is about 170 years ago, humans have been increasingly releasing large quantities of industrial greenhouse gases, including *carbon dioxide*, *methane* and *nitrous oxide*, into the atmosphere!

Greenhouse gas in the atmosphere increased by 70 percent between 1970 and 2004. The most impacting greenhouse gas, *carbon dioxide*, rose by about 80 percent during that time. Most of the carbon dioxide that people put into the atmosphere comes from burning fossil fuels such as *oil, coal,* and *natural gas* for transport and producing electric power.

Cutting down forests also increases the quantities of carbon dioxide into the atmosphere – carbon dioxide is released from decaying plant material, and harvested trees can no longer absorb carbon dioxide from the atmosphere.

Large amounts of another greenhouse gas, *methane*, come from farming and from big rubbish tips. *Nitrous oxide,* which also traps heat very well, is released from agricultural activities and from the burning of fossil fuels.

All of these human activities add excess greenhouse gases to the atmosphere, trapping more heat than usual. These things are all contributing to rapid *global warming* that might be resulting in drastic climate changes, more severe weather events and rising sea levels.

Component 4B

- Read out the following questions and ask students to answer in the space on their worksheet.

  Q1. What was the percentage increase in *carbon dioxide* in the atmosphere over the period 1970 and 2004?

  Q2. What things cause more greenhouse gases to be released into the atmosphere?

  Q3. How does global warming cause some **bad** effects?

- Observe students' answers. Ask the students to volunteer their answers, giving positive feedback. Select a good sample answer for all students to write down. This may come from one of the students or from the following sample answers.

Sample answers:

Q1. • 80%.

Q2. • Burning fossil fuels such as oil coal, and natural gas.
- Motorcycles, cars and trucks that burn fossil fuels.
- Electric power production.
- Farming of livestock.
- Rubbish landfill.
- Agricultural activities.

Q3. • Global warning causes the climate to change,
- More heat in the atmosphere causes more severe weather events.
- More heat in the atmosphere causes ice to melt in the Artic and Antarctic causing sea levels to rise.

Component 4C

- Read out the following questions and ask students to answer in the space on their worksheet.

  Q1. What are Greenhouse gases?

  Q2. What are some things that people could do to reduce *global warming*?

  Q3. **(Optional)** Describe some human activities that are not indicated in the Information box that might also contribute to *global warming* and *climate change* and say what impacts the activities might have.

- Watch students answering, giving encouragement. Ask the students to volunteer answers. Select a good sample answer for all students to write down. This may come from one of the students or from the following sample answers.

Sample answers:

Q1. • *Gases in the atmosphere that absorb heat energy.*

Q2. • *Use less plastic.*
- *Use less carbon-based fuels like petrol, diesel, kerosene.*
- *Only leave electric light on when needed.*

Q3. *Leaving lights and air conditioners on requires electricity, which is mostly generated using fossil fuels in many countries. This means that using electricity adds to the burning of fossil fuels, releasing greenhouse gases into the air. These gases contribute to global warming, causing changes in the Earth's climate.*

[For teacher information: *Global internet use adds 1.4 billion tons of greenhouse gases per year, which equals 3.7% of global greenhouse gas emissions – equal to the combined emission of Brazil, South Africa, and Türkiye (Turkey).]*

Component 5: Lesson Conclusion

Time: 5 mins

This lesson was about reinforcing the fact that Earth has a delicate energy balance, which can be upset very easily.

- Has the lesson helped you to think more about the role of the atmosphere in supporting life?
- What did you enjoy about the lesson?
- What is something that is **good** about the Greenhouse Effect and what is something that is **bad** about the Greenhouse Effect?

NOTE: Remember to collect student worksheets to review and analyze student's learning.

Science Grade 7 Lesson Plan 13

Exploring the movement of an object in one dimension

Key Idea

Describing the movement of an object in one dimension allows scientists to understand and calculate its speed from the time it takes to travel a measured distance.

Component 1: Short Review

Time: 7 mins

- Ask students to answer the following questions on their worksheet first.

  *Q1. What is a way you can make an object **move**?*

  *Q2. If you throw an object, like a ball, into the air across the school yard, it will move in a **curved** path. What are some other ways to describe how things can move?*

  Q3. If we push a toy car across a long table, how can we scientifically measure its movement?

- Ask students to volunteer answers. Read out a sample answer for students to listen to or write down from one student or the sample below.

Sample answers:

Q1. • *Push it;* or *Pull it;* or *Lift it;* or *Drop it;* or *Throw it; Kick it;* or *Hit it;* or *Drag it;* or *Blow it;* or *Push or pull it with a string or magnet.*

Q2. • *It can travel in a straight line;*
- *It can go round and round (in a circle);*
- *It can go back and forth (vibrating);*
- *It can go fast;* or *slow;*
- *It can slow down; or It can speed up.*

Q3. • *Measure its starting position and its end position;* (concepts of position and distance) or
- *We can time how long it takes to move from position 1 to position 2.* (concepts of time, position, and distance)

Component 2: **Lesson Purpose/Intention**

Time: 3 mins

- This lesson is about **learning how to describe the movement of objects in one dimension.**

e.g., We want to be sure we know and understand about movement, or how it can occur in one dimension (1D).

Component 3: Lesson Language Practice

Time: 5 mins

- Read out difficult or unfamiliar words or phrases and ask the students to read them to themselves and then out loud as a class; e.g.:

  Move/Moving; Direction, Distance, Speed, Travel, Traveled, Uniform; Constant

- Ask students the difference between the words '***travel'*** and **'*traveled*'.**
  Sample student responses: *Travel is what you do* (present tense); *Traveled is what you have done* (past tense).
- Ask students to volunteer their answers, giving positive feedback and discussing.
- Ask the students to practice saying the words in a sentence.

  e.g., "*I **traveled** in one **direction** for a **distance** of 5 meters."*

Component 4*:* Lesson Activity

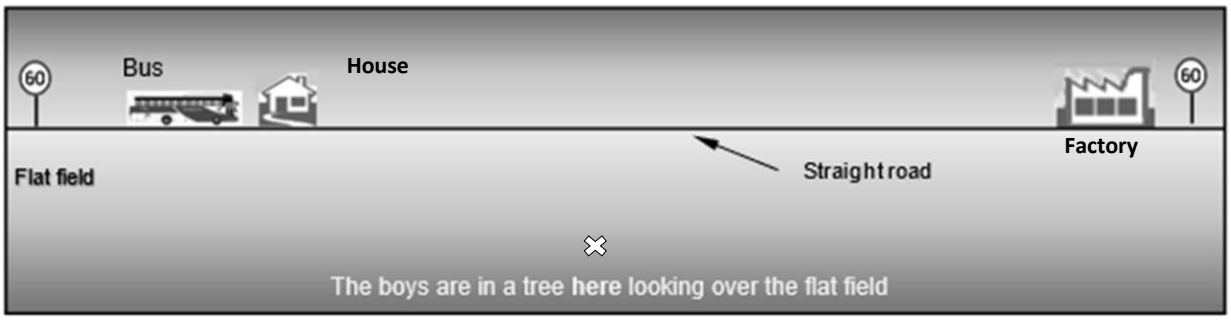
Time: 25 mins

Component 4A

- Refer students to the lesson stimulus below and **orient them to the text** [the *heading*, an *image*, *three paragraphs* (one setting the scene, one suggesting a problem, and one providing information that can be used to solve the problem), and a *graphic representation* to set up the scene). **Read the textual paragraphs**.
- Ask students if there are any words that are not familiar. (Suggest examples such as *straight*, *traveled*, *distance*, *uniform*, *rate*, *speeding*, *breaking*, *positioned.*) Give descriptions of words that may be problematic.

Was the bus exceeding the speed limit?

Two students were sitting in a tree, looking out over a flat field. On the other side of the field, they could see a very straight road running along the other side of the field. They watched across the field as a bus traveled in one direction along the straight road.



They noticed that the bus was traveling at a **uniform speed** – not speeding up, not slowing down, but the students thought it might be breaking the 60 speed limit!

They could see the bus was about to pass a house that they know is 1 kilometer from a factory positioned further along the road. They timed how long it took the bus to travel from the house to the factory. It took the bus 70 seconds to travel from the house to the factory.

One student said to the other "*I wonder if the bus is speeding*?".

Component 4B

- Students read the following questions and answer in their worksheet first.

Q1. How far is it between the house and the factory?

Q2. What important things about the problem do we know from the text? (Problem: Was the bus speeding?)

Q3. What does a speed limit of 60 mean and why is it important?

- Observe students' answers. Ask students to volunteer their answers, giving positive feedback. Select good sample answers for students to write down. These may come from students or from the following sample answers.

Sample answers:

Q1. • *1 kilometer (1 km)*

Q2. • The *distance from the house to the factory = 1 km.*

- *The time the bus takes to travel from the house to the factory* = 70 seconds.
- *That the bus is traveling at a uniform speed.*
- *The speed limit for the road is 60 (60 kilometers per hour).*

Q3. • Vehicles *are not allowed to travel faster than 60 kilometers per hour because:*
- *traveling faster might be dangerous for the people driving or for people standing near the road.*
- *the road might not be smooth enough to travel faster.*
- *there might be people walking near the road who could get hit by speeding cars; etc.*

Component 4C

- Read out the following questions and ask students to answer on their worksheet.

  Q1. What does 'traveling at a uniform speed' mean?

  Q2. What do we need to know to calculate the speed that bus was traveling?

  Q3. **(Optional)** *We know the bus took 70 seconds to travel 1 kilometer. What do we have to do to work out the bus's speed in kilometers per hour (km/hr)?*

- Observe students' responses, giving encouragement. Ask students to volunteer their answers, giving positive feedback. Select good sample answers for students to write down. These may come from students or the sample answers.

Sample answers:

Q1. • *not speeding up or slowing down.*

Q2. • *We need to know how far the bus traveled in a time period.*
- *Speed = distance ÷ time (in km/hr), so we need to know how many kilometers it would travel in an hour.*

Q3. • We need to convert seconds to hours. or
- W*e need to work out what 70 seconds is in hours and multiple by 1(km)* or
- Number of seconds in 1 hour = 30 sec/min x 30 mins = 3600 sec;
  So, the time taken as a fraction of an hour is $\frac{3600\ sec}{70\ sec}$ = 51.4; Therefore, the number of kilometers the bus would travel if it traveled for 1 hour = 51.4 km;

So the bus speed is 51.4 km/hr. [so, the bus was **NOT** speeding]

Component 5: Lesson Conclusion

Time: 5 mins

- *The focus of the lesson was on learning how to describe the movement of objects in a scientific way. How has the lesson helped you to describe movement **scientifically**?*
- Think about Component 4 and answer these questions:
  1. *Could you find answers to questions in the text for Component 4? Which ones?*
  2. *Did you find it easier to answer the questions in Component 4B or 4C? Why?*
  3. *Has the activity helped you to think about the movement of objects in different dimensions? How?*

Science Grade 7 Lesson Plan 14

The Difference between Distance and Displacement

Key Idea

Scientists use *displacement* to find the final position and the net direction an object has moved from its starting point.

Component 1: Short Review

Time: 7 mins

- Ask students to answer the following questions on their worksheet first.
  Q1. What is distance?

  Q2a. How do we measure distance?

  Q2b. What units do we use?

  Q3a. What is speed?

  Q3b. What is average speed?
- Ask students to volunteer their answers, giving positive feedback. Read out a sample answer for students to listen to and write down. This may come from one student or from the sample answers below.

Sample answers:

Q1. How far to something; How far to travel; How far between two points.
Q2a. With a ruler, tape measure, or using a map.
Q2b. We use centimeters, meters or kilometers, etc.
Q3a. Speed = distance ÷ time (in km/hr or meters/sec).
*Q3b. Over a trip, you could go slow and fast – average speed is the **net** or **avrage** speed for a whole trip.*

Component 2: **Lesson Purpose/Intention**

Time: 3 mins

- The lesson is about learning the difference between ***distance*** and the scientific term ***displacement***, and why that is important.

  *E.g., We want to be sure we know and understand the difference – distance is only about how far things travel; **Displacement** is about the **distance** AND **direction** that an object moves **from its starting position**. Scientists use this idea to measure where objects move, regardless of the type of movement involved. They also use the idea of displacement to predict where objects will travel to.*

Component 3: Lesson Language Practice

Time: 5 mins

- Read out difficult or unfamiliar words or phrases and ask students to read them to themselves and then out loud as a class; e.g.:

  Movement; Start position, Final position, Displacement, Vector, Represents

- Ask students the difference between ***'start*** and ***'final.***

  ***Sample student responses:** 'Start is the **beginning**; final is the **end** or **finishing position**"; "a sprint race has a **start** and an **end** or **finish** or **final position**".*

- Ask students to sound out difficult words like ***Displacement, Vector*** and ***Represents***

Component 4*:* Lesson Activity

Time: 25 mins

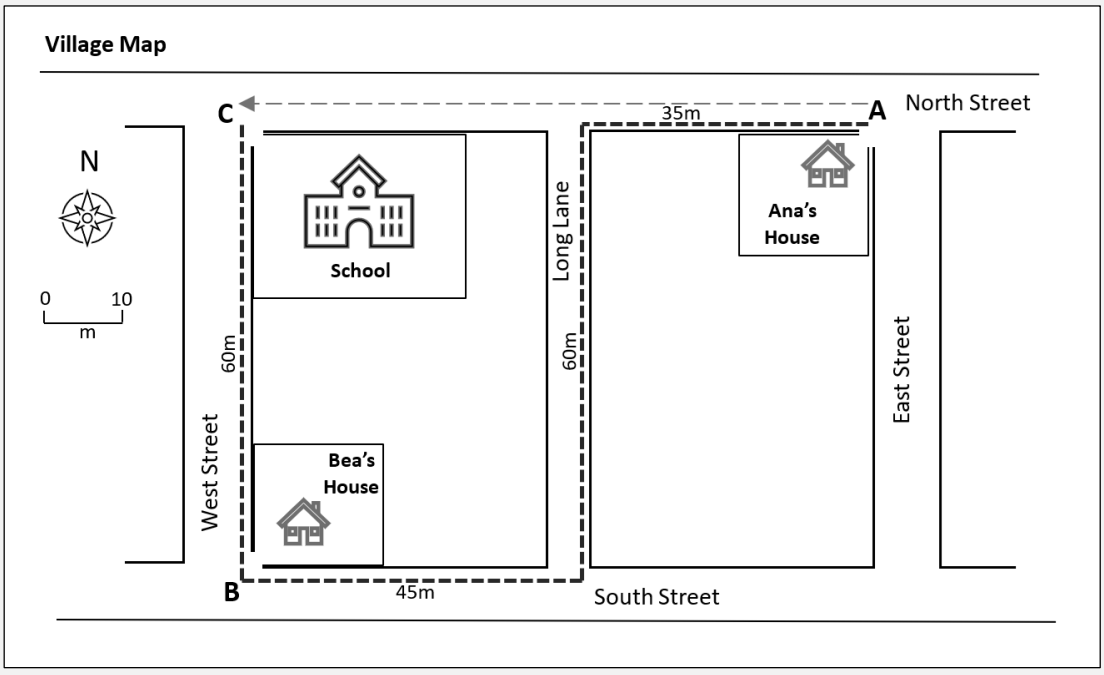
Component 4A

- Refer students to the main lesson stimulus and **orient them to the text.** [if needed, explain that the map is what the village looks like from high above; refer students to the ***compass*** to show direction; the ***scale*** to help judge distances].

Why *Displacement* is important to Scientists

An everyday example can help to show what displacement is and why it is important.

A student, called *Ana*, walks from her house in North Street to school each morning via the house of her friend, *Bea*, in South Street. Ana's path to school is shown on the village map below in **the heavy dashed line** (------). Ana has to walk from Point **A** to Point **B** and then to Point **C**. It takes Ana 6 minutes to get to Bea's house. Ana waits 2 minutes for Bea to get ready, then Ana and Bea take 3 minutes to walk together to school.



The light dashed line (← – – –) represents how far Ana is from her house (start position) when she gets to school (final position). This represents the ***net distance*** that Ana is from her house.

The dashed line with the arrow indicates the direction from Ana's house to her school. When we know the net distance and net direction that Ana has moved, we know her ***displacement*** from her house to school.
When Ana gets to school, her ***displacement*** is 80 meters directly West from her house.

Displacement is a measure of **both** the *net distance* moved **and** the *net direction* moved. This is important to scientists as knowing distance and direction gives precise measurements of where moving things have traveled.

In Science, when a quantity has both **DISTANCE** and **DIRECTION** it is called a **VECTOR** quantity**.**

Component 4B

- Students read the following questions and answer on their worksheet first.

Q1. What is the first street that Ana walks along?

Q2. Which direction does Ana need to go when she gets to Long Lane?

Q3. How far in total does Ana walk to get to school each morning?

- Observe students' answers. Ask students to volunteer their answers, giving positive feedback. Select good sample answers for students to write down. These may come from students or from the following sample answers.

Sample answers:

Q1. North Street

Q2. • *She turns left at Long Lane.*
- *She walks towards the South at Long Lane.*

Q3. 35 *m + 60 m + 45 m + 60 m = 200 m*

Component 4C

- Students read the following questions and answer on their worksheet first.

Q1. a. After school, Ana walks home along North Street. What is the distance she needs to walk?
b. What is the direction Ana walks from her school to home?

Q2. a. What are ways you could describe Bea's movement from her home to school?
b. What is Ana's ***displacement*** *from her school* ***in the afternoon****?*

Q3. **(Optional)**
a. How far has Ana walked in total in going both to and from school?
b. How would you describe Ana's ***displacement*** *over* ***the whole day****?*

- Walk around giving encouragement and looking at students' answers. Ask students to volunteer answers, giving positive feedback. Select a good sample answer for students to write down.

Sample answers:

Q1a. 80 m.
b. In an East direction

Q2a. • Bea *walks 60 m.*
- *Bea walks due/directly North.*
- *Bea takes 5 minutes to get to school.*
- *Bea walks at 60 m/5 mins = 12 m/min.*
- *Also, in terms of speed = 60 m/(5 x 60 sec) = 60 m/300 sec = 0.2 m/s.*
- *Bea's displacement from home in the morning is 60 m North.*

b. 80 m East.

*Q3*a. 200 *m + 80 m = 280 m.*
b. 0 m. (Because she is back to her starting position)

Component 5: Lesson Conclusion

Time: 5 mins

The focus of the lesson was on learning the difference between distance and the scientific term displacement. Why is that important.

1. *How has the lesson helped you to describe movement scientifically?*
2. *Which questions were easy to answer – the ones in Component 4B or Component 4C? Why?*
3. *What strategies do you use to answer the harder questions?*

Science Grade 7 Lesson Plan 15

Let's Scientifically Analyze Motion

Key Idea

Representing motion in tables and graphs helps students to notice patterns and make connections that develop their thinking about associations between variables.

Component 1: Short Review

Time: 7 mins

- Ask students to answer the following questions on their worksheet.

  *Q1. What do we mean in science when we use the word '**Motion**'?*

  Q2. What are some key characteristics of motion that we can measure?

  Q3. What is a graph in science and why are there commonly two axes on graphs.?

- Ask students to volunteer their answers, giving positive feedback. Read out a sample answer for all students to listen to and write down. This may come from one of the students or from the sample answers below.

Sample answers:

Q1. When *something is moving.*
Q2. time, distance, direction, speed, velocity, acceleration.
Q3. A graph *is visual way to show the relationships between two aspects of a situation being analyzed, such as showing how* distance *relates to time.*

Component 2: **Lesson Purpose/Intention**

Time: 3 mins

- The lesson is about learning how scientists represent motion in tables and graphs and use this to visualize motion in a way that allows us to analyze it and to make predictions based on the analysis. Graphs help to identify patterns and make connections that develop our thinking about the associations between the things we are measuring (the variables).

  (Optional)*:* Depending on the confidence of the students, the teacher may decide here to indicate that students might recognize the following:

  *If one variable is changed (in this case **time**), the effect of the change on another variable (**distance**) can be measured. We can then use this to develop a new measure – (in this case – **velocity**).*

Component 3: Lesson Language Practice

Time: 5 mins

- Read out unfamiliar or difficult words or phrases and ask students to read them to themselves and then out loud as a class; e.g.:

  Motion; Graph, Displacement, Distance-time, Axis and axes, Units, Slope

  - Ask students to sound out and distinguish difficult words***: Axis and Axes,***

  e.g., "A graph has two **axes**; a horizontal **axis** and a vertical **axis**."

Component 4*:* Lesson Activity

Time: 25 mins

Component 4A

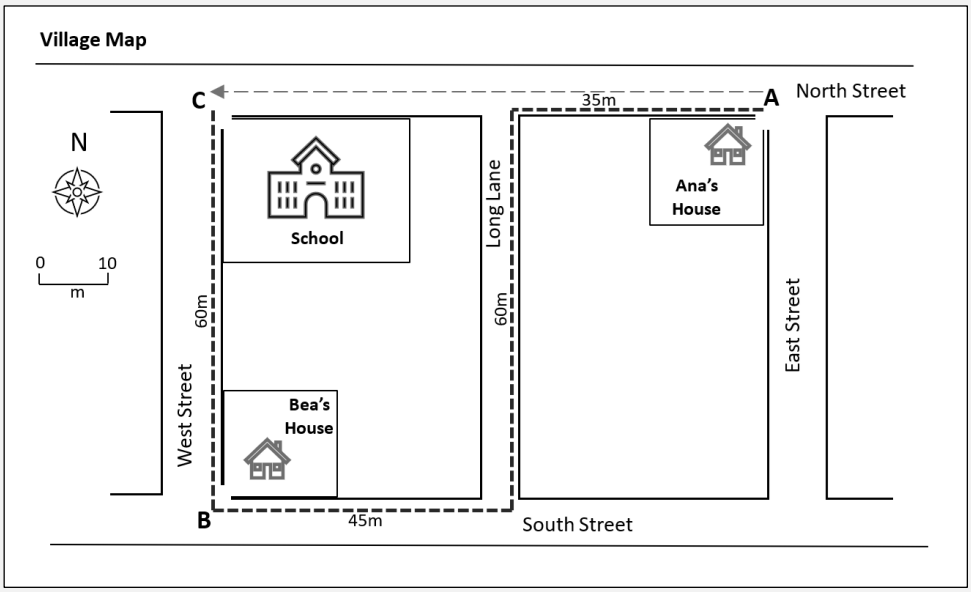
- Refer students to the main lesson stimulus and **orient them** to the text, map, table and graph. It might be good to point out that the table and graph are using the same units as described in the scenario; i.e., *distance* and *time*. Ask students if any ideas or presentations are not familiar and give descriptions and support for aspects that are a problem.

Lesson Stimulus

Ana's displacement to and from school.

We can use a graph to represent *Ana's* ***displacement*** from her house to school in the morning, and then from her school to her house in the afternoon after school finishes.

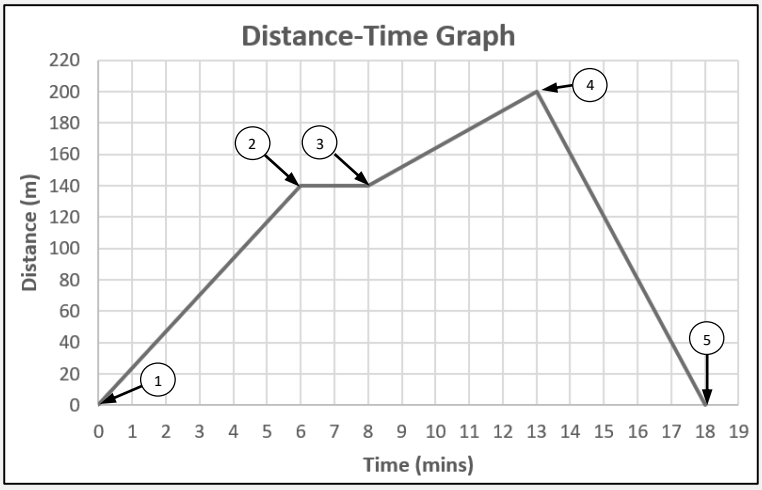
Please recall from Lesson 14 that, in the mornings, Ana walks from Point **A** to Point **B** and that takes 6 minutes. She then waits 2 minutes at Point **B** for her friend Bea to get ready. Then Ana and Bea take 3 minutes to walk together from Point B to the school at Point **C**.



After school, Ana walks **directly** from her school to her house in North Street. The following is a graph which ***represents*** Ana's walk to and from her house to school. Some important points are labelled 1, 2, 3, 4, and 5 on the plotted line.

Data table

Point	Time (mins)	Distance (m)
1	0	0
2	6	140
3	8	140
4	13	200
5	18	0



- Use this information to answer questions in Component 4B and Component 4C.

Component 4B

- Students read out the following questions and answer them in their worksheet.

  Q1. What does point 1 on the graph represent?

  Q2. Which part of the plotted line on the graph represents Ana's slowest walking speed? Why?

  Q3. What is happening between points 2 and 3, and how do you know?

- Observe students' answers. Ask students to volunteer their answers, giving positive feedback. Select good sample answers for students to write down. These may come from students or from the following sample answers.

Sample answers:

Q1. • The *beginning of Ana's walk to school;*
• *Zero distance (0 m) at zero time (0 sec)*

Q2. • *The part between points 3 and 4, because it has the lowest angle (shows 5 mins to travel 60 m)*
• *[The part between 2 and 3 because Ana is stationary (not waking at all)].* [Accept this if it is given; it is quite a good answer, as 0 m is the slowest possible speed. However, it could also be described as 'not moving'.]

Q3. Ana is stationary, because the line remains at 140 m; (or "because the text tells us that Ana waits for her friend to get ready.)

Component 4C

- Students read the following questions and answer them in their worksheet first.

  Q1. Which section of the plotted line represents Ana's walk home from school?

  Q2. Ana walks the fastest when she walks from school to her house. What on the graph indicates that?

  Q3. **(Optional)** *What is Ana's total displacement after all her walking to and from school? How do you know?*

- Walk around giving encouragement and looking at students' answers. Ask the students to volunteer their answers, giving positive feedback. Select a good sample answer for all students to write down. This may come from students or from the following sample answer.

Sample answers:

Q1. The *section between 4 and 5.*
Q2. The *steepest slope of the plotted line, which is between points 4 and 5.*
That Ana walks 200 m in 5 minutes.

Q3. Ana's displacement is zero (0 m). We know because the plotted line returns to the bottom of the horizontal axis (the *distance* axis)

Component 5: Lesson Conclusion

Time: 5 mins

The focus of the lesson was on learning how scientists represent motion in tables and graphs and use this to visualize motion in a way that allows us to analyze it and to make predictions based on the analysis.

1. *Has the activity helped you to better understand tables and graphs related to motion? How?*
2. *What did you enjoy about the lesson?*
3. *What is something you would like to learn more about using tables and graphs?*

Science Grade 7 Lesson Plan 16

It is Time to Accelerate!

Key Idea

In everyday life, very few things move with a set (or uniform) velocity – nearly all things are speeding up, slowing down, or changing direction – they are accelerating, and scientists can measure that precisely.

Component 1: Short Review

Time: 7 mins

- Ask students to answer the following questions on their worksheet.
  Q1. What is speed?

  Q2. What are some units we use to describe speed?

  Q3. What is the difference between speed and velocity?

- Ask students to volunteer their answers, giving positive feedback. Read out a sample answer for students to listen to and write down. This may come from the students or from the answers below.

Sample answers:

Q1. The *change in distance over time.*

Q2. • *cm/sec*
- *m/s*
- *km/sec* [when something is really fast.]
- *km/hour*

Q3. Speed *is the distance divided by* (÷) *time; velocity is the displacement divided by* (÷) *time and it is a vector (because it has direction).*

Component 2: **Lesson Purpose/Intention**

Time: 3 mins

The lesson is about acceleration and its importance in helping to precisely measure how objects move.

This lesson provides a good opportunity for teachers to help students recognize acceleration in everyday situations. Here are some ideas for a short discussion with students to link acceleration with 'changing velocity', or 'changing direction'.

*We want to be sure we know and understand the difference between **velocity** and **acceleration**, to recognize acceleration in everyday situations, and understand how to calculate it and represent it in a variety of ways.*

*You all probably know the difference between **velocity** and **acceleration** in intuitive ways (i.e., based on what you physically feel or have felt before).*

Examples where you can 'feel' acceleration:

- *If you are in a vehicle that is taking off quickly from a stationary position, you feel a force on your body – you get pushed backwards – you might get pushed into the back of the seat, or on a motorcycle, might need to hang on so you do not fall off;*
- *You can also feel acceleration when your vehicle travels in a curve or around a bend in the road. If your vehicle turns sharply to the right, your body feels like it is forced towards the left-side of the vehicle.*

This lesson will help to give you a scientific understanding of acceleration.

Component 3: Lesson Language Practice

Time: 5 mins

- Read out difficult or unfamiliar words or phrases and ask the students to read them to themselves and then out loud as a class; e.g.:

Velocity; Acceleration; Force; Concept; Equation; Units

- Ask the students if there are any words that they are not familiar with and give descriptions of any words that may be problematic.

Component 4*:* Lesson Activity

Time: 25 mins

Component 4A

- Refer students to the main lesson stimulus and orient them to the text, pointing out what is labelled ***Concepts*** and ***Equations***. Explain how the two relate.

Lesson Stimulus

Distinguishing Speed, Velocity and Acceleration

Acceleration is the scientific term for any process where there is a **change in velocity**.

Velocity involves both speed and direction. Because acceleration is a change in velocity, it also involves both speed and direction.

So, acceleration is defined as a **change in speed** and/or a **change in direction**. Therefore,

- if you are speeding up – you are accelerating,
- if you are slowing down – you are decelerating,
- if you are going at the same speed but changing direction – you are accelerating.

It also means that no matter how fast you are going, if you are **not** changing your speed or you are **not** changing your direction, you are **not** accelerating.

In Science, we use the following ideas to describe and calculate motion:

Concepts	Equations
Distance traveled over *time* is used to calculate the *average speed* for a journey. ***Average speed*** is the total distance traveled divided by (÷) a period of time. It **is not** a vector quantity.	Ave speed (m/s) = $\frac{\text{distance (m)}}{\text{time (s)}}$
Displacement measures the '*final position*' of an object. It tells the distance from the starting position **and** the direction of movement. ***Velocity*** is the change in position divided by (÷) the change in time. It **is** a vector quantity.	Velocity (m/s) = $\frac{\text{displacment (m)}}{\Delta \text{ time (s)}}$
Acceleration measures the rate of change in velocity and it has direction. A general principle is that if an object is slowing down, then its acceleration is in the opposite direction of its motion. It **is** a vector quantity. ***Acceleration*** is the change in velocity divided by (÷) the change in time.	Acceleration (m/s/s) = $\frac{\Delta \text{ velocity (m/s)}}{\Delta \text{ time (s)}}$

Note ['Δ' is a symbol meaning "the change in"]

Component 4B

- Students read the following questions and then answer them in their worksheet.

  Q1. What is used to calculate the *average speed* for a journey*?*

  Q2. A scooter travels 120 meters directly towards the East in 6 seconds, and then it travels 100 m directly towards the North in 6 seconds. What is the ***average speed*** *of the scooter?*

  Q3. The displacement of the scooter from its original starting position was 141 m. What is the ***velocity*** *of the scooter?*

- Observe students' answers. Ask students to volunteer their answers, giving positive feedback. Select good sample answers for all students to write down. These may come from the students or from the following sample answers.

Sample answers:

Q1. Distance traveled over *time.*

Q2. 120 m + 120 m in 6 s + 6 s = 240 m in 12 s = ***20 m/s***

or [*(120 +120)m in (6+6) s = 240 m in 12 s =* ***20 m/s***]

Q3. The scooter moves *141 m towards the North-east in 6 s + 6 s*

= 141 min 12 s

$= \frac{141\ (\mathrm{m})}{12\ (\mathrm{s})}$

= ***11.75 m/s North-east****.*

Component 4C

- Students read out the following questions and then answer on their worksheet.

  Q1. What is acceleration?

  Q2. What are some ways that an object could be accelerating?

  Q3. **(Optional)** *How are velocity and acceleration related?*

  - Observe students' responses, giving encouragement. Ask students to volunteer their answers, giving positive feedback. Select good sample answers for all students to write down. These may come from the students or from the following sample answer.

Sample answers:

Q1. When something moves faster and faster (in one continuous event).

Q2.
- *Speeding up.*
- *Slowing down.*
- *Changing direction.*

Q3. velocity is m/s, and acceleration is m/s/s; they are both vectors (they both have direction).

Component 5: Lesson Conclusion

Time: 5 mins

The focus of the lesson was on learning about acceleration and its importance in helping to precisely measure how objects move.

1. Could you find any answers in the Stimulus text provided for questions in Component **4B** or **4C**? Which ones?

> e.g., It can be helpful to explain to students that it is good learning technique to look for answers that might be given in a text or stimulus. This also helps understanding what is needed to answer questions.

   Students can find direct answers to 4B Q1, and 4C Q2.

2. What connections or differences do you notice between questions in **4B** and **4C.**

3. Did you find it easier to answer the questions in Component **4B** or **4C**? Why?

NOTE: Remember to collect student worksheets to review and analyze student's learning.

Science Grade 7 Lesson Plan 17

Acceleration Can Catch You Out!

Key Idea

Acceleration is any change in motion and occurs when something speeds up, slows down or changes direction. The science meaning of acceleration is often counter-intuitive to what people think from their everyday experiences.

Component 1: Short Review

Time: 7 mins

- Ask students to answer the following questions on their worksheet.

  Q1. What is velocity?

  Q2. What are some examples of things that exhibit uniform or constant velocity?

  Q3. Some people think that the movement of the hands on a clock exhibits uniform or constant velocity. What would a scientist say about this?

- Ask students to volunteer answers, giving positive feedback. Read out a sample answer for students to listen to and write down. This may come from one student or from the sample answers below.

Sample answers:

Q1. Velocity is the rate of change of distance; it is distance divided by time; The units for velocity are meters per second, or kilometers per hour.

Q2. Anything *that is moving in a straight line without speeding up or slowing down, like a moving car, train, or airplane.*

Q3. A scientist would say that although the hands of a clock are moving constantly or in a uniform way, they are moving in a circle and so they are changing direction all the time. That means that the hands are actually ***accelerating****.*

Component 2: **Lesson Purpose/Intention**

Time: 3 mins

- This lesson is about how we can represent an everyday situation involving motion in distance-time graphs. One reason scientists do this is to help explain motion, including the differences between things like velocity and acceleration by showing trends and patterns in the measurements recorded as objects move.

  e.g., This lesson should help you to develop your thinking about the relationships between the individual aspects of motion (variables) like *distance, time, velocity* and *acceleration*.

Component 3: Lesson Language Practice

Time: 5 mins

- Read out difficult or unfamiliar words or phrases and ask the students to read them to themselves and then out loud as a class; e.g.:

  Velocity; Accelerate; Stationary; Uniform; Constant; Straight line; Curved line

- Ask students the difference between a ***straight line*** *and a* ***curved line.***
  Sample student responses: *"A straight line does not bend; a curved line is not straight – it is like when you bend a plastic ruler, you get a curve".*
- Ask students what they think it means to have a ***smoothly curved line.***
  Sample student responses*: "It means the line curves in a uniform way rather than in a jagged or erratic way."*

Component 4*:* Lesson Activity

Time: 25 mins

Component 4A

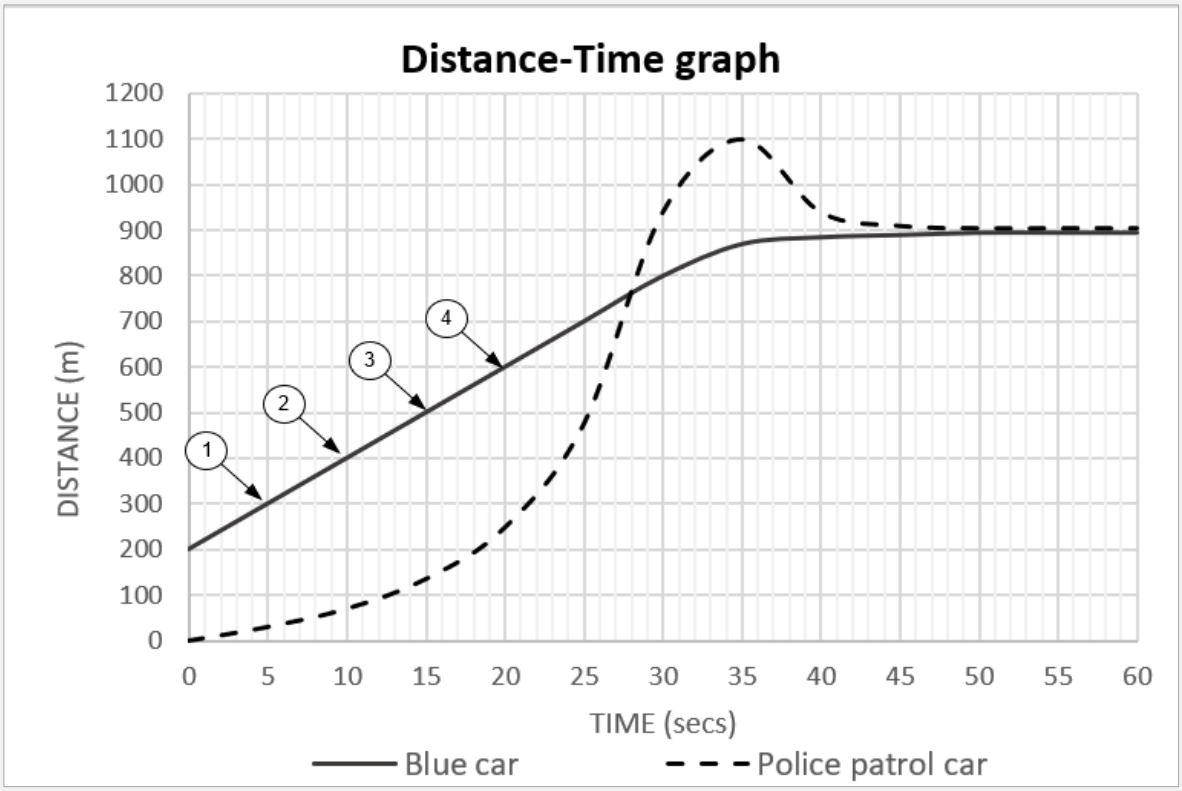
- Refer students to the main lesson stimulus and **orient them to the text**.
- Ask the students if there are any words that they are not familiar with and give descriptions of any words that may be problematic.

Lesson Stimulus

Acceleration can catch you out!

A police officer (The pulisya) witnesses a blue car going through a red traffic light. The car seems to be traveling at a uniform velocity, but it also seemed to the police officers to be traveling faster than the allowable 50 speed limit. The police officer chased the car, accelerating his patrol vehicle from a stationary position.

The graph below shows the motion of the blue car and the police officer's patrol vehicle.



Use the information in this stimulus to answer the questions below.

- Use this information to answer questions in Component 4B and Component 4C.

Component 4B

- Students read the following questions and answer them on their worksheet first.

  Q1. How long does it take for the police officer to pull over or stop the driver of the blue car?

  Q2. What are some ways the two vehicles have moved in this scenario?

  Q3. At any time, did the blue car accelerate? How do you know?

- Observe students' answers. Ask the students to volunteer their answers. Select good sample answers for students to write down. These may come from students or from the following sample answers.

Sample answers:

Q1. Between 50-60 seconds; about 1 minute.

Q2. The blue car was traveling with uniform or constant motion [until the police officer pulled it over (about 25 secs)]. The plotted line for the blue car is a straight line from 200m-700m.

The patrol car accelerated to catch the blue car. The plotted line for the police car is a curved line from 200m-800m.

The blue car began to slow down after 25 seconds.

The patrol car began to slow down after 30 seconds.

Q3. The blue car 'accelerated' after 25 seconds because it **changed its velocity**. In science, **any change in velocity** is '**acceleration'**, even if it is slowing down.

Component 4C

- Students read the following questions and answer them on their worksheet.

Q1. What is a quantity that is used in the stimulus to describe or measure motion?

Q2. a. From the information in the stimulus, what tells us if the blue car or the police car was stopped?

b. What was the velocity of the blue car when it went through the red light?

Q3. **(Optional)** *If the police car did not stop the blue car, could we* ***predict*** *how long it would take to travel 1 kilometer?*

- Observe students' responses, giving encouragement. Ask students to volunteer their answers, giving positive feedback. Select good sample answers for students to write down. These may come from a student or from the following sample answer.

Sample answers:

Q1. distance; time, speed, velocity, acceleration.

Q2. The *police car was stopped (stationary) when the blue car went through the red light.*

The blue car was stopped when the police car pulled it over – but from the stimulus, we only know that from the graph showing the blue car and police car being at 900m from 50-60 sec.

Q3. We can use v=d/t to calculate the velocity before the car slows down using information read from the graph; e.g., between points 1 and 2, we can read that the blue car traveled 100m in 5 seconds. That equals 100m/5s = 20m/s. Between points 3 and 4, we can also read that the blue car traveled 100m in 5 seconds. That equals 100m/5s = 20m/s. So, the slope of the graph for the blue car when it went through the lights is the same, so it was traveling at 20m/s. This is at a uniform velocity.

Q4. Yes, just extend the straight part of the blue line up the graph and read off the time at 1000m (1km) – it would be 40 seconds when the blue car reached 1 kilometer.

Component 5: Lesson Conclusion

Time: 5 mins

The focus of the lesson was on learning how we can represent an everyday situation involving motion in distance-time graphs.

1. *Did you enjoy the scenario for this lesson? Why?*
2. *How has the lesson helped you to represent motion scientifically?*
3. *Which questions were easy to answer – the ones in Component 4B or Component 4C? Why?*
4. *What strategies do you use to answer the harder questions?*

Science Grade 7 Lesson Plan 18

Thunder and Lightning – very, very frightening!

Key Idea

Applying Science knowledge and skills to everyday situations can be very useful to understand and respond to the world around us.

Component 1: Short Review

Time: 7 mins

- Ask students to answer the following questions on their worksheet first.
  Q1. What is lightning?

  Q2. What forms of energy can be identified during a violent storm?

  Q3. What are some ways that the different forms of energy in a violent storm are related to each other?
- Ask students to volunteer their answers, giving positive feedback. Read out a sample answer for students to listen to and write down. This may come from one of the students or from the sample answers below.

Sample answers:

Q1. A bright flash in a storm or a short duration natural discharge of static electricity/electrical energy in a storm.

Q2.
- *Light energy,*
- *Sound energy,*
- *Electrical energy (static electricity),*
- *Kinetic/movement energy; wind energy.*

Q3. When *electrical energy is discharged between clouds and the ground, light energy and sound energy are suddenly released.*

Component 2: **Lesson Purpose/Intention**

Time: 3 mins

- This lesson is about practicing how to apply scientific ideas that we have learnt this week about motion to an everyday situation.
  e.g., We want to know and understand how to apply the concepts of displacement and velocity to a moving thunderstorm system.

Component 3: Lesson Language Practice

Time: 5 mins

- Read out difficult or unfamiliar words or phrases and ask the students to read them to themselves and then out loud as a class; e.g.:

  Thunder; Lightning; Velocity of sound; Velocity of light; 3,000,000 (3 million)
- Ask students the difference between:
  *'**300**'* and *'**3,000**'* and *'**30,000**'* and *'**300,000**'* and *'**3,000,000**'.*
- Ask students to sound out the words ***Thunder*** and ***Lightning.*** Maybe they could put them into a sentence or a rhyme – like the lesson title.

Component 4: Lesson Activity

Time: 25 mins

Component 4A

- Refer students to the main lesson stimulus and **orient them to it** [if needed, point out:
  - The map and its dimensions using the scale [the map represents an area of about 11 km x 7 km];
  - The compass to show direction;
  - The symbol used for the storm; and the storm's size – about 1km wide!
  - What 'Your Position' means.
- Ask the students visualize being at the 'your position' mark and imagine seeing flashes of light followed by sharp thunderclaps. Slow counting to 10 in their mind will help their visualization.

Component 4A: Lesson Stimulus

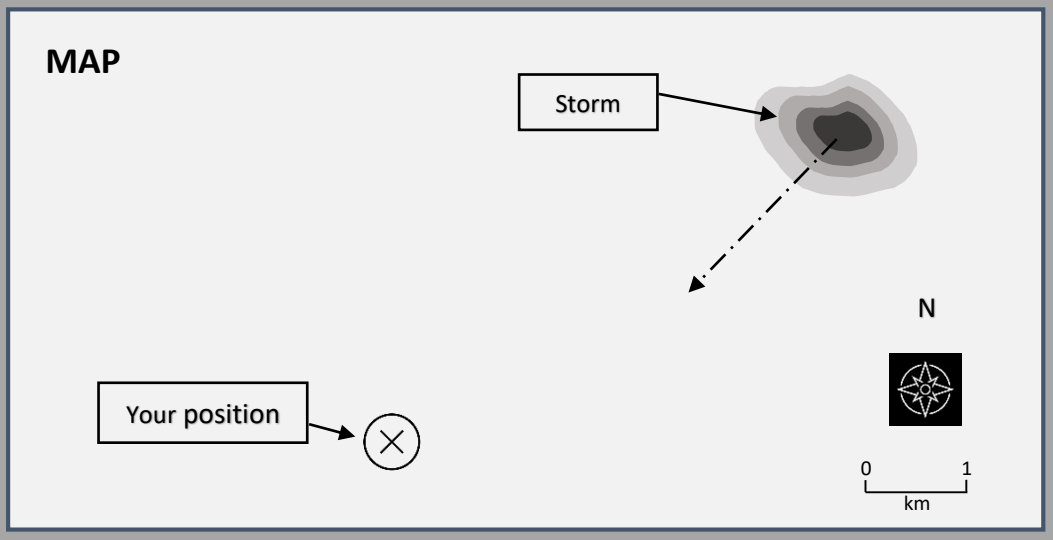
Here comes a big storm – how close is it?

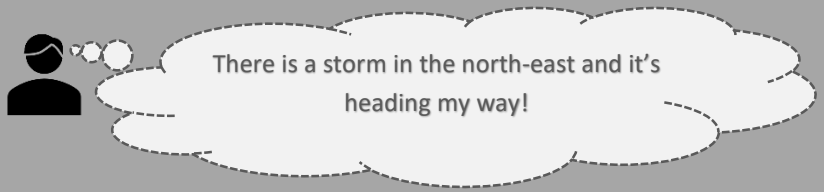
Light travels faster than sound. That is why, if we are watching a storm, we usually see lightning before we hear the thunder.

Light travels close to 3,000,000 meters per second (3,000,000 m/s). That is about 10,800,000 kilometers per hour! That is so fast that if a storm is approaching, the lightning reaches us in a fraction of a second after it is produced in a thunder strike.

Sound travels much more slowly through the air of Earth's atmosphere. Its velocity is about 350 meters per second (350 m/s). That is about 1,260 kilometers per hour.

So, if you count the number of seconds between when you see a storm's lightning and when you hear its thunder, you can calculate how far the storm is away from you!





Component 4B

- Students read the questions and answer them on their worksheet.

  Q1. What is the velocity of sound in air?

  Q2. A rocket that takes cargo to the International Space Station travels faster than sound shortly after take-off. What are some other things that can travel faster than sound travels in air?

  Q3. Write a statement that compares, or shows a relationship between, *Velocity of sound* and *Velocity of light.*

- Observe students' answers. Ask the students to volunteer their answers, giving positive feedback. Select good sample answers for students to write down. These may come from students or from the following sample answers.

Sample answers:

Q1. • About 350 meters per second

Q2. • Supersonic jet fighter planes (about 3,500 km per hour);
- The Concorde (up to 2,179 km per hour);
- The tip of a whip when the whip is cracked;
- A space rocket (escape velocity is 40,250 km per hour),
- Sound through water (about 1500 m/s or 5400 km per hour)
- Sound through steel (about 6000 m/s; or 21600 km per hour - over 17x faster in air).
- Light

Q3. • The Velocity of sound is slower than the Velocity of light.
- The Velocity of light is a lot faster than the Velocity of sound.
- The Velocity of light is about 8500 times faster than the Velocity of Sound

Component 4C

- Students read the following questions and answer them on their worksheet.

  Q1. Which of the following is the best approximation of how long the light from a lightning strike takes to reach us if it occurs 10 kilometers away? ✓ Tick your answer:

  A: much less than 1 second . . . .☐
  B: about 1 second . . . . . ☐
  C: about 5 seconds . . . . . ☐
  D: about 10 seconds . . . . . ☐

  Q2. If we see a lightning strike and count 15 seconds before we hear the thunder, how far away is the storm?

  Q3. **(Optional)**

  a. If in 10 mins the gap between the storm's lightning and its thunder **is now 4 seconds**, how fast is the storm traveling towards you?

  b. How would a scientist describe the motion of the storm?

- Observe students' responses, giving encouragement. Ask the students to volunteer their answers, giving positive feedback. Select good sample answers for all students to write down. These may come from the students or from the following sample answer.

Sample answers:

Q1. Option *A is correct.*

Q2. $v = d/t$ [or 350 m/s = d/15sec]
therefore $d = v \times t$ = 350m × 15 = 5250m = about **5.2 km away**

Q3. a.
$v = d/t$; [or 350 m/s = d/4sec]; therefore $d = v \times t$
So, distance = $d \times t$ = 350m × 4 = 1400m = 1.4 km away
So, in 10 mins the storm has moved from 5.2 km to 1.4 km = 3.8km.
Storm moves 3.8 km in 10 mins = **22.8 km/hr.**

Alternative way to work out or 'calculate':
[1 hour = 6 × 10 mins.] So, 6 × 3.8 km in 10 mins.

Therefore in 60 mins the storm would move = 3.8 × 6 = **22.88 km/hr.**

b. The storm is moving with a velocity of approximately 22.8 kilometers per hour in a South-westerly direction.

Lesson Conclusion

Time: 5 mins

- *The focus of the lesson was on* practicing how to apply scientific ideas that we have learnt this week about ***motion*** to an everyday situation*?*
- *Has the activity helped you to think more deeply about the motion of objects in different situations? How?*
- *What did you enjoy about the lesson?*
- *What is something you would like to learn more about in this topic?*

NOTE: Remember to collect student worksheets to review and analyze student's learning.

For inquiries or feedback, please write or call:

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