8

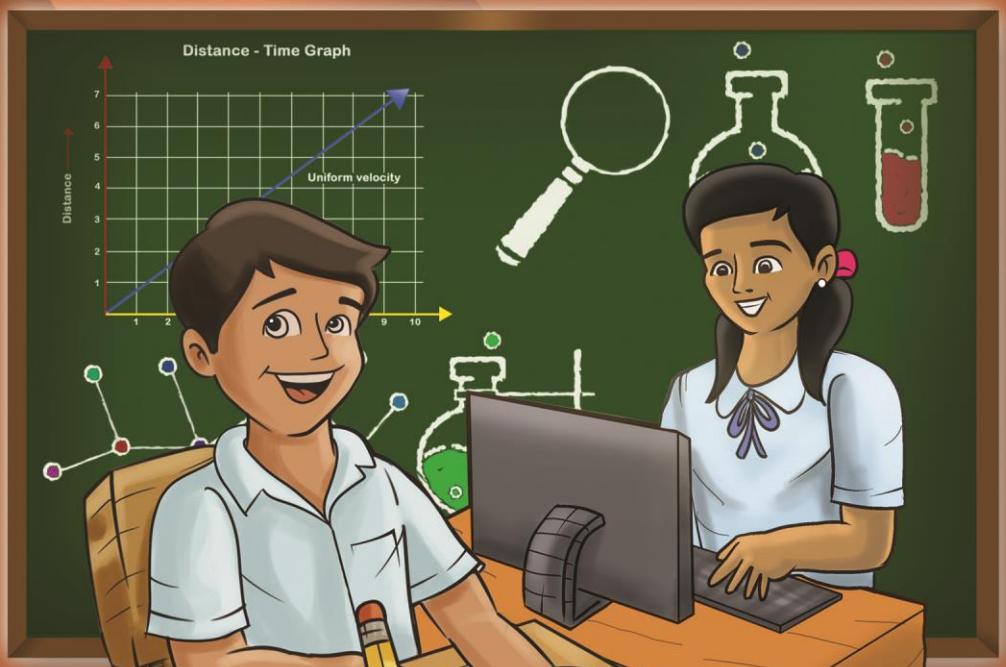
NATIONAL LEARNING CAMP

DepED DEPARTMENT OF EDUCATION

Science

Enhancement Learning Camp

Lesson Plans



Enhancement Learning Camp

Lesson Plans Booklet

Science Grade 8

Weeks 1 to 3

Contents

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 subtler and more 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. These needs have to be practically limited 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 a repeated exposure associated with elaborating, 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, all but 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 8 Lesson Plan 1

Balanced and Unbalanced Forces

Key Idea

Net Force is the sum of all the forces acting on an object; When the forces acting on an object are balanced, there is no net force (F_{net}) and so the object will not move. When the forces acting on an object are unbalanced, there is net force (F_{net}) and so the object will move.

Component 1: Short Review

Time: 7 minutes

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

  Q1a. What does the word ***balance*** mean in everyday terms?

  Q1b. What does the word ***force*** mean in everyday terms?

  Q2. What does ***balance*** mean in scientific terms when we are referring to ***forces***?

  Q3. How could you illustrate or represent ***balanced forces***? (you can use words, symbols, or drawings)

- Ask students to volunteer 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:

Q1a. • *When something is stable.* • *Equal.* • *Not falling over.*

Q1b. • *To break something open, like to force a door open;*
- *A (force) field,*
- *A push or a pull;*
- *Something that makes things move (accelerate) – like a magnet pulling a metal toy.*

Q2. • *The forces are the same.*
- *The forces are cancelling each other;*
- *One force counteracts the other.*

Q3. • some possible representations:  ,  ,  ,  ,  ,  .(others could include: A seesaw; A balance beam for gymnastics; Pushing the palms of your hands together; Standing on one foot, etc.)

Component 2: **Lesson Purpose**

Time: 3 minutes

This lesson is about balanced and unbalanced forces and how forces can affect the way an object moves. The lesson may also help student to be better at using symbols to communicate information in science.

Component 3: Lesson Language Practice

Time: 5 minutes

- 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.:

  Force; Same direction; Opposite direction; Cancel; Representations; Situations

- Ask the students to practice saying the words.

Component 4*:* Lesson Activity

Time: 25 minutes

Component 4A

- Refer students to the main lesson stimulus pointing out that it includes *symbolic representations* of forces that help explain what is happening.
- Read out the written 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.

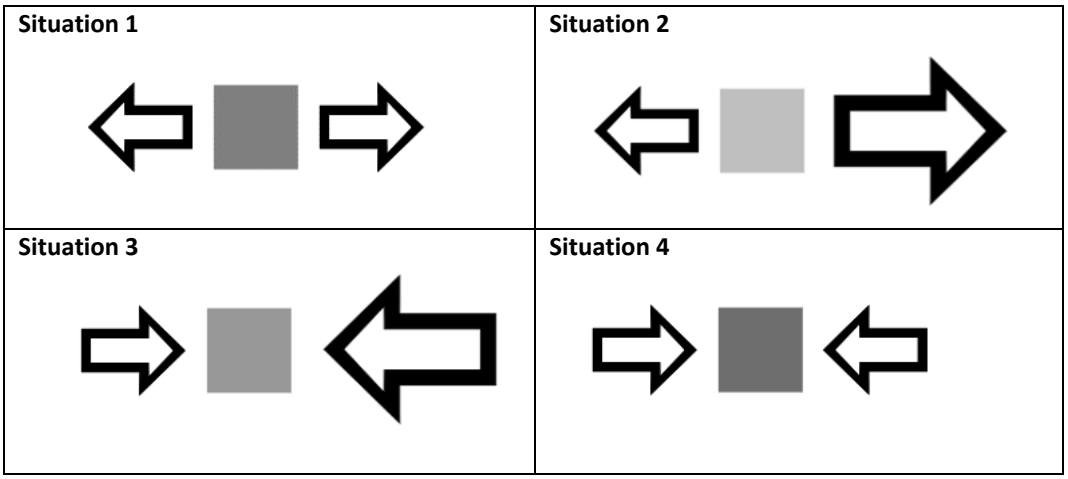
Balance and Forces

Here are two statements about forces and balance:

1. *Equal forces acting in opposite directions in the same line cancel each other and are described as being 'in balance'.*
2. *The movement of objects is changed if the forces acting on them are not 'in balance'.*

[Reference: *Working with Big Ideas of Science Education*; Wynne Harlen, IPA, 2015]

These statements relate to four representations of forces (⇨ or ⇦) acting on some square objects (■, ■, ■, and ■,) as shown here:



Component 4B

- Read out the following questions and ask students to answer in the space on their worksheet.
  Q1. What does ***Equal forces*** mean?

  Q2. What are some ways that the *motion* of objects might be changed?

  Q3. What needs to happen for a *force* to change an object's *motion*?
- 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 answer.

Sample answers:

Q1. The same sized forces – two or more.

Q2. • *They could start moving from being still (i.e., accelerate).*
- *They could speed up (i.e., accelerate).*
- *They could slow down (i.e., accelerate).*
- *They could change direction (i.e., accelerate).*
- *They could stop moving.*

Q3. • *If an object is still, you would need to apply a force to it to make it move (like push it or pull it).*

- *If an object is moving, you could apply a force to it to make it slow down, to make it change direction, or to make it go faster.*

Component 4C

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

  Q1. The stimulus shows four ways to represent *forces* using *symbols*. Which situations are representing *balanced forces*?

  Q2. Assuming the square objects are the same *size* and *mass* (weight), what do you *predict* would be the movement of the objects in each situation when the *forces* represented were *applied* to the objects?

  Q3. **(Optional)** Write a general statement that describes the relationship between *forces* and the *motion* of an object?

- 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 answer.

Sample answers:

Q1.
- *Situation 1;* or
- *Situation 4*
- *Situation 1 and Situation 4* (a great answer!)

Q2.
- *The object in situation 1 will not move.*
- *The object in situation 2 will move to the right.*
- *The object in situation 3 will move to the left.*
- *The object in situation 4 will not move.*

Q3.
- *If the forces acting on an object are balanced, the object will not move.,* or
- *If the forces acting on an object are unbalanced, the object will move.,*
- *If there is no net force, the object will not move.,* (a great technical answer)
- *If there is a net force, the object will move.* (a great technical answer)

Component 5: Lesson Conclusion

Time: 5 minutes

1. What did you learn from this lesson?
2. What are some things you enjoyed about the lesson?
3. What is something you would like to learn more about in this topic?

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

Science Grade 8 Lesson Plan 2

Let's Get Rolling!

Key Idea

A force acting on an object is not seen directly but is detected by its effect on the object's motion or shape.

Component 1: Short Review
Time: 7 minutes

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

  Q1. What does ***force*** mean in Science?

  Q2. What are some *forces* we can recognize in our daily lives?

  Q3. What *forces* interact when you slide down a playground slide?

- Ask students to volunteer 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
- *A force is an influence that causes an object to change its velocity.*
- *A push or a pull.*
- *Something that makes things move (accelerate).*

Q2.
- *When you kick a football – (Applied force)*
- *The force that makes you feel you heavy; weight; – (Gravity)*
- *Attracting force of metal to a magnet – (Magnetic)*
- *The static in your hair when you brush it in dry weather – (Electrostatic)*
- *Force that holds you up or pushes back against gravity – (Normal force).*

Q3.
- *As you climb up to the top of the slide, you are climbing against gravity.*
- *When you slide, gravity pulls you down, but friction makes your legs and hands feel hotter.*
- *When you slide, you can feel gravity pulling you down and you can feel the force of the slide pushing up, but friction slows you down a bit too.* [Great answer].

Component 2: **Lesson Purpose/Intention**
Time: 3 minutes

The lesson is about how forces act on an object to have an effect on the object's motion, even though the forces involved **cannot be seen directly**; Maybe they can be **detected** by the effect the forces have on the object's motion?

Component 3: Lesson Language Practice
Time: 5 minutes

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

  Experiment; Detect; Identical; Launch; Gravity; Friction

- Ask the students to practice saying the words.

Component 4*:* Lesson Activity

Time: 25 minutes

Component 4A

- Refer students to the main lesson stimulus. Read out the written text. Ask the students if there are words that are not familiar and give descriptions of any words that may be problematic.

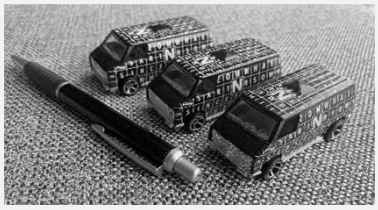
Building a Force Detector

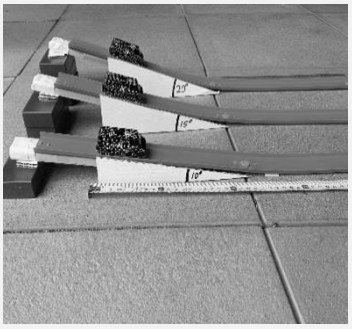
A ***force*** is an influence or interaction that causes an object to change its velocity. A force can be a push or a pull.

Two students decided to try to build a model that would allow them to show that a force acting on an object must exist, even if you cannot see it. To test their thinking, they conducted an *experiment* to see if a force can be detected by the *effect* of the force on an object's *motion*.

Here are some pictures of their experiment:

They used three identical toy cars to be launched from the same starting point to run on three identical tracks. The only thing they changed was the angle of the launch ramps because they knew that the force of *gravity* acting on each car is the same – but by using a different angle for each car, they could accelerate each car differently.





Their teacher said to them "Without the forces of *friction* and *air resistance* to slow the cars, the cars would just keep running right across the floor until they hit something! However, the experiment will be valid because *friction* and *air resistance* would be the same for each car because they used identical cars.". The students collected their data:

EXPERIMENTAL DATA		**Distance cars travel** (cm)			
Car	Ramp angle	Trial 1	Trial 2	Trial 3	**Ave distance travelled**
1	10^0	69	74	82	**75**
2	15^0	107	105	115	**109**
3	20^0	140	149	146	**145**

In summary, the students wanted to see if a greater force resulted in a car moving further. They reasoned that a car moving a greater distance along the flat track indicated that the initial force applied to the car was greater.

Component 4B

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

Q1. What is an *experiment*?

Q2. What things did the students *keep the same* in their *experiment*?

Q3. What do the student's *results* (*data*) show?

- Observe students' answers. Ask the students to volunteer 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 answer.

Sample answers:

Q1. • *A practical investigation.*

Q2. • The cars; or The weight of the cars; or The size and shape of the cars;
- The type of track;
- The length of track that was flat on the ground;

Q3. • *That Car 3 moved further than Cars 1 & 2, and that Car 2 moved further than Car 1.*
- *That the greater force resulted in a car moving the greatest distance – so the movement of the car indicated the strength of the force acting on the car as it ran down the ramp.*

Component 4C

- Read out the following questions and ask students to answer in the space on their worksheet.
  Q1. What is a *force*?

  Q2. What did the two students want to show with their *experiment*?

  Q3. **(Optional)** Were the students able to *detect* a *force*? Explain.

- Observe students' answers. Ask the students to volunteer answers, and 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 answer.

Sample answers:

Q1. • An influence or interaction that causes an object to change its velocity, or
- A push, or
- A pull

Q2. • That a force acting on an object must exist, even if you cannot see it, or
- If a force can be detected, or
- If a greater force resulted in a car moving further.

Q3. • Yes; *If a force exists, it will cause the cars to move – the larger the force, the further the cars will move. The results show this so the students can conclude that a force exists.*

Component 5: Lesson Conclusion

Time: 5 minutes

1. Could you find any answers in the Stimulus text for questions in Component **4B** or **4C**? Which ones?
   Q2. and Q3. in Component 4B, and Q1. and Q2. in Component 4C; Answers to these questions are all available directly in the text.
2. What differences do you notice between questions in **4B** and **4C?**
   Component 4B was mostly focused on knowledge and skill about scientific investigations – the practices and process of science. Component 4C was mostly focused on knowledge and understanding of *forces*.
3. Did you find it easier to answer the questions in Component **4B** or **4C**? Why?

> 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.

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

Science Grade 8 Lesson Plan 3

Newton's First Law – the Law of Inertia

Key Idea

An object at rest will remain at rest until acted upon by an unbalanced force, and an object in motion will stay in motion unless acted on by an external force. [Newton's First Law]

Component 1: Short Review
Time: 7 minutes

- Ask students to answer the following questions on their worksheet.
  Q1. What is a *force*?
  Q2. What is *gravity* and how does it affect our lives?
  Q3. Write a sentence using the words '*gravity'* and '*force'* to say how they affect common everyday situations.
- Ask students to volunteer 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.
- *A force is an influence that causes an object to change its velocity.*
- A push or a pull;
- Something that makes things move (accelerate).

Q2.
- *A force*.
- It pulls things down to the ground.
- Gravity is invisible but causes things to drop.
- Gravity is attractive. It keeps the planets going around the sun.

Q3.
- *Gravity is a force.*
- Gravity is the force that pulls objects towards the ground/center of the Earth.
- Gravity is an invisible attractive force that existed between all things that have mass.

Component 2: **Lesson Purpose/Intention**
Time: 3 minutes

The lesson is about the scientific law that explains how forces affect the motion of objects, including the motion of small objects like golf balls and really large objects like the Earth and other planets.

Component 3: Lesson Language Practice
Time: 5 minutes

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

Balanced; Unbalanced; Rest; Inertia; Remain; Gravity; External; Tendency;

- Ask the students to practice saying the words.

Component 4*:* Lesson Activity
Time: 25 minutes

Component 4A

1. Refer students to the main lesson stimulus and help them to see the *scientific* and *everyday* information and language.
2. Read out the written 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.

Information about Inertia

Newton's First Law – the *Law of Inertia*:
*An object at rest will remain at rest until it is acted upon by an unbalanced **force**, and an object in motion will remain in motion unless it is acted on by an external **force**.*

A non-scientific meaning of *Inertia*:
A tendency for an organization to do nothing or to remain unchanged.

The following are all examples of everyday situations that can be used to describe the Law of Inertia:

1. A shinny glass marble rolling over a smooth flat floor.
2. A bicycle moving forward even after peddling is stopped.
3. A drinking glass sitting on a table.
4. Rolling a heavy tenpin ball straight down the center of a bowling alley lane.
5. The motion of a heavy tenpin ball as it knocks the pins over.
6. A golf ball sitting on a golf tee before the golfer hits it down the fairway.
7. A house built in an earthquake zone just before it is destroyed by an earthquake.
8. The motion of a hockey ball that is hit along the ground between two players.
9. A spacecraft when it is cruising between the planets Earth and Mars.

Component 4B

- Read out the following questions and ask students to answer in the space on their worksheet.
  Q1. The word '*remain'* is used three times in the information provided about *Inertia*. What is another word that means the same as '*remain'*?

  Q2. Which of the 9 examples describe objects that are *at rest*?

  Q3. What are the important differences between the Scientific and Non-scientific meanings of '*inertia'*?
- 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 answer.

Sample answers:

Q1. • *Stay,* or *keep,* [Do not accept the terms '*stop',* or *'travel'*]

Q2. • Numbers 3, 6, and 7.

Q3. • *The Scientific meaning of 'inertia' describes objects that are either still or moving and indicates that a force can cause a change; The Non-scientific meaning does not describe organization movement and does not tell what could change it.*

[NOTE: Science has a more precise meaning, which is common; but when science words are appropriated for everyday usage, they often lose their precision.]

Component 4C

- Read out the following questions and ask students to answer in the space on their worksheet.
  Q1. What is *gravity* and how does it affect objects?

  Q2. What *forces* are acting in Example 1. '*A shinny glass marble rolling over a smooth flat floor*.'?

  Q3. **(Optional)** Choose one **other** example and describe the *balanced* and/or *unbalanced forces* that are acting in the example. You can use a labelled diagram to display your thinking as well?

- Observe students' answers. Ask the students to volunteer their answers, giving positive feedback. 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 answer.

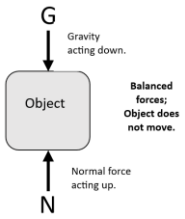
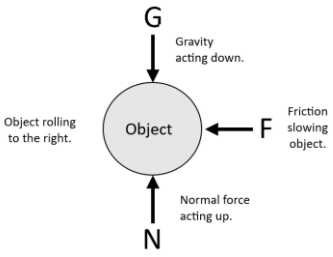
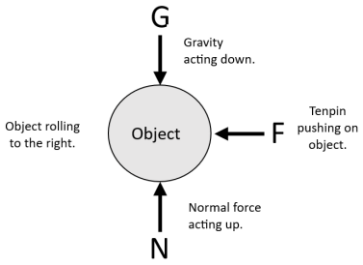
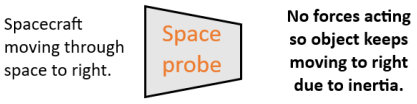
Sample answers:

Q1.
- *Gravity pulls things down; it makes things fall to the ground.*
- *Gravity is a force – it pulls all objects towards the center of the Earth.*
- *Gravity is a pulling force – it attracts things that have mass.*

Q2.
- *Gravity (pulling the marble down).*
- *Normal or reaction force (The floor pushing up on the marble).*
- *Friction and/or air resistance (slowing the marble down).*

[**NOTE: Only** support an answer of '*The push force'* or '*The force making the ball roll*' **if it is clear** the student is referring to the force initiating the ball to roll. A common misconception is that the initiating force is acting on the object all the time to push it along – which is contrary to Newton's First Law.]

Q3. • See stylized sample responses below. Note that if students use arrows to show the direction an object is moving, make sure they do not confuse the direction of movement as the *forces* acting on the object.

Examples	Forces acting	Sketch samples (arrows indicate acting forces)
3, 6, and **7**	***Balanced***: Gravity and normal ***Unbalanced***: 0, therefore no movement	
2, 4 and **8**	***Balanced***: Gravity and normal ***Unbalanced***: Friction/air resistance slowing object	
5	***Balanced***: Gravity and normal ***Unbalanced***: Friction/air resistance and tenpin slowing object	
9	*There are **no forces** (balanced or unbalanced) acting on the probe, t*herefore the object continues to move with constant velocity. The probe is moving with ***inertia*** until it is influenced by the gravitational attraction of Mars.	

Component 5: Lesson Conclusion

Time: 5 minutes

1. *The focus of the lesson was on learning about how forces affect the motion of objects. How has the lesson helped you to describe forces?*

2. *Has the activity helped you to think about forces in everyday life? Which ones?*

3. *What did you enjoy about the lesson?*

4. *What is something you would like to learn more about in this topic?*

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

Science Grade 8 Lesson Plan 4

Crash – Force Can Make the Difference.

Key Idea

For any given object, a larger force causes a larger change in motion. [Newton's Second Law]

Component 1: Short Review
Time: 7 minutes

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

  Q2. What can happen in a crash?

  Q3. If people are involved in a crash, what can happen and why?
- Ask students to volunteer 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
- *When something runs into something else.*
- *A collision.*
- *A car crash.*

Q2.
- *Things can bend and twist or snap/break/shatter.*
- *A car crash can cause lots of damage.*
- *When a truck runs into the back of a car or bike, the car or bike can be forces forward.*

Q3.
- *If a car hits someone, it can do a lot of damage because it is heavier and harder than them.*
- *People in a car crash are thrown forward because the car stops but the people keep going unless seatbelts save them.* [Great answer, describing *inertia*].

Component 2: **Lesson Purpose/Intention**
Time: 3 minutes

The lesson is about how larger forces can cause a larger effect on other objects. The lesson is designed to lead students to a deeper understanding of Sir Isaac Newton's Second Law involving a quantitative relationship between *Force, Mass* and *Acceleration*

Component 3: Lesson Language Practice
Time: 5 minutes

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

  Investigating; Collision; Conducted; Wondered; Identical; Mass; Acceleration
- Ask the students to practice saying the words. Which are words that have a special meaning in science?

Component 4*:* Lesson Activity

Time: 25 minutes

Component 4A

- Refer students to the main lesson stimulus.
- Read out the written text. Ask the students if there are any words that they are not familiar with and give descriptions of any words that may be difficult.

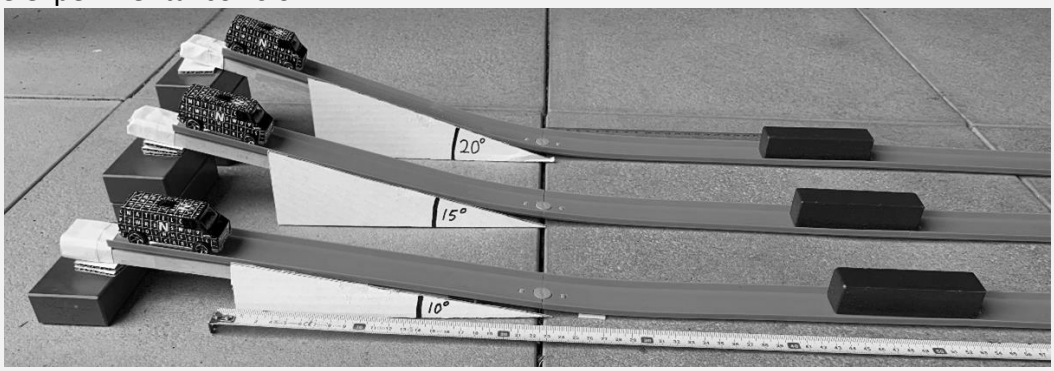
Lesson Information box:

Investigating Force and Mass

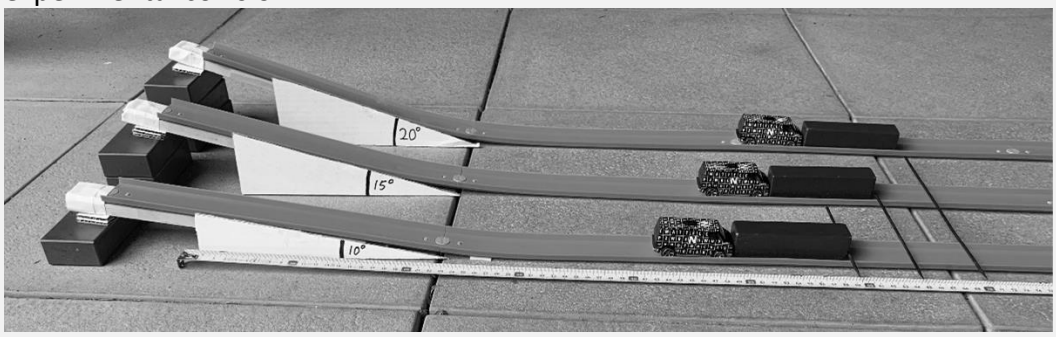
One of the students who did the experiment with toy cars in Lesson 2 decided to see what forces can do to objects. She conducted an *experiment* to see what happens when the toy cars collide with wooden blocks – She wondered, *Will the block all get moved the same distance?*

She again used three identical toy cars. She placed three identical wooden blocks on the tracks 30 cm from where the cars would be running on flat ground. She made sure the cars were all the same distance from the wooden blocks. She again used ramps set at different angles to give each car a different acceleration. Here are some pictures of her experiment.

Before experimental collision:



After experimental collision:



The student's teacher thought the experiment will be valid because she used identical cars and so *any friction* or *air resistance* would be the same for each car.

Here are her experimental results.

EXPERIMENTAL DATA			**Distance the blocks moved after collision** (cm)			
Car	Ramp angle	Acceleration	Trial 1	Trial 2	Trial 3	**Ave distance travelled**
1	10^0	low	5	4	6	**5**
2	15^0	medium	9	14	10	**11**
3	20^0	high	16	17	15	**16**

Component 4B

- Read out the following questions and ask students to answer in the space on their worksheet.
  Q1. What does the scientific term '*mass*' mean?

  Q2. If toy cars are the same, what *scientific properties* do they all have that are the same?

  Q3. What did the student do to ensure that each car could apply a different *force* to act on the blocks?
- 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 answer.

Sample answers:

Q1. • Mass is a measure of the amount of matter in an object*. / SI units are kilograms (kg), but it can be measured in grams (g) as well.*

Q2. • Same weight.
- Same size.
- Same types of wheels.
- Same color. [not important to the experiment]
- Same labels. [not important to the experiment]

Q3. • *She set the three ramps at different angles. She set them to increase angle by 5^0 from the lowest ramp. This ensured there was an increase in force as the cars were set at a higher point amount.*

Component 4C

- Read out the following questions and ask students to answer in the space on their worksheet.
  Q1. What was the *average distance* travelled by Car Number 2?

  Q2. What things did the student need to *measure* accurately?

  Q3. **(Optional)** What do the *experimental results* show?
- Observe students' answers. Ask 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 answer.

Sample answers:

Q1. • *11 cm.*

Q2. • The angles of the ramps.
- The distance the blocks were set before collision.
- The distance the blocks moved after collision.

Q3. • A larger force causes a larger change in motion. or
- The greater the acceleration, the greater force applied to the blocks*. The experiment indicates that the force applied by the cars is proportional to the acceleration of the cars.* [A great answer indicating understanding of F = ma]

Component 5: Lesson Conclusion

Time: 5 minutes

1. Which questions were easy to answer – the ones in 4B or the ones in 4C? Why?
2. What strategies do you use to answer the harder questions?

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

Science Grade 8 Lesson Plan 5

A Balloon Rocket

Key Idea

When one object exerts a force on a second object, the second object exerts an equal opposite force on the first object. The size of the force on the first object equals the size of the force on the second object. [Newton's Third Law].

Component 1: *Short Review*

Time: 7 mins

- Ask students to write down their answers in the space provided on their worksheet.

  Q1. What is a rocket?

  Q2. What are rockets used for?

  Q3. How can we safely investigate how rockets work if they are usually dangerous vehicles?

- 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:

Sample answers:

Q1. A rocket can be a tall round vehicle that flies into space.
A rocket can be a type of engine – one that produces gases out the end to push a vehicle .

Q2. Space rockets are used to get space vehicles (payloads, shuttles, space probes) into space.
Skyrockets are a type of fireworks that uses the burning of solid fuel to create gases that push the rocket into the sky.
Meteorological rockets carry weather instruments in the atmosphere.
Water rockets use a jet of water to push machines out of a water pool or lake – people can ride on them.
There are toy rockets that use compressed air and/or water to propel objects.

Q3. We can make models of rockets using safe propellants like air and water.

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

Time: 3 mins

- Explain to the students that this lesson is about reinforcing that models can be used to show that when an object exerts a force on an object (an *action*), there is an equal and opposite force acting (called a *reaction*).

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, e.g.:

exert; action; reaction; p***ropel;***

- Ask the students to practice saying the words.
- It might be useful to ensure all students understand the meanings of the terms provided as these will be important to understand the questions in the main lesson activity.

Component 4*: Lesson Activity*.

Time: 25 mins

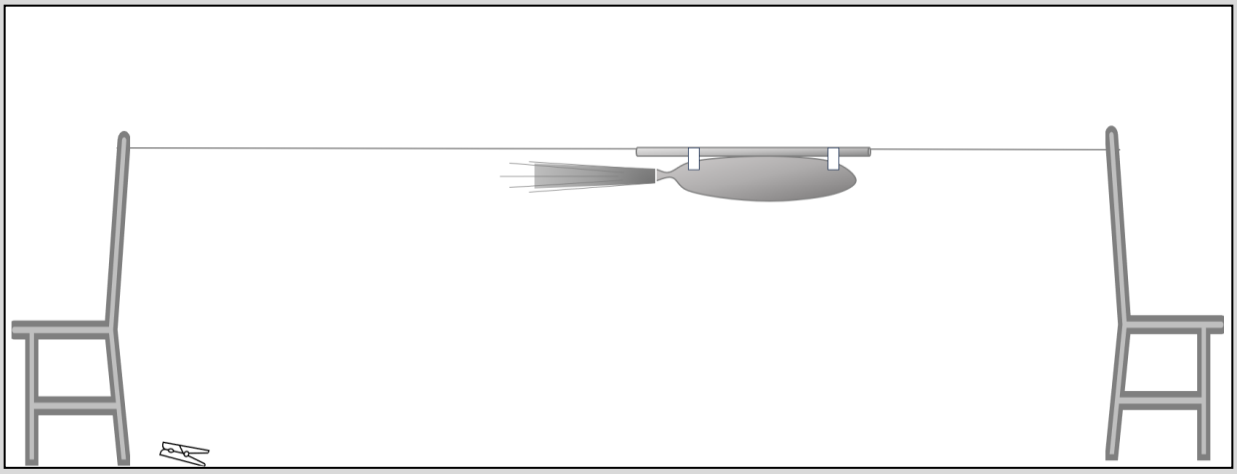
Component 4A

Making a balloon rocket

Angela made and tested a model balloon rocket. She wanted to find out how fast the model rocket would travel.

The model rocket was a long balloon. To guide the model rocket she put a string line through a drinking straw and then tied the string line between two chairs, positioned about 5 meters apart. She then attached the model rocket to the drinking straw with sticking tape.

Once Angela blew up the balloon with air, she tied the end with a twist and then with a peg to hold in the gas. When Angela released the peg, the balloon rocketed along the string line between the chairs in about 2 seconds.



Component 4B

- Read out the following questions and ask students to answer in their worksheet.
  Q1. Why did Angela need to use a string line for her model rocket?

  Q2. What are the factors (variables) that Angela will need to measure?

  Q3. How fast did the rocket travel?

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

Sample answers:

Q1. Without the string line the model rocket would fly randomly around the room.

Q2. Angela would need to measure the distance the rocket travelled and the time it took to travel the distance, (so she could determine speed = distance / time).

Q3. Distance = 5 m; the time = 2 sec Therefore speed = 5m/2s = 2.5 m/s.

Component 4C

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

Q1. Angela's teacher told her that for every ACTION there is an equal and opposite REACTION. What was the ACTION in her experiment?

Q2. On the picture of Angela's model, on your worksheet, draw labelled arrows to show the size and direction of the ACTION and REACTION?

Q3. **(Optional)** *Try to visualize the working model when Angela released the peg from the balloon. What are some aspects of the motion of the model balloon rocket that you would be able to observe and explain?*

- Ask the students to volunteer their answers. Select a sample answer for all students to write down for each question. This may come from the students or from the following sample answers.

Sample answers:

Q1. The force of air rushing out of the model balloon.

Q2. Sample labelled drawing .

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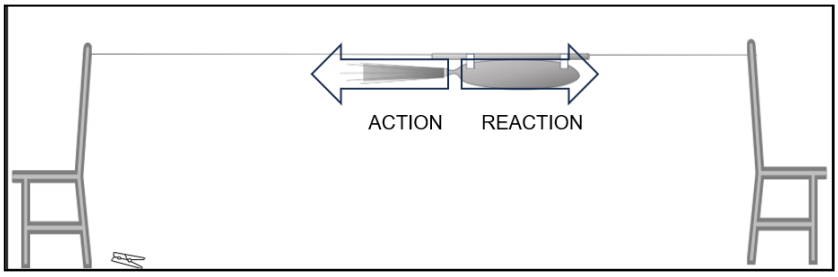


Q3. The air would rush out of the balloon due to the elastic energy in the balloon. The model balloon rocket would propel very fast to the right as soon as the air gushes out. The balloon would travel fast until the air is gone, then it would slow and stop because of the friction of the straw on the string.

Component 5: Lesson Conclusion

Time: 5 mins

- The focus of this lesson was about reinforcing that models can be used to show that when an object exerts a force on an object (an action), there is an equal and opposite force acting (call a reaction).

Q1. Has this lesson helped you to better understand using models in science? In what ways?

Q2. Were you able to visualize the rocket moving? Maybe you could make one to try?

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

Science Grade 8 Lesson Plan 6 Consolidation

Putting it All Together in a Golf Swing!

Key Idea being reinforced

When acceleration is applied to an object, the object will then travel with constant velocity (i.e., at the same speed and direction) **until** it is acted on by an external force.

Component 1: Short Review
Time: 7 minutes

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

  Q1. What is a *Scientist*?

  Q2. What things do *scientists* study?

  Q3. How do *scientists* contribute to our society?

- Ask students to volunteer 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
- *A professional person who scientifically investigates about the natural world and how it functions.*

Q2.
- *About forces, movement and energy (a physicists).*
- *How plants and animals grow and interact (a biologist)*
- *All about chemicals. (a chemist)*
- *Volcanoes and earthquakes, and the way the Earth is shaped. (a geologist)*
- [lots of others will be correct]

Q3.
- *They conduct investigations to solve complex real-world problems such as fixing local pollution, developing new medicines for COVID, developing ways to reduce global warming, establish early warning systems for earthquakes; and designing new batteries for pollution-free vehicles.*

Component 2: **Lesson Purpose/Intention**
Time: 2 minutes

The lesson is a consolidation lesson and is designed to help students to recognize that Newton's three Laws of Motion can be applied to a single situation. It is important to help students to recognize that in many situations many laws and principles of science do not occur in simple and unrelated situations. To make sense of the physical world, scientists often isolate small components in order to study each in depth and with precision.

Component 3: Lesson Language Practice
Time: 5 minutes

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

  Situations; Maximum; Acceleration; Velocity; Newton; Vertical; Horizontal

- Ask the students to practice saying the words.

Component 4*:* Lesson Activity

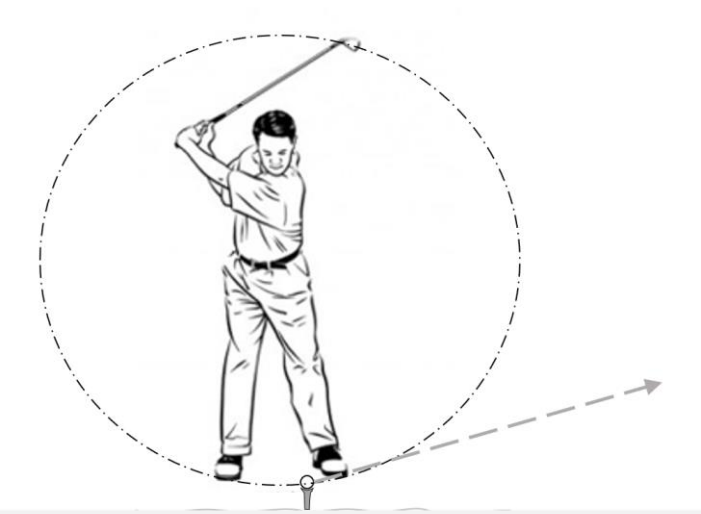
Time: 25 minutes

Component 4A

- Refer students to the main lesson stimulus ensuring they can identify with the golf example. If golf is not generally known or recognized by students, the same questions could be easily applied to a similar situation such as hitting in T-ball.
- Read out the written text.
- Ask the students if there are any words that they are not familiar with (or suggest examples such as <*insert*>) and give descriptions of any words that may be problematic.

Can we apply Newton's three Laws of Motion to a single situation?

When a golfer uses a golf club to hit a golf ball, there are basic forces involved. There are forces acting on the golf ball when it is sitting on the tee. There are forces acting on the golf club supplied by the arms of the golfer as he swings. There are forces acting on the golf ball as the golf club hits the ball. There are forces acting on the golf ball once it has left the golf club.



How do we make sense of it all?

Try using each of Newton's three laws to help you explain it to someone else.

First Law:	An object at rest will remain at rest until acted upon by an unbalanced force, and an object in motion will stay in motion in a straight line unless acted on by an external force.
Second Law:	The acceleration of an object's motion is directly related to the mass of the object and the force acting on it.
Third Law:	When one object exerts a force on a second object, the second object exerts an equal opposite force back on the first object.

Component 4B

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

  Q1. The text in the Information Box states: 'There are ***forces*** acting on the golf ball when it is ***sitting*** on the tee.' Would these forces be *balanced forces* or *unbalanced forces*?

  Q2. What does the *acceleration* of an object depend on?

  Q3. Why does the diagram in the Information Box indicate that the path of the golf ball after the club hits the golf ball is a straight line?

- 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 answer.

Sample answers:

Q1. • Balanced forces (because the ball is not moving)

Q2. • the mass of the object.
• The force acting on it.

Q3. • Because according to Newtons First Law, an object will stay in motion in a straight line unless acted on by an external force. When the golf ball is hit, it will be travelling with very high velocity, and it will not be easy to see the effects of gravity and air resistance slowing the ball until the ball is further away from the golfer.

Component 4C

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

Q1. The word '*exert*' is used three times in the information provided. What is another word that means the same as '*exert*'?

Q2. The table below describes 7 different situations that exist when a golfer is hitting a golf ball. In the table, add a tick (✓) to indicate which of Newton's Laws apply to each situation – you can select more than one Law for each situation and you can ignore *friction*, *air resistance* and *wind resistance*. [The first situation is done for you to show how to add ticks.]

	Newton's laws		
Situations occurring as the golfer swings and hits the ball	*1st*	*2nd*	*3rd*
1. When the golf ball is sitting on the tee, it does not fall off.	✓		
2. When the golf club is swung by the golfer to hit the ball, the club experiences an unbalanced force, from the golfer's arms, which produces a change in the club's velocity – it is now accelerating towards the ball.			
3. As the golf club hits the ball, it is at its maximum acceleration. (Mass of club head x Acceleration of club head = F on the club head).			
4. As the golf club hits the ball, it applies its force to the ball, accelerating the ball until the golf ball leaves the club. The golf ball is experiencing a change in velocity – it is accelerating. The greater the force applied to the golf ball the greater the acceleration.			
5. As the golf club hits the ball, it applies force causing the ball to go in motion. In return, the ball also applies an equal and opposite force back to the club. This force slows the golf club down.			
6. The golf ball moves away from the golf club at a greater velocity than the club head because the club head has a much greater mass than the golf ball.			
7. Once the golf ball is in motion in the air, its horizontal velocity remains the same (constant); its vertical velocity is acted on by gravity.			

Q3. **(Optional)** Look at the pattern of ticks you have placed in the table in Q2. What does this tell you about how *Newton's Laws* can be applied to hitting a golf ball?

- 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 answer.

Sample answers:

Q1. • *Applies,* or *puts, or places,* [not *stop,* or *travel*]

Q2.

	Newton's laws		
Situations occurring as the golfer swings and hits the ball	*1st*	*2nd*	*3rd*
1. When the golf ball is sitting on the tee, it does not fall off.	✓		
2. When the golf club is swung by the golfer to hit the ball, the club experiences an unbalanced force, from the golfer's arms, which produces a change in the club's velocity – it is now accelerating towards the ball.	(✓)	✓	(✓)
3. As the golf club hits the ball, it is at its maximum acceleration. (Mass of club head x Acceleration of club head = F on the club head).		✓	
4. As the golf club hits the ball, it applies its force to the ball, accelerating the ball until the golf ball leaves the club. The golf ball is experiencing a change in velocity – it is accelerating. The greater the force applied to the golf ball the greater the acceleration.		✓	
5. As the golf club hits the ball, it applies force causing the ball to go in motion. In return, the ball also applies an equal and opposite force back to the club. This force slows the golf club down.			✓
6. The golf ball moves away from the golf club at a greater velocity than the club head because the club head has a much greater mass than the golf ball.		✓	
7. Once the golf ball is in motion in the air, its horizontal velocity remains the same (constant); its vertical velocity is acted on by gravity.	✓		

Q3.
- *The pattern of ticks shows that all of Newton's laws play a part in hitting a golf ball.*
- *The* pattern *of ticks shows that all of Newton's laws play a part in hitting a golf ball, but the first and second laws seem to play a more significant part.*
- [If a student ticks three laws for situation 2:] *Some parts of the golfer's action can have all three laws operating at the same time .*

Component 5: Lesson Conclusion

Time: 5 minutes

The focus of the lesson was on learning about how *Newton's three Laws of Motion* can be applied to complex everyday actions.

1. Has the lesson helped you apply Newton's three Laws? What other situations could you apply the laws to?

2. Which questions were easier to answer – the ones in 4B or the ones in 4C? Why?

3. What strategies do you use to answer the harder questions?

4. What did you enjoy about the lesson?

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

Science Grade 8 Lesson Plan 7

Distinguishing Asteroids and Comets

Key Idea

Understanding the origin of asteroids and comets, and their motion, helps scientists to explain the nature and formation of the Solar System.

Component 1: Short Review

Time: 7 minutes

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

  Q1. What is the *Solar System*?

  Q2. What are some members of the Solar System?

  Q3. Try to visualize what the Solar System and the Universe look like. How do members of the Solar System move in Space?

- 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. • *Our Sun and the celestial/planetary/astronomical objects that go around it.*

Q2. • *Sun*
- *Planets*
- *Moons*
- *Asteroids*
- *Comets*
- *Meteors*

Q3. • *The planets move (orbit around) the Sun.*
- *The moons go around (orbit) the planets.*
- *The Sun goes around (orbits) the center of our galaxy along with our whole Solar System.*

Component 2: **Lesson Purpose/Intention**

Time: 3 minutes

The lesson is about understanding more deeply how asteroids and comets form and travel in space and how they are visible or can impact on Earth.

Component 3: Lesson Language Practice

Time: 5 minutes

- 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.:

  Asteroid, astronomy, astronomical, orbit, a million years, a billion years, vaporize

- Ask students what might be the meaning or origin of the words, ***asteroid, astronomy,*** and ***astronomical?***

  Sample student responses: *Astro* means *star* [from Greek, *astronomos* = 'star-arranging'.]

Component 4: Lesson Activity

Time: 25 minutes

Component 4A

Asteroids and Comets

Asteroids and *comets* are **minor** astronomical objects of the Solar System. The **major** members of the Solar System are the *Sun*, the *planets* and their *moons*. Asteroids and comets are thought by scientists to be leftovers from when the planets and moons formed about 4.6 billion years ago.

Asteroids and comets orbit the Sun as do the planets and moons, but their sizes and movements vary a lot, and this can cause some of them to impact on other members of the Solar System in interesting ways.

An ***asteroid*** is a rocky astronomical object, varying in size from about 500 kilometers diameter to 10 meters diameter. Over 1 million have been identified but their total mass is much less than the mass of the Moon. Most asteroids orbit in a region between the orbits of Mars and Jupiter called the *Asteroid Belt*, which is between 329-478 million kilometers from the Sun. Some asteroids are round, some are elongated, and some even have satellites. Asteroids all orbit in the same direction as the planets. Asteroids usually have circular orbits but these are more tilted than those of the planets. The time it takes for an asteroid to orbit the Sun can vary from 1-100 years.

A ***comet*** is composed of frozen gases, rocks and dust. A comet is usually about 10-15 kilometers in diameter. Comets tend to have *elliptical* orbits. When a comet gets close to the Sun, its gases start to vaporize which makes the comet appear fuzzy. As the comet gets closer to the Sun, the gases and dust sweep out from the comet, producing a glowing 'tail' that can be many thousands of kilometers long. Comets come from orbit belts beyond Neptune, about 5.8 billion kilometers from the Sun. About four thousand comets have been identified, but there must be thousands or millions more. Some comets orbit in the same direction as planets and some in the opposite direction. The time it takes for a comet to orbit the Sun can vary from 4 years to more than 100,000 years!

Component 4B

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

  Q1. Is an Asteroid generally bigger than a Comet?

  Q2. What features do *Comets* have that *Asteroids* do not have?

  Q3. What is more likely to hit Earth, an *Asteroid* or a *Comet*? Why?

- 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. • Yes – an asteroid can be 500 km in diameter.

Q2. • Gases.

- Tails when they are near the Sun.
- Some travel around the Sun in different directions, Asteroids go the same way as Earth.
- They can take 100,000 years to orbit the Sun; Asteroids only take 1,000 years at the most.

Q3. • An Asteroid – because **asteroids** are generally closer to Earth – they originate in the orbits between Mars and Jupiter – about 400 million kilometers away and they orbit the Sun more quickly, maybe every 100 years. **Comets** come from over 5 billion kilometers away and most don't come by the Sun very often – many would only come close to the Sun every 100,000 years.

Component 4C

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

  Q1. What type of *energy* and/or *forces* are likely to affect comets as they travel closer to the Sun?

  Q2. Make some labelled drawings to show the different shapes that Asteroids and Comets can have.

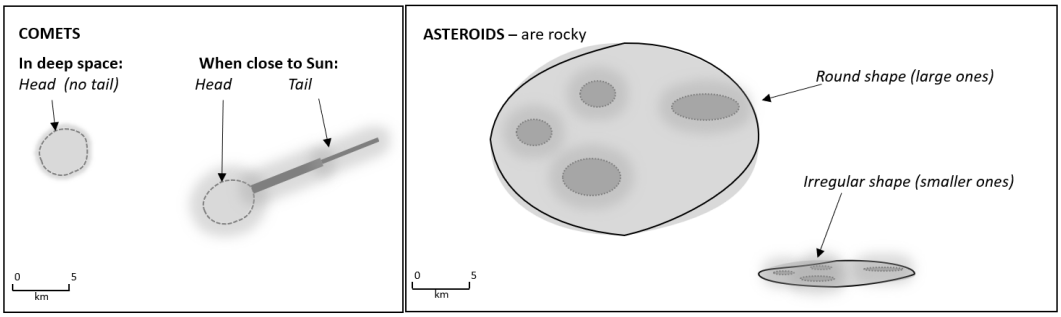
  Q3. **(Optional)** If asteroids usually orbit in the *Asteroid Belt* between Mars and Jupiter, what could cause an asteroid to head towards and hit Earth?

- Watch students answering, and giving encouragement. Ask students to volunteer answers. Select a good sample answer for students to copy. This may come from students or sample answers.

Sample answers:

Q1. • Light, • heat, • gravity

Q2. • sample drawings:



Q3. • It might have collided with another asteroid and that changed its direction.

- It could move close to a large planet which would change its path due to the planet's gravity – gravitational attraction;
- It might have been from a bigger asteroid that collided and broke into pieces, and it is a piece that is heading for Earth.

Component 5: Lesson Conclusion

Time: 5 minutes

1. *Has the activity helped you to think more about the astronomical objects of the Solar System?*
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 8 Lesson Plan 8

Making meaning of Meteoroids, Meteors & Meteorites

Key Idea

Analyzing the nature and origin of meteors and meteorites helps scientists to explain natural phenomena that occur with our planet as well as how the Solar System formed.

Component 1: Short Review
Time: 7 minutes

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

  Q1. What is a meteor?

  Q2. What impacts can meteors have?

  Q3. How are Meteors, Meteorites and Meteoroids related?
- 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.
- *A fireball.* or *A fireball from space.* or *A shooting star.*

Q2.
- *They burn up in the sky.*
- *They can blast the ground, form craters.*
- *They could hit planes.*

Q3.
- *They are the same.*
- *They form from one another – a meteorite is from a meteor.*

Component 2: **Lesson Purpose/Intention**
Time: 3 minutes

The lesson is about **learning how to describe scientific phenomena accurately.**

e.g., We want to be sure we can tell the difference between natural space objects that come into the atmosphere.

Component 3: Lesson Language Practice
Time: 5 minutes

- 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.:

  friction, meteor, meteorite, meteoroid, composition, random

- Ask the students to practice saying the words in a sentence.
  e.g.: "*Friction causes heat." or 'Random is unpredictable or erratic movement."*

  Ask students to volunteer their answers, giving positive feedback and discussing.

Component 4: Lesson Activity

Time: 25 minutes

Component 4A

Meteoroids, Meteors and Meteorites

The major members of the *Solar System* are the *Sun*, the *planets* and the *moons*.

Meteoroids are minor astronomical objects, like asteroids and comets, but they are usually much, much smaller. They are typically pebble-sized but could be a little smaller or a little larger. Some can be quite big, up to 5 meters wide. Meteoroids, like asteroids and comets, are thought to be leftovers from when the planets and moons formed about 4.6 billion years ago. As well, they might be small pieces of an asteroid or a comet created from a collision.

Meteoroids orbit the Sun as do the planets, moons, asteroids, and comets, but their movements are more random, and sometimes they stray into the orbit of the Earth with interesting effects.

A ***meteor*** is formed when a meteoroid enters the Earth's atmosphere. As the meteoroid enters the atmosphere it will be travelling at a very high speed and the friction between the meteoroid and the atmosphere causes it to get hot. When a meteoroid is in the atmosphere, we call it *a meteor*. It can begin to glow, and it can begin to burn up. Because it is travelling fast, it produces a streak of light and people call it a shooting star. It might burn up completely in the atmosphere, or it might not all burn!

A ***meteorite*** is the name for an object from space that survives from burning up as it travels through the atmosphere, and lands on the ground. In other words, a *meteorite* is a meteor that did not all burn up when travelling through Earth's atmosphere. Meteorites are usually either rocky or metallic. The biggest found on Earth are a few meters across; the heaviest weighs about 60,000 kilograms. When large meteorites land on the ground, they can form a crater, called an *Impact crater*. The largest impact crater discovered has a diameter of about 100 kilometers. Scientists study meteor paths to find out where meteorites come from. They study their composition to work out what the Solar system was made of 4.6 billion years ago.

Component 4B

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

  Q1. How big is a typical meteoroid?

  Q2. What are some Major astronomical objects? What are some Minor astronomical objects?

  Q3. What would you have to know to predict if a big meteoroid (0.5-meter-wide and 500 kg heavy) would become a meteorite by surviving burning up in Earth's atmosphere?

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

Sample answers:

Q1. • Pebble sized. □ about 5 cm.

Q2. • **Major** are Sun, planets and moons**.**
  • **Minor** are asteroids, comets, meteoroids, meteors and meteorites**.**

Q3. • You would need to know things like its speed, composition, angle of entry and compare that with information about other meteorites that have landed on Earth.
  • You could put it into a computer simulation that was based on what scientists know from other

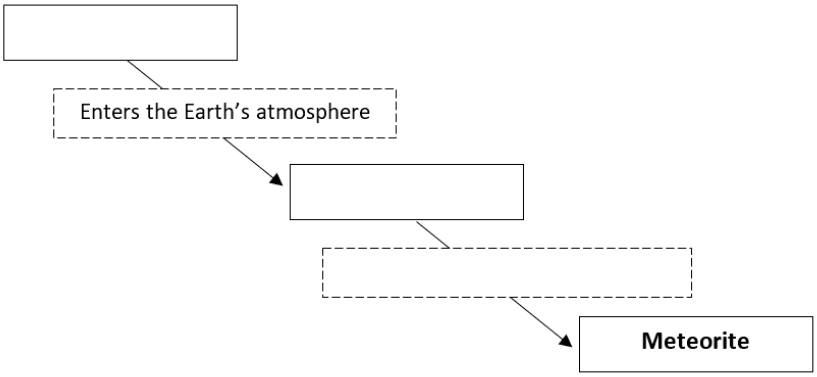
meteoroids entering Earth's atmosphere.

Component 4C

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

Q1. What is usually bigger – a meteoroid or an asteroid?

Q2. Complete the flow chart to show the process to have a **meteorite** land on Earth**.**



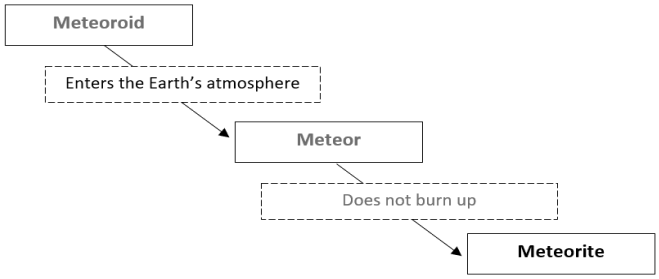
Q3. **(Optional)** Comets and meteors can glow brightly in the night sky and so they can be seen by people on Earth. How would you distinguish a comet from a meteor if you saw them in the night sky?

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

Sample answers:

Q1. • an asteroid

Q2. • sample completed diagram:



Q3. • A meteor would only be visible for a very short time, unless it was very big and does not all burn up before it hits the ground. Even so, that would only take about 10-20 seconds. It would look very close, closer than stars. A comet will be visible each night for many weeks or months and would not look like it is moving, relative to the stars, unless you studied it closely for a few hours. It would look like it is a long way away – amongst the stars.

Component 5: Lesson Conclusion

Time: 5 minutes

- *Could you find any answers to questions in the text provided for Component 4? Which ones?*

1. *Yes – Q1 and Q2 in Component 4B.*
2. *Yes – Q1 and Q2 in Component 4C.*

- [You might explain to students that it is **good learning technique** to look for answers in a text or stimulus. Doing this also helps you understand what is needed to answer many questions]

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

The First set was only about meteoroids, meteors and meteorites; For the second set, you needed to remember information about comets and about how meteors and comets are different.

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

Science Grade 8 Lesson Plan 9

Food Chains and Energy

Key Idea

Science texts often use flowcharts to communicate complex scientific ideas.

Component 1: Short Review

Time: 7 minutes

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

  Q1. Name a common plant in a rainforest.

  Q2. Describe some common herbivores that might live in a rainforest.

  Q3. Why are some animals called carnivores? Give an example.

- 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 students or from below.

Sample answers:

Q1. A common plant would be the coconut palms or mango trees.

Q2. Common herbivores are deer and monkeys?

Q3. Animals are called carnivores if they usually eat another animal for food to obtain nutrients. Examples would be lions, wolves, and some snakes.

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

Time: 3 minutes

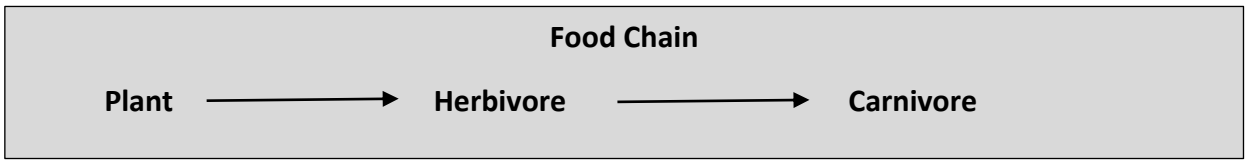
Explain to the students that this lesson is about reading flowcharts and how important reading is for their learning and when answering questions.

The lesson is about the food chains in an ecosystem. We want to be sure we know and understand about the transfer of energy.

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

Time: 5 minutes

- The diagram below shows how scientists represent a food chain. The importance of the activity is to see if students can interpret the diagram.
- Encourage the students to read/view the diagram carefully to think about what it means.



- Ask students to write down:

  Q1. What do the arrows represent?

  Q2. What does the diagram above 'say' in words?

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

Sample answers:

Q1. *The arrows represent the energy that is being passed from one organism to another.*

Q2. *Plants are eaten by herbivores and herbivores are eaten by carnivores.*

Component 4*: Lesson Activity*

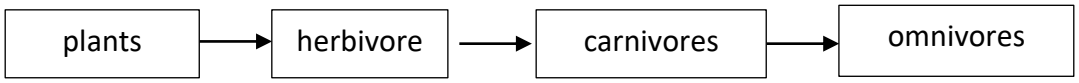
Time: 25 minutes

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 *food chain, herbivores, carnivores, omnivores*) and give descriptions of any words that may be problematic.

Food Chains

A food chain model



A Philippines food chain in a mangrove swamp

Component 4B

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

  Q1. What is the name given to the group of animals that eat plants?

  Q2. Complete the sentence*: Omnivores eat …… and ……*

  Q3. Would a scientist say that all humans are omnivores?

- 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. They are called herbivores.

Q2. Omnivores eat plants and other animals.

Q3. Yes; [**For discussion if required**: Most humans eat both plants and other animals and their body structures have developed to be able to eat both plants and other animals. Some humans choose to eat only plants and some humans choose not to eat the products of animals such as milk or eggs – however, scientifically, humans are classified as Omnivores.]

Component 4C

- Read out the following questions and ask students **to fill in the boxes on the food chain diagram for Q1 &Q2** and to answer Q3 in the space on their worksheet.

  Q1. Write in the box (marked 4CQ1an example of an herbivore in the mangrove swamps in the Philippines.

  Q2. Write in the box (marked 4CQ2) the name of a carnivore~~s~~ found in a mangrove swamps of the Philippines.

  Q3. **(Optional)** *Explain the important role that producers have in a food chain and give examples.*

- 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. Examples of herbivores might include **mollusks;** or **shrimp**.*

Q2. Examples of carnivores would include turtles, fish, sharks.

Q3. Producers are very important as they make the food for animals to eat from water and carbon dioxide. Examples include grasses, plants, trees, ferns and mangroves.

Component 5: Lesson Conclusion

Time: 5 minutes

The focus of this lesson was to use flowcharts to describe food chains and the transfer of energy.

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

Q1 Did you find using the terms herbivore, carnivore and omnivore difficult? If so, why?

Q2. Did you find the answers to the questions in component 4B and 4C 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 8 Lesson Plan 10

Trophic Levels and Losing Energy – The Food Web!

Key Idea

Science texts often use multi-step flowcharts to communicate complex scientific ideas.

Component 1: Short Review
Time: 7 minutes

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

  Q1. *If producers are in trophic level 1, into which trophic levels do herbivores belong?*

  Q2. If producers are in trophic level 1, into which trophic levels do humans belong?

  Q3. Why are plants called the producers?
- 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 Herbivores belong in trophic level 2.

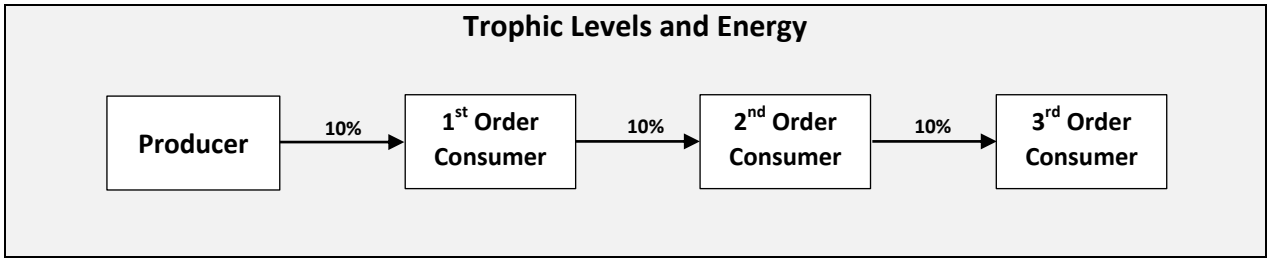
Q2. Humans may be in trophic levels 2 and or 3.

Q2. Plants are called producers because they are the living things that produce food and oxygen from the carbon dioxide in the air, water and the energy from the sun.?

Component 2: ***Lesson purpose/Intention***
Time: 3 minutes
Explain to the students that this lesson is about reading flowcharts and how important reading is for their learning and when answering questions.
The lesson is about the trophic levels of an ecosystem. *We want to be sure we know and understand about the transfer of energy.*

Component 3: ***Lesson Language Practice.***
Time: 5 minutes

- The diagram below shows how scientists represent data in a food chain. The importance of the activity is to see if students can interpret the diagram. Encourage the students to read/view the diagram carefully to think about what it means.



- *Ask* students to write down:

  Q1. What do the arrows represent?

  Q2. What does the diagram above 'say' in words?

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

Sample answers:

Q1. *The arrows represent the amount of energy that is being passed from one trophic level to another.*

Q2. The diagram says *that producers pass on some (10%) of their energy to first level consumers who pass on some (10%) of their energy to second order consumers and they pass on some (10%) of their energy to third order consumers*.

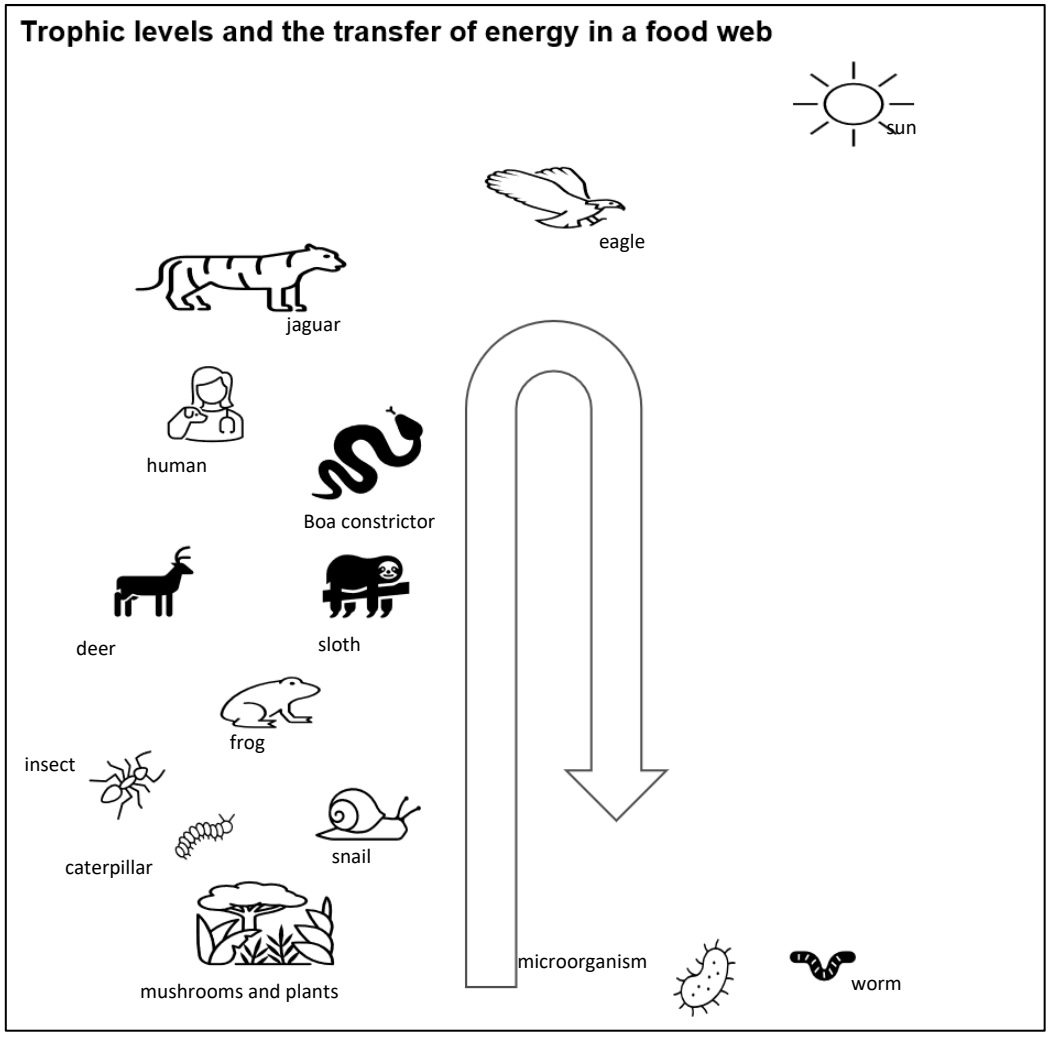
- Explain to students that some everyday words have different meanings when used in Science – it is very important to recognize these differences in word use in the English language.

Component 4*: Lesson Activity*

Time: 25 minutes

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 or pictures that they are not familiar with (or suggest examples such as sloth, deer) and give descriptions of any that may be difficult.



Component 4B

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

  Q1. Which carnivores would catch and eat sloths?

  Q2. Name a common household pet that people in your neighborhood have that would be a primary (first order) consumer.

  Q3. Explain why it is important for there to be types of insects, microorganisms and fungi as part of a food web?

- Observe students' answers. Ask the students to volunteer their answers, and give 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. Jaguar or a boa constrictor.

Q2. Rabbits or chickens

Q3. Fungi such as mushrooms, insects, and worms together with microorganisms, such as bacteria, are ***decomposers*** *and break down dead plants and animals into nutrients.*

Component 4C

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

Q1. If the plants you see in the diagram above start off with an energy level of 10,000 calories,-how many calories will the sloth get and how many calories will the jaguar get?

Q2. If you had a pet that was a secondary (second order) consumer, which native animal might they attack and eat?

Q3. **(Optional)** *Does the Philippines have a native sloth? Why are they considered endangered?*

- 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 sloth would get 1,000 calories and the jaguar would end up with 100 calories.

Q2 . Dogs and cats might attack native birds or frogs.

Q3. The sloth like animal in the Philippines is actually a primate unlike other sloths, and it is endangered because of increasing destruction of its habitat in the forests and the presence of feral cats.

Component 5: Lesson Conclusion

Time: 5 minutes

The focus of this lesson was to use multi-step flowcharts such as a food web to describe trophic levels and the loss of energy between steps.

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

Q1 Did you find the diagram of trophic levels and energy difficult? If so, Why?

Q2. Do you think you could describe the diagram of the Food Web in words? If so, How?

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

Science Grade 8 Lesson Plan 11

Humans and the Environment

Key Idea

Science texts are often written with technical language that helps communicate complex scientific ideas.

Component 1: Short Review
Time: 7 minutes

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

  Q1. Suggest a human activity that is conducted on a large scale that has a negative impact on the environment.
  Q2. Select one of these human activities and suggest some of the countries of the world where this occurs.

  Q3. Explain how this activity has damaged a relevant ecosystem.

- Ask students to volunteer to read out their answers, and give 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 Many answers such as: use of fossil fuels, deforestation

Q2. For example deforestation occurs in the Amazon jungle but also in the tropical rainforests of Queensland Australia.

Q3. For example deforestation in Queensland has caused erosion and the subsequent run off into the near bye ocean has caused pollution in the waters of the barrier reef.

Component 2: ***Lesson purpose/Intention***
Time: 3 minutes
Explain to the students that this lesson is about reading science texts and how important reading is for learning and when answering questions.
The lesson is about the negative human impact an ecosystem. *We want to be sure we can* ***suggest ways to minimize the impact****.*

Component 3: ***Lesson Language Practice****.*
Time: 5 minutes

- 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.
  d*eforestation, erosion, pollution*
- Ask the students to complete the table about the meanings of words in the appropriate column. Suggest to students to use their own words to give a meaning for these scientific terms.
- 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:

Word	Meaning
deforestation	*The clearing of a wide area of trees.*
erosion	*The gradual destruction by wind or water.*
pollution	*Introducing a substance into an environment that has harmful effects.*

Component 4*: Lesson Activity*

Time: 25 minutes

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 or pictures that they are not familiar with (or suggest examples such as biodiversity, infrastructure) and give descriptions of any that may be difficult

Deforestation

One of the ways that humans have had a negative impact on the environment is through the process of deforestation.

The reason that this has occurred is that humans have wanted to clear the land for such things as: commercial agriculture, commercial logging, building of homes and infrastructure and for purposes of mining.

This deforestation has occurred all over the world and in recent years in Australia.

Deforestation causes soil erosion, flooding, the destruction of biodiversity, the release of greenhouse gases like carbon dioxide and as a result an increase in global warming,

In order to minimize this impact on the environment we could plant more trees particularly the farmers and use less paper and recycle it.

Component 4B

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

  Q1. In which country has there been recent deforestation?

  Q2. What are some of the reasons why humans want to clear the land?

  Q3. Why would it be particularly important for farmers to grow more trees?

- 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. In the Australian rainforest.

Q2. They want to clear the land for farming and building houses.

Q3. Because the farmers have cleared their land to grow things or to have cattle so they should be replacing some of the trees on their land.

Component 4C

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

  Q1. What is one of the negative impacts of deforestation in the Philippines?

  Q2. What are some of the damaging effects on the people in the Philippines as a result of deforestation.

  Q3. **(Optional)** *Explain why deforestation can increase global warming.*

- Ask the students to volunteer their answers, and give 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.One of the impacts is that it has reduced the biodiversity of the Philippines.

Q2. Deforestation has caused flooding and landslides which have damaged our homes and even caused injury and death.

Q3. When forests are cut down or burnt the carbon stored in them is released mostly as carbon dioxide which is a greenhouse gas that contributes to global warming.

Component 5: Lesson Conclusion

Time: 5 minutes

The focus of this lesson was to suggest ways to minimize negative human impact on an ecosystem.

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

Q1 Did you find the text about deforestation interesting? If so, Why?

Q2. In this lesson did you learn something about minimizing human impact on an ecosystem that you did not know before? If so, What?

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

Science Grade 8 Lesson Plan 12 Consolidation

Dynamics of a Food Web

Key Idea being reinforced

Science texts often use multi-step flowcharts that help communicate complex scientific ideas.

Component 1: *Short Review*
Time: 7 minutes

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

  Q1. What do scientists call the group of organisms that eat mostly meat or the flesh of other animals?

  Q2. How would you describe a food web?

  Q3. Describe the transfer of energy in a simple food chain with an example.

- 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 are called carnivores.

Q2. A food web is all the food chains that exist in a single ecosystem.

Q3. A food chain shows the energy links between organisms within an ecosystem. So for example the grass makes its own food from water, carbon dioxide and the sun's energy. A cow eats the grass and gets some energy and then humans eat the cow and get a little bit of energy.

Component 2: ***Lesson purpose/Intention***
Time: 3 minutes

Explain to the students that this lesson is about *using multi-step flowcharts* and how important this is for their learning and when answering questions.
The lesson is about the effect of possible **c**hanges in one population of a trophic level on the rest of the food web/ecosystem. *We want to be sure we can understand **the impact**.*

Component 3: *Lesson Language Practice*.
Time: 5 minutes

- Read out the following word and ask the students to read it to themselves and then out loud as a class.

  Population, ecosystem

- Ask the students to complete the table about the meanings of the word in the appropriate column. Suggest to students to use their own words to give a meaning for these scientific terms.

- 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:

Word	Meaning
population	*A community of animals or plants*
ecosystem	*A biological community interacting with each other and the physical components*

Component 4*: Lesson Activity*

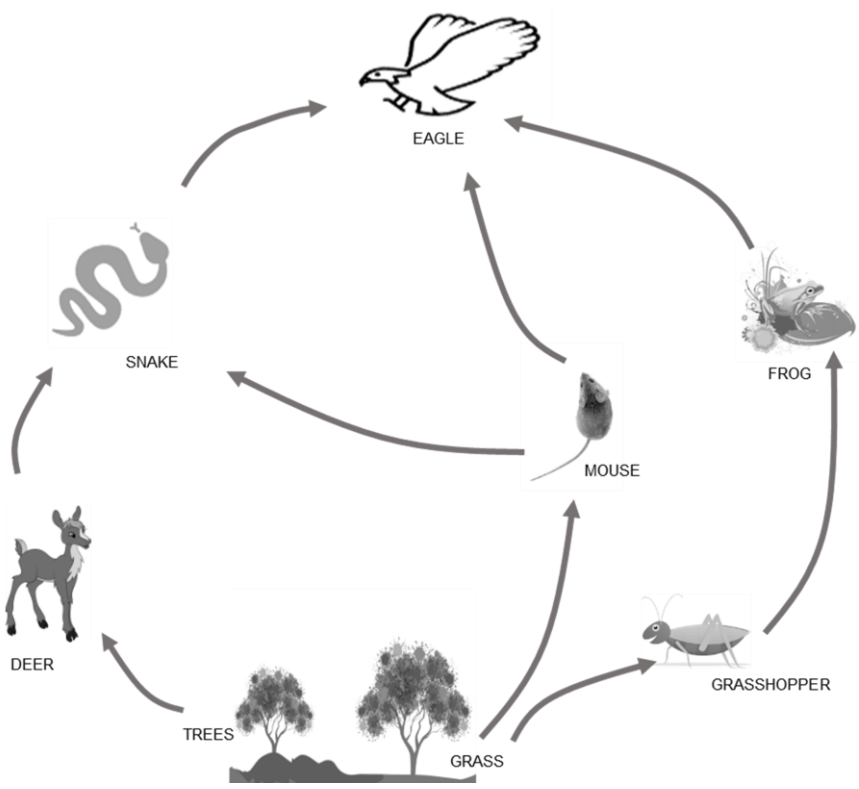
Time: 25 minutes

Component 4A

- Refer students to the main lesson stimulus and read out the labels.
- Ask the students to read the labels to themselves.
- Ask the students if there are any words or pictures that they are not familiar with and give descriptions of any that may be problematic.

Component 4B

Rain forest food web



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

  Q1. Identify a label in the picture which is the name of a producer.

  Q2. Name the first level consumers in the picture.

  Q3. Explain which trophic level has the most energy and why.
- Observe students' answers. Ask the students to volunteer their answers, and give 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. Trees or grass.

Q2. The first level consumers are the grasshopper, mouse and deer.

Q3. The first trophic level, that is, the producers have the most energy because they actually produce their own energy from the sun, air and water.

Component 4C

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

  Q1. Which trophic level in an ecosystem has the smallest population?

Component 5: Lesson Conclusion
Time: 5 minutes

The focus of this lesson was to suggest what the impact would be on a food web /ecosystem if there is a change in the size of the population of one of the members.

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

Q1 Did you find the diagram of the food web interesting If so, Why?

Q2. In this lesson did you learn something about food webs and ecosystems that you did not know before? If so, What?

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

Science Grade 8 Lesson Plan 13

Nature of Matter – Properties of Solids, Liquids & Gases

Key Idea

Science texts are often written with technical language that helps communicate complex scientific ideas.

Component 1: Short Review

Time: 7 minutes

- Ask students to write down their answer on their worksheet first.

  Q1. What is one property of liquids?

  Q2. What are the three main states of matter?

  Q3. What is the difference between solids and gases in terms of shape and volume?

- Students volunteer to read their answers, and give positive feedback. Read sample answers for students to listen to and write down. This may come from a student or from the sample answers:

Sample answers:

Q1. Liquids have a definite volume / Liquids have no definite or fixed shape.

Q2. The three main states of matter are solids, liquids and gases.

Q3. Solids have a definite shape and volume, but gases do not have definite shape or volume.

Component 2: **Lesson Purpose/Intention**

Time: 3 minutes

- The lesson is about reading a science text and how important using technical language is for their learning and when answering questions.

The lesson is about solids, liquids and gases. *We want to be sure we know and understand about shape and volume for the states of matter.*

Component 3: Lesson Language Practice

Time: 5 minutes

- 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.

shape, definite, liquid, volume, gas,

- Ask students to complete the table about everyday word meanings in the appropriate Column and to provide answers and discuss where it needed.
- Ask students to complete the table about the scientific word meanings in the appropriate column. Suggest students use their own words to give a meaning for these scientific terms. Give encouragement to students' answers.
- Read out some answers for students to write down. This may come from a student or from the following sample answer.

Sample answers:

Word	Everyday meaning	Meaning in science
shape	*A square or triangle.*	*The form or structure of an object.*
definite	*Certain; for sure*	*Fixed or not changing*
liquid	*Something you can pour.*	*Flows and has a definite volume.*
volume	*Level of sound.*	*The 3-dimentional space that something occupies.*
gas	*Like the air for example.*	*A substance with no definite shape or volume.*

- Explain 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 minutes

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 any words that they are not familiar with (such as, *objects*, *brick*, *helium*) and give descriptions of any words that may be a problem.

The States of Matter

Objects like a table or a brick are called *solids*. Solids have definite shape and volume. Things like water and honey are called *liquids*. Liquids have definite volume but not definite shape. Things like air and helium that make balloons rise are called *gases*. Gases do not have definite volume or definite shape.

Component 4B

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

  Q1. Bricks and tables are classified as solids. What is another example of a solid?

  Q2. Why are water and honey classified as liquids?

  Q3. How are the properties of water and honey different to the properties of air and helium?

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

Sample answers might be:

Q1. a wall. a piece of wood.
. . . . [many other possible answers]

Q2. Because they flow/pour. or
Because they have a definite volume. or
Because they do not have definite shape.

Q3. Water and honey have definite volume, but air and helium do not. or
Water and honey have definite volume but do not have definite shape whereas air and helium do not definite shape or volume.

Component 4C

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

Q1. What would you need to measure the volume of a liquid?

Q2. What would you have to do to measure the volume/size of a brick.

Q3. **(Optional)** *Explain using examples how water can be a solid or a liquid.*

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

Sample answers:

Q1. You would need a measuring cylinder / You can measure it with a measuring cylinder.

Q2. You would need to measure the sides (length, height, depth) with a ruler or a tape measure.

Q3. Water from a tap or water in the ocean is a liquid and you can pour it but when it is really cold, like in a freezer, it turns to solid ice.

Component 5: Lesson Conclusion

Time: 5 minutes

- The focus of this lesson was to describe the properties of solids, liquids, and gases in terms of shape and volume. Students answer the following questions using class discussion or writing the answers in their worksheet.

Q1. Did this lesson help you to better understand and recall the properties of shape and volume for solids, liquids and gases? If so, how?

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.

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

Science Grade 8 Lesson Plan 14

The Nature of Matter – Maria's Special Drink

Key Idea

Scientific knowledge about solids liquids and gases helps to solve real-life problems.

Component 1: *Short Review*

Time: 7 minutes

- Ask students to write down their answer on their worksheet first.

  Q1. Which one of the states of matter has no definite volume?

  Q2. How many states can the common substance water exist in.

  Q3. Why do scientists use the properties of shape and volume to classify the states of matter?

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

Sample answers:

Q1. Gases have no definite volume.

Q2. Water can be a solid, liquid or a gas.

Q3. Scientists use shape and volume to classify the states because each state has a different combination of shape and volume.

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

Time: 3 minutes

- Explain to students that this lesson is about reading a science text and how important using technical language is for their learning and when answering questions.

The lesson is about *using scientific knowledge to solve real life problems.*

Component 3: Lesson Language Practice

Time: 5 minutes

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

  solid, states of matter

- Ask students to complete the table about the everyday meanings of the word in the appropriate Column.
- Ask students to provide answers and discuss where needed.
- Ask the students to complete the table about the scientific meanings of words in the appropriate column. Suggest to students to use their own words to give a meaning for these scientific terms. Give encouragement to students' answers.
- Read out some answers for students to write down. This may come from one or several of the students or from the following sample answer.

Sample answers:

Word	*Everyday meaning*	*Meaning in science*
solid	*It's hard like a brick.*	*Has fixed shape and fixed volume.*
states of matter	*States in a country*	*Different forms of matter – solids, liquids and gases*

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

Component 4*: Lesson Activity*

Time: 25 minutes

Component 4A

Maria's Special Mango Drink

Maria is making a special drink in her kitchen. She has 2 mangos and needs exactly 500 mL of cold water so she goes to the refrigerator but there is no liquid water in the fridge. So, she gets some ice cubes out of the freezer. She puts a handful of ice cubes in a large measuring cylinder, but she can't see whether it is exactly 500 mL or not.

1. Refer students to the main lesson stimulus below and read out the following text.
2. Ask the students to read the text to themselves.
3. Ask the students if there are any words that they are not familiar with (or suggest examples such as *refrigerator*) and give descriptions of any words that may be problematic.

Component 4B

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

  Q1. What is Maria trying to do?

  Q2. What are the things that Maria has in her kitchen to make the special drink?

  Q3. Why do scientists use measuring cylinders?

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

Sample answers:

Q1. Make a special drink.

Q2. A glass, 2 mangoes, ice, measuring cylinder, a refrigerator.

Q3. Because it is important when you are mixing liquids in science to have exactly the right amount.

Component 4C

- Read out the following questions and ask students to answer on their worksheet first.
  Q1. How much cold water does Maria need?

  Q2. What is the problem that Maria is having?

  Q3. **(Optional)** *What steps could Maria take to solve the problem?*
- Walk around giving encouragement and looking at students' answers. Ask the students to volunteer their answers, and give a 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. 500 mL

Q2. The problem is that Maria is trying to measure the volume of a solid with a measuring cylinder.

Q3. Maria should let the ice melt, or heatt it just enough to make it melt, and then measure the liquid. To get exactly 500 mL, she might need to add more ice or pour out some of the water.

Component 5: Lesson Conclusion

Time: 5 minutes

- The focus of this lesson was to show that scientific knowledge about solids, liquids, and gases could help to solve a real-life problem.
- Ask students to answer the following questions either by class discussion or writing the answers in their worksheet.

Q1. Did you find Maria's special mango drink interesting? If so, Why?

Q2. Did you find the answers in component 4C helpful in your understanding of how science can solve everyday problems? 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 8 Lesson Plan 15

The Particle Nature of Matter

Key Idea

The properties of solids liquids and gases can be described scientifically using the *particle model.*

Component 1: *Short Review*

Time: 7 minutes

- Ask students to write down their answer on their worksheet first.

  Q1. Complete the following sentence "Scientists say that all matter is made up of ……..".

  Q2. Describe what you think scientists mean by particles.

  Q3. How are the particles in a solid different to the particles in a gas?

- Ask students to volunteer to read out their answers, and give positive feedback.

- Read out a sample answer for students to listen to and write down. This may come from a student or from the sample answer:

Sample answers:

Q1. "particles"

Q2. Particles are the smallest parts that make up matter.

or

Solids, liquids, and gases are made up of particles.

Q3. The particles in a solid are held in position by strong forces between the particles – that is why they have fixed shape. The particles in a gas are also held together but are weaker and that is why they have no shape but fill whatever space they are in.

or

The particles in a liquid are also held together by forces but they can move about and that's why they can flow and change shape.

Component 2: Lesson Purpose/Intention

Time: 3 minutes

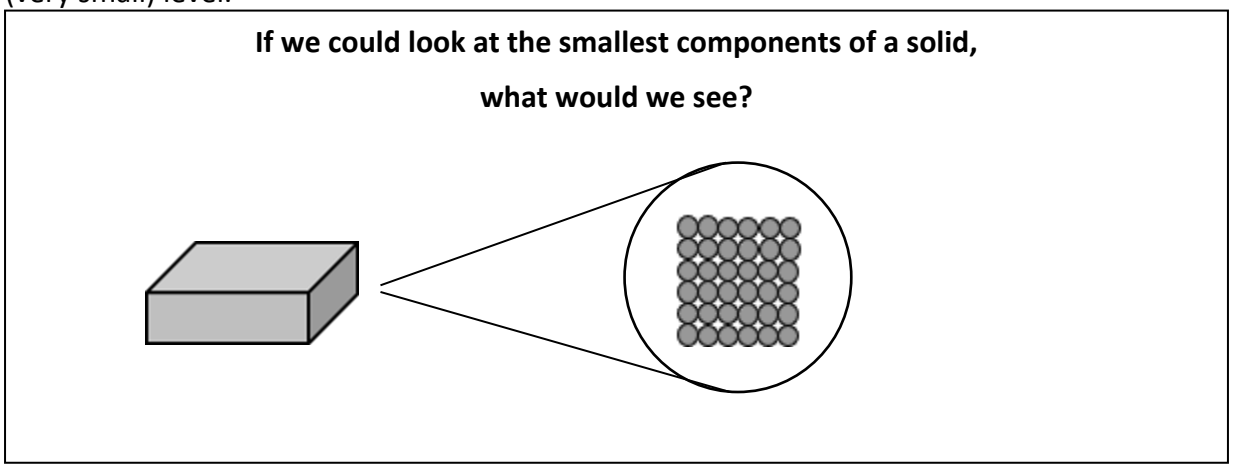
- This lesson is about reading diagrams and how important using diagrams is for their learning and when answering questions.

We want to be sure we know and understand how the particle nature of matter helps us explain the properties of solids, liquids, and gases.

Component 3: Lesson Language Practice

Time: 5 minutes

- Describe that the diagram below explains how particles in a solid are arranged at a really microscopic (very small) level.



- The importance of the activity is for students to read what the diagram represents.
- Read out the question below and ask the students to write down their answer. Encourage the students to read/view it carefully to think about what it means.

*Q1 What do the little grey circles represen**t**?*
Q2. Describe the shape they make.

- Ask students to volunteer answers, and give positive feedback.
- Read out some answers for students to write down. These may come from several students or from the following sample answer.

Sample answers:

Q1. *The circles represent the particles in the solid.*

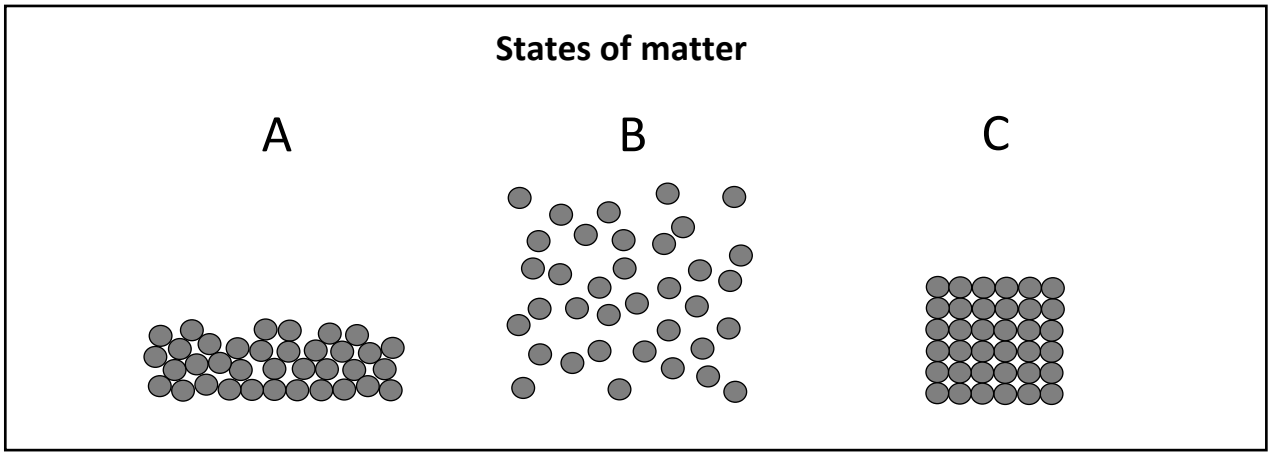
Q2. *The circles are locked in a regular pattern.*

Component 4*: Lesson Activity*

Time: 25 minutes

Component 4A

- Refer students to the main lesson stimulus and describe the diagram below.
- Ask students to look at the diagram themselves.
- Ask the students if there are any words or pictures that they are not familiar with.



Component 4B

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

  Q1. Which of the labels, A, B and C, represent a liquid?

  Q2. Describe the particles in the diagram of a solid.

  Q3. Why are the particles in a gas further apart than the particles in a liquid?

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

Sample answers:

Q1. Label A is a liquid.

Q2. The particles in the solid are very close together and don't look like they can move.

Q3. The particles in a liquid are closer together than the particles in a gas because particles in a liquid have less energy than the particles in a gas; therefore, in a liquid the particles can't move much and are closer together.

Component 4C

- Hand out a block of ice to each student. [If ice is not available, ask them to think about a block of ice]
- Students read the following questions and answer in their worksheet first.

  Q1. Look at the ice that your teacher has given you and suggest what will happen to it if you leave it for a while?

  Q2. What would happen if you put the ice in the sunlight or held it in your hand?

  Q3 **(Optional)** *What would you feel if you held it in your hand? Why?*

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

Sample answers:

Q1. *It will melt.*

Q2. *It will melt more quickly.*

Q3. My hand will feel cold because the ice is getting heat from my hand to melt faster.

Component 5: Lesson Conclusion

Time: 5 minutes

- The focus of this lesson was the use of diagrams to show how the particle model can explain the properties of solids liquids and gases.
- Ask students to answer the following questions either by class discussion or writing the answers in their worksheet.

Q1 Did you know what the little circles represented in component 3? If so, how*?*

Q2. Did you find the diagram in component 4A helpful to explain the particle nature of solids, liquids and gases? If so, why?

- Let students know that good learners reflect on their learning

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

Science Grade 8 Lesson Plan 16

Changes of State in Terms of Particles

Key Idea

The physical changes in states of matter can be described and explained scientifically using the *particle model*.

Component 1: Short Review

Time: 7 minutes

- Ask students to write down their answer on their worksheet first.

  Q1. What do you need to do to make solid ice turn to liquid water?

  Q2. What do scientists call what happens when a solid changes to a liquid and a liquid change to a gas?

  Q3. Explain what happens to the particles in a solid when the solid changes to a liquid?

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

Sample answers:

Q1. You need to heat it.

Q2. When a solid change to a liquid it is called melting and when a liquid changes to a gas it is called evaporation.

Q3. When the solid changes to a liquid the particles get energy from the heating and so they can overcome the forces holding their particles together. The particles in a liquid are also held together by forces but they can move about and that's why they can flow and change shape.

Component 2: Lesson Purpose/Intention

Time: 3 minutes

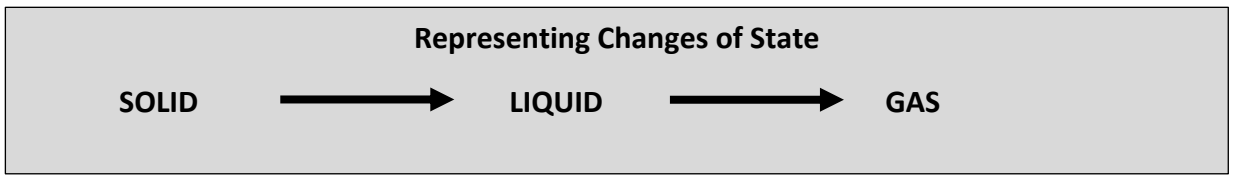
- The lesson is about reading diagrams and how important using diagrams is for their learning and when answering questions in science.

The lesson is about physical changes of solids, liquids, and gases. *We want to be sure we know and understand about changes of state in terms of the particle nature of matter.*

Component 3: Lesson Language Practice

Time: 5 minutes

- The diagram below shows how scientists represent change of state. The importance of the activity is to see if students can interpret the diagram.
- Encourage the students to read/view the diagram carefully to think about what it means.



- Ask students to write down:

  Q1. What do the arrows represent?

  Q2. What does the diagram above mean in words?

- Ask students to volunteer their answers, and give a positive feedback. Discuss answers. Select an

answer for students to write down. This may come from one or several of the students or from the following sample answer.

Sample answer:

Q1. *The arrows represent the process of the change of state from a solid to a liquid to a gas.*

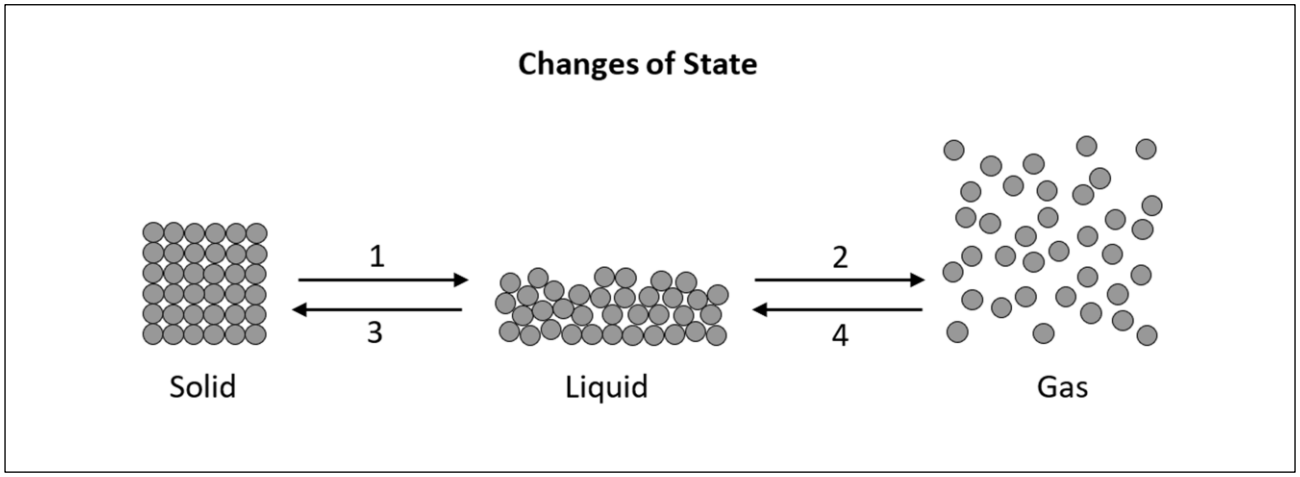
Q2. 'Solids change to Liquids, and Liquids change to Gases.

Component 4*:* Lesson Activity

Time: 25 minutes

Component 4A

- Ask students to look at the diagram below. Ask students to describe what they see and how does it relate to science. Explain that scientists often use this type of diagram to represent physical changes.



Component 4B

- Ask students to write down their answers first. Encourage students to read/view it carefully and think about what each part means.

Q1. Which one of the arrows (1,2, 3 and 4) indicates the process of freezing?

Q2. Which of the arrows indicate processes that need heat energy?

Q3. Explain what happens to the motion and the arrangement of particles when a substance undergoes the process of melting.

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

Sample answers:

Q1. Arrow 3 indicates the process of *freezing*.

Q2. Arrows 1 and 2 need heat energy. Arrow 1 needs heat for melting and Arrow 2 needs heat for evaporation.

Q3. The process of melting is when a solid changes to a liquid and energy in the form of heat is required. When you heat a solid it gives the particles more energy and they have more movement. They move more so that they even change their arrangement and slide past each other and become a liquid.

Component 4C

- Using the same diagram, ask students to write down their answers first.

  Q1. What is the name of the process that is shown /indicated by Arrow 4?

  Q2. Where in nature would you see solid ice and liquid water at the same time?

  Q3. **(Optional)** *Some processes like "melting" require energy so what we need to do is heat them. Explain what you would need to do for the processes that don't need energy like "freezing" in terms of particle energy and arrangement*.

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

Sample answers:

Q1. *The process shown by Arrow 4 is called condensation.*

Q2. *You could see ice and water at the same time in Antarctica where there is ocean or liquid water and masses of ice/icebergs in the water.*

Q3. What you would have to do is to make the water very cold by putting it in a refrigerator or freezer where the temperature is very cold. This would mean that the particles would lose energy and then they would not be able to move, and the forces would hold the particles together very strongly like in a solid.

Component 5: Lesson Conclusion

Time: 5 minutes

- The focus of this lesson was to use diagrams to describe t*he* physical changes in states of matter using the particle model.
- Ask students to answer the following questions either by class discussion or writing the answers in their worksheet.

Q1 Did you find the diagram showing the changes of state difficult to read? If so, why*?*

Q2. Did you find the questions in component 4C more difficult than those in 4B or was there one question more difficult than all the rest? If so, why?

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

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

Science Grade 8 Lesson Plan 17

Change of State in the Water Cycle

Key Idea

Science texts often use flowcharts to communicate complex scientific ideas.

Component 1: *Short Review*

Time: 7 minutes

- Ask students to write down their answer on their worksheet first.

  Q1. Where does the water come from when it rains?

  Q2. What are the two important physical changes of state that drive the water cycle?

  Q3. Explain the important role of the sun in the water cycle.?

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

Sample answers:

Q1. The water comes from the clouds.

Q2. The two important changes of state are evaporation and condensation.

Q3. The heat from the sun evaporates the liquid water in the oceans to form water vapor in the atmosphere.

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

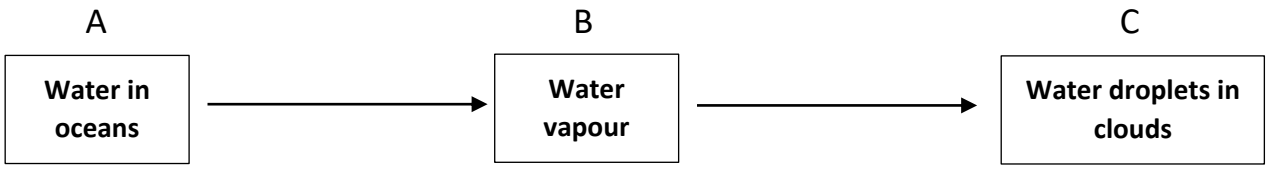
Time: 3 minutes

- This lesson is about reading diagrams and how important completing diagrams is for their learning and when answering questions in science.
  The lesson is about physical changes. *We want to be sure we know and understand the water cycle in terms of physical changes.*

Component 3: Lesson Language Practice

Time: 5 minutes

- The diagram below shows how scientists explain changes of state in the water cycle.



- Ask students to look at the diagram. Read out the question below and ask the students to write down their answer. Encourage the students to **read/view it carefully** to think about what it means.

  Q1. In which box is the water a gas?

- Ask students to volunteer their answers, and give a positive feedback.
- 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 answer:

Q1. *The water is a gas in the middle box (Box B)*

Component 4*: Lesson Activity*.

Time: 25 minutes

Component 4A

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

The Water Cycle

The *water cycle* is the path that all water follows as it moves around the Earth. It is a continuous process.

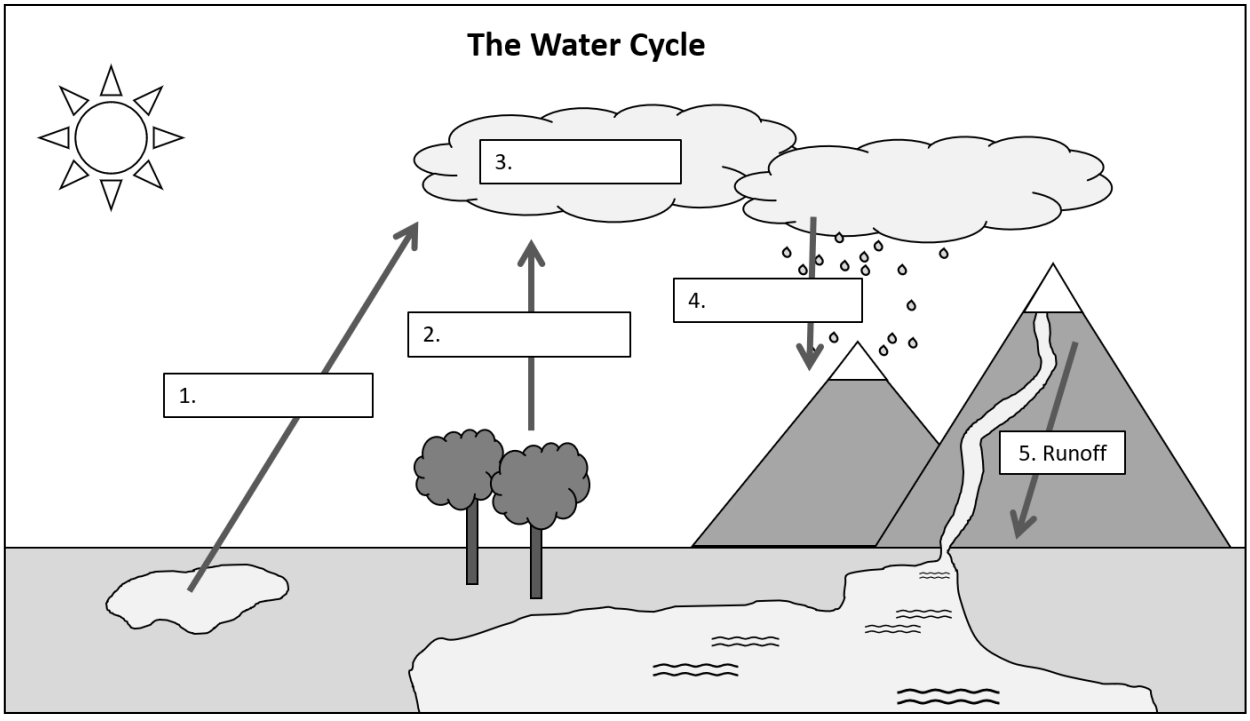
1. Water evaporates into the atmosphere because of heat from the sun.
2. Water evaporates into the atmosphere from the transpiration of plants.
3. When it cools, water condenses in the clouds.
4. Water falls as rain (from the clouds) on the oceans and the land.
5. The rain might be frozen as ice or snow.
6. The snow and ice can melt from the sun's heat.

- Ask the students if there are any words with which they are not familiar (such as, *atmosphere, condenses*) and give descriptions of words that may be a difficulty.

Component 4B

Questions

Ask students to use the information in the text to complete the illustration by writing the appropriate word for the process shown in the numbered boxes in the diagram below.



- Ask the students to volunteer answers, and give a positive feedback.
- Select a sample answer for students to write down. This may come from a student or from the following sample answer.

Sample answers:

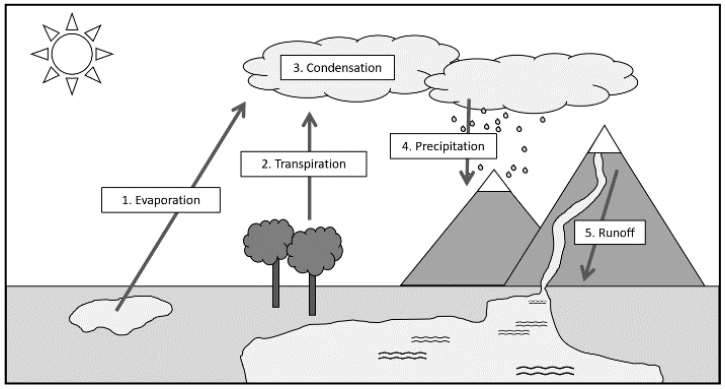
Q1. The process of evaporation is shown by arrow 1.

Q2. The process of transpiration is shown by arrow 2.

Q3The process of condensation is shown in arrow 3

4 The process of precipitation is shown by arrow 4

.



Component 4C

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

  Q1. Which part of the cycle needs heat from the sun?

  Q2. Complete the following sentence "Water exists in the liquid form in the …….. and in the ……..".

  Q3. **(Optional)** *How would the water cycle be affected if there is a very long period of hot sun?*

- Ask students to volunteer answers, and give a positive feedback.
- Select sample answer for students to write down. This may come from a student or from the following sample answer.

Sample answers:

Q1. The evaporation of water from the oceans won't happen without heat from the sun.

Q2. "Water exists in the liquid form in the oceans and the clouds.".

Q3. During long periods of hot sun, more water than usual will evaporate, and this could cause a drought on the land.

Component 5: Lesson Conclusion

Time: 5 minutes

- The focus of this lesson was to use diagrams to describe t*he* physical changes of state in the water cycle. Ask students the following questions either by class discussion or writing the answers in their worksheet.

  Q1 Did you find using the text to complete the diagram of the water cycle difficult? Why*?*

  Q2. Did you find learning about the water cycle using scientific language interesting? Why?

- Let students know that good learners reflect on their learning*?*

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

Science Grade 8 Lesson Plan 18 Consolidation

Heating Water - An Experiment

Key Idea being reinforced

Science texts often include graphs to communicate trends in data.

Component 1: *Short Review*

Time: 7 minutes

- Ask students to write down their answer on their worksheet first.

  Q1. Which process of physical change gives out heat?

  Q2. Name processes of physical change that require heat.

  Q3. Describe what happens to particles in a beaker of water when the water is heated.

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

Sample answers:

Q1. Condensation

Q2. The processes that need heat include melting and evaporation.

Q3. When water is heated the particles gain energy from the heat and begin to vibrate and move faster, they might even get enough energy to change to a gas.

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

Time: 3 minutes

- This lesson is about **reading diagrams and graphs** and how important this is for their learning and when answering questions in science.

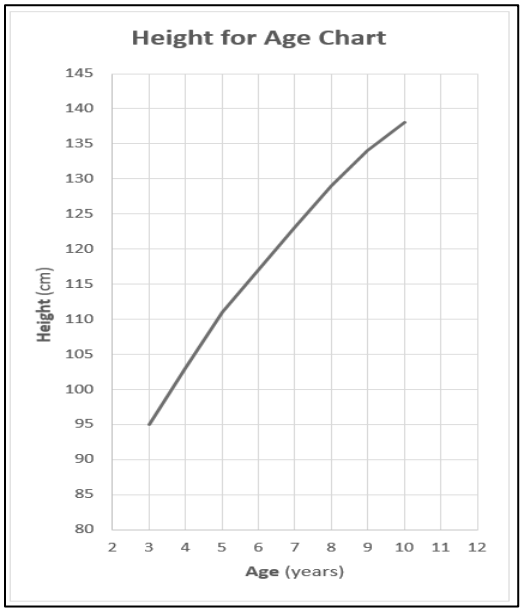
The lesson is about physical change. *We want to be sure we know and understand that some **physical changes require energy in the form of heat and that this can be explained by the particle model**.*

Component 3: Lesson Language Practice

Time: 10 minutes

- The information presented here shows how scientists produce a graph from data in a table.

Time in years:	3	4	5	6	7	8	9	10
Height in centimeters (cm):	95	103	111	115	123	129	134	138



- Ask students to look at the graph. Read out the question below and ask the students to write down their answer. Encourage the students to **read/view it carefully** to think about what it means.

Q1. Describe what the graph means in words.

- Ask students to volunteer their answers, giving positive feedback.
- Read out some answers for students to write down. This may come from one or several of the students or from the following sample answer.

Sample answer.

Q1. *The graph shows that as children get older, they grow taller.*

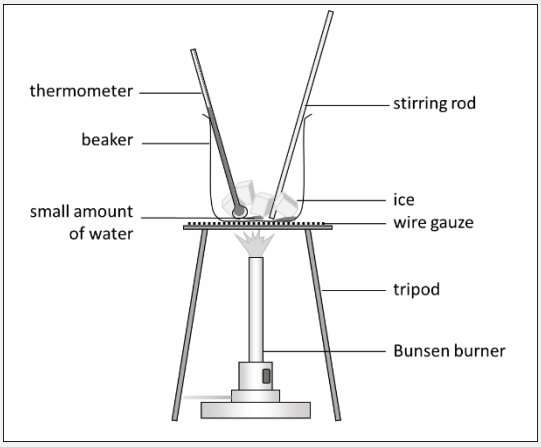
Component 4*:* Lesson Activity.

Time: 25 minutes

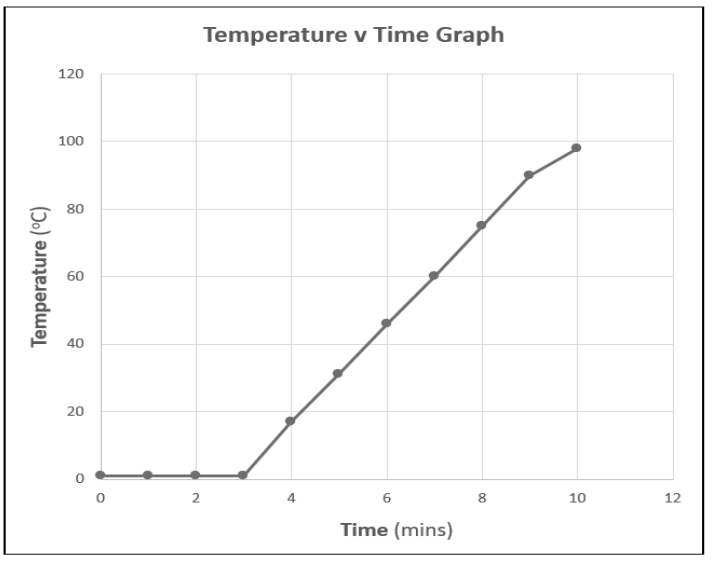
Component 4A

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

Heating water



A small group of students followed the teacher's instruction to gently heat some ice in a beaker and take the temperature every minute. The students recorded their data and produced the graph below.



- Ask the students if there are any words of which they are not familiar (such as, wire gauze, tripod, Bunsen burner) and give descriptions of words that may be a problem.
- Ask students to use the information in the diagram and graph to answer the following questions.

Component 4B

- Students read the following questions and answer on their worksheet first.
  Q1. *What might you see happening in the first 4 minutes?*

  Q2. *What do you think has happened in the last 4 minutes?*

  Q3. *What do you think would happen if the students went on heating the water?*

- 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 ice is melting.

Q2. The temperature is rising rapidly.

Q3. The water would probably start to boil.

Component 4C

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

  Q1. Describe what is happening to the temperature in the first 4 minutes while the ice is melting.

  Q2. Describe what is happening in the beaker and according to the graph in words.

  Q3. **(Optional)** *Use your understanding of the particle model to explain why the temperature does not rise in the first 4 minutes.*

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

Sample answers:

Q1. The temperature is staying the same.

Q2. When you first start heating the ice the temperature stays the same for 4 minutes and then when the ice melts the temperature starts to go up quickly.

Q3. For the ice to change to liquid water the particles need heat to give them enough energy to move about a bit and become a liquid so while that is happening the temperature doesn't rise.

Component 5. Lesson Conclusion

Time: 5 minutes

- The focus of this lesson was to use an experiment and graphs of the data to explain t*he* physical changes of state using the particle model.
- Ask students to answer the following questions either by class discussion or writing the answers in their worksheet.

Q1 Did you find the questions in B easier than the questions in C. Why?

Q2. Did you find this lesson helped you to understand the particle model better? Why?

- Let students know that good learners reflect on their learning*?*

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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