Exploring Light, Teaching Sequence. Year 5, Term 4

Phase	Lesson	Content	Resources
Engage **Lesson 1**	**Lesson 1** **Introduction to light** **What is light?** The purpose of this lesson is to elicit questions about light, find out what they know and understand about light sources. This will give me some ideas for adjusting and planning future lessons.	This lesson will be firstly to identify what students believe about light, where it comes from, how we use light. I will introduce the Website Bubbl. us <https://bubbl.us/ > This is a free concept mapping tool that I will use to encourage students to engage with ICT The purpose of this lesson is to elicit questions about light, find out what they know and understand about light sources. This will give me some ideas for adjusting and planning future lessons. This lesson is constructed so that the students will generate ideas about light and justify their identification of light and its sources.	**Resources:** • Prepared word wall chart. • https://bubbl.us/ Free concept mapping tool. • If is not possible to use this technology this could be done on the whiteboard or paper. Or enlarged copy of thoughts about light resource from “Light fantastic” • Science Journals • The prepared resource,” thoughts about light” from “light fantastic” • Torch

		I will organise the students to work effectively in teams, this will be achieved by giving each member an identified role in the group. Groupings also apply some social constructivism to the learning environment. This session introduces several of the ongoing practices and resources that I will be using throughout the unit. • The word wall, this will be a place that students can reference science language for use in journals and speech. • The chat board, for questions and material that they find interesting. I will also place interesting extra reading material and websites for students. • Proper journaling and scientific drawings • Concept Mapping • Teams, expectations and roles.	For Teams: • Badges for team roles, Manager, Director, Speaker. • Paper for concept mapping for each team • Marking Pens • Scissors • Glue

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Lesson 2	**Lesson 2 In the dark.** Students will be able to discuss their perceptions of how we need light to see The students will use concept mapping to communicate those understandings	This lesson will elicit further students understanding of dark places and how light helps us to see. We will explore the dark and the student's perception of dark places through concept mapping; this will be done as a group discussion and mapped on Buble.us. The conclusion of this lesson will be a viewing of the promo clip from the Hayward Gallery detailing artist that have used light in their artwork. This clip will be a discussion point for the materials used how those materials reflect, refract and transmit; this is a good resource for this topic.	**Resources:** • Science journals • Science chat board • Word wall • In the dark, prepared worksheet. • Computer • Data projector For Teams: • Badges for team roles, Manager, Director, Speaker. • Marking Pens • Scissors • Glue

Lesson 2a	**Lesson 2a** **Looking for light**. **Light sources** Students will be able to sort light sources correctly as either man-made or natural	The focus question for this lesson will be: Where does light come from? Students will learn about light, how it travels and how it is used in everyday life. I will guide the students to construct a concept map about light. Ask students to think about everything they know about light and discuss with a partner. Display an unfilled concept map with light as the main topic. Invite students to share what they know about light and add to the concept map. Revise prior knowledge about light. **Focus questions:** *Where do we find light?* *How do we use light?* *What is light?* Discuss student responses and add to the	**Resources:** • Science journals • Science chat board • Word wall • Prepared list of light sources • Computer • Data projector For Teams: • Badges for team roles, Manager, Director, Speaker. • Marking Pens • Scissors • Glue

	Diagnostic Assessment Elicit students prior knowledge	concept map. Explain that light is a type of energy. Have students copy the concept map into their science journals.	
Explore Lesson 3	**Lesson 3 How we see.** Students will understand that objects either need to reflect light or be a light source to see them Students will understand how light allow humans to see.	The objective of this lesson is to show students how light allow humans to see. This lesson is the first of the exploration section of this unit, in the first two lessons we used questions to glean understandings and perceptions. The next section is about testing theories and experimenting. The students will engage with the resources and through questioning and scientific processes generate and evaluate knowledge ideas and possibilities. They will make visual representations (labelled diagrams) reflect on their outcomes through reflections, posing questions and analysing the evidence.	**Resources:** • Science journals • Science chat board • Word wall • Computer • Data projector For Teams: • Badges for team roles, Manager, Director, Speaker. • Marking Pens • Scissors

			• Glue • Pinhole camera instructions • Peek box with small opaque object • Tape • Rubber bands • Pringles container.
Lesson 4	**Lesson 4** **How does light travel?** Students will understand that light travels in a straight line Students will use labelled diagrams and a ray diagram to demonstrate their understanding	This lesson is a demonstration of how light travels. In the first lesson I have asked the students to write their understandings of light, this activity will allow the students to test their hypothesis about how light travels. I will explain to the students that the purpose of these experiments is to test their original hypothesis regarding how light travels. This will also be an opportunity to demonstrate the	**Resources:** • Science journals • Science chat board **Prepared resources.** • Template of light shield card • Instructions on the procedure • Equipment list

		importance of diagrams in scientific explanations and work through from the hypothesis to the testing to conclusion. **Questions for this investigation:** • Does Light travel in a straight line? • Why do you think that? • Can light curve? Why? • Can light change direction on its own? Why? I will display the sheet how light travels investigation and explain that these are the instructions for the investigation. Read with the sheet with students and discuss the investigation, and explain that the investigation involves two steps by referring to 'Procedure 1' and 'Procedure 2'.	• Labelled diagram for students to model **For Teams**: • Badges for team roles, Manager, Director, Speaker. • Marking Pens • Light Shield Cards x 3 • Ruler • Scissors • Tape • Thick book • Torch • Blue tack • Science Journals • Worksheets • Instruction sheet • A piece of string

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Lesson 5	**Lesson 5** **Make way for light.** Define the terms 'transparent', 'opaque', 'translucent' in Relation to the transmission of light. Classify objects as either transparent, opaque or translucent and investigate the properties of these three definitions. Explain what happened to the light using scientific investigation using the scientific terms?	Students will investigate how shadows are formed when light is blocked by opaque objects. What happens to light when it hits an object? When lights hits an object, it is either reflected, absorbed, refracted or transmitted. When light is reflected, it reflects to our eyes, and it is this light that allows us to see an object. Certain objects will absorb certain colours and reflect other colours of the light spectrum. This is how objects gain their colour. Refraction of light is related to reflection and transmission of light. The light changes direction as it passes through a more dense medium and then reflects back to our eyes. Transmission of light is when light passes through an object. Opaque objects transmit no light.	**Prepared resources.** • Instructions on the procedure • Equipment list • Make way for light worksheet and procedure • **For Teams**: • Badges for team roles, Manager, Director, Speaker. • Marking Pens • Ruler • Scissors • Science Journals • Worksheets • Objects of different levels of transparency. • Torch

		Focus Questions and predictions for this lesson. *Can light travel through things? How do we know that?* *Does light travel through all things? How do we know that?* How does this type of material affect the light transmitted? How does the type of material affect the amount of light transmitted? *What does the brightness of the light tell us about how much light is being transmitted?* *Which objects transmitted the most light?* *Which objects transmitted the least light?* *Were there some objects that only transmitted some light?* *What happened to the light if it wasn't being*	

		transmitted through an object? *Which object is easier to see from a distance?* *Why do you think it is harder to see transparent objects than opaque objects?* *Do you think a translucent object would be easier or harder to see than an opaque or transparent object?*	
Lesson 6	**Lesson 6 Shadows** Understand that shadows are formed when an object blocks a light source.	This is an investigation lesson; I will explain that scientists conduct investigations to find out how changing one thing affects another. The test must be fair so that the information gathered is accurate. This is called fair testing. I will explain that things that can be changed are called variables. In any investigation there are number of possible variables, that is, lots of	**Prepared resources.** • Instructions on the procedure • Equipment list • Investigating shadows worksheet • **For Teams**:

		things that can be changed. I will prepare a *Shadow height: Investigation planner*. Some questioning for this could be: *What is the variable we are going to measure in this investigation?* *What are some of the variables we could change that would affect the height of the shadow?* *Are there any other things that could change the height of a shadow?* *Which would be the easiest variable to test? Why?* *What did you notice about the shadow heights?* *What happened as you moved the torch further away from the eraser?* *What does this tell you about shadow heights*	• Badges for team roles, Manager, Director, Speaker. • Marking Pens • Ruler • Tape • Scissors • Science Journals • Torch • Worksheets

		and their distance from a light source? *How does this explain how Viktor was able to make his puppets change size?* • Explore how different materials create different shadows (size, shape, darkness). • Relate the topic to shadow puppets. Play a shadow game. **This game needs to be played outdoors.** It is a version of 'Simon says' with the teacher giving the instructions. Have each student find their own space. Ask them to take note of their shadow. You can call out a range of instructions, but here are some suggestions: • Move to a place where you cannot see your shadow.	

	Formative Assessment Monitor developing understandings	• Try to get away from your shadow. • Turn your shadow into a 'T'. • Turn your shadow into an 'O'. • Make your shadow as small as possible. • Make your shadow as large as possible. The children can also play shadow tag where they try to catch another person's shadow.	
Explain **Lesson 7**	**Lesson 7** **Periscope investigation**	This lesson is designed to support the students into the assessment task and, as such, the focus is on the inquiry skills and ability to construct explanations. Of course, this means that the students are expected to display some understanding of the properties of light as studied through the unit. This lesson is a very important monitoring opportunity to determine where students require assistance with their inquiry skills. It also allows for a considerable amount of feedback on these	**Prepared resources.** • Instructions on the procedure • Equipment list • Periscope worksheet • Equipment list • PowerPoint presentation of the history of periscopes. • Example of a flow chart **For Teams**: • Badges for team roles,

		skills. **Periscope construction** The periscope construction needs to be strongly guided as the steps can be somewhat confusing. There are many other ways to make periscopes, but this will be the easiest to make a change to. The procedure can be printed in black and white for students to share. You will need mirrors. The use of reflective cardboard will not work here as there is too much scatter. (This could actually be the change the students make, replace the mirrors with reflective card.) Small plastic mirrors would be the best option and are easily attainable. You may wish to have students share mirrors for this task. Any cardboard will work as long as it is a	Manager, Director, Speaker. • Marking Pens • Ruler • Tape • Scissors • Science Journals • Torch • Worksheets • A4 cardboard • coloured cellophane • small mirrors

	Formative Assessment Monitor developing understandings	suitable size for the mirrors. We will explore the history of periscopes and their main uses. • Construct and test periscopes in groups under teacher instruction. • Develop an investigation surrounding the periscope, including determining the variable to be tested, developing the investigation question, predicting, developing procedure, deciding how to best present their data (all under teacher guidance as a whole class). • Carry out the investigation including developing an explanation and evaluation of methods.	

Elaborate **Lesson 8**	**Lesson 8** **Properties of light** Explore how different cultures experienced difficulty with spear fishing due to refraction (focus on Aboriginal peoples and Torres Strait Islander peoples). Explore refraction using a bending pencil/coin. Complete a problem-solving task related to spear fishing using objects immersed in containers of water and straws.	This lesson involves the concept of refraction The basic concept of the refraction of light is that as light travels through a denser medium it slows down. For example, as light travels through air and then water it slows down because water is a denser medium. Of course when we look from the side of a glass light also travels through the glass. Many communities around the world have experience with spear fishing, including Aboriginal and Torres Strait Islander peoples, Asian peoples and indigenous groups from North America. When discussing spear fishing in this context, we are referring to spear fishing in shallow water at the water's surface, looking down on the fish from above. When this happens, the fish appears to be in a different location to the reality due to refraction.	See digital resources attached

Lesson 9	**Lesson 9** **Shadow puppets**	The key is to aim just below the fish. (This is assuming the fish is moving away from you.) This Resource has lesson plans, Videos and instruction for a lesson that ties into this unit.Artsedge, 2013, The Science of Shadow Puppets. Retrieved 20th November 2013. http://artsedge.kennedy-center.org/educators/lessons/grade-6-8/Shadows_and_Light.aspx#Overview *Make predictions about the way light travels and determine whether the predictions are correct* *Use online resources to learn how shadows are formed* *Demonstrate an understanding of the terms translucent, opaque, and transparent through*	Artsedge, 2013, The Science of Shadow Puppets. Retrieved 20th November 2013. http://artsedge.kennedy-center.org/educators/lessons/grade-6-8/Shadows_and_Light.aspx#Overview This resource has how to videos, lesson plans and support material.

	Summative Assessment Evaluate the achievements of the investigation skills and concepts developed	*the creation of shadow puppets* *Explore the way light interacts with matter by way of transmission, absorption, and reflection* *Make observations about the properties of shadows based on online interactive activities* *Experiment with a light source, puppet, and screen to create different shadow effects, demonstrating an understanding that the properties of a shadow are determined by the intensity and position of the light source and the distances and angles between the light, object, and surface* *In groups, create and perform shadow plays.* Artedge, 2013.	

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Evaluate Lesson 10 **This will take more than one lesson.**	**Lesson 10** **The Maze trick** **Summative Assessment** Evaluate the achievements of the investigation skills and concepts developed	This is the assessment task. Students will need to construct a maze using a template that I will provide, students then find a way for light to move around the maze. Students will need to change on element of the maze, include predictions, observations and scientific diagrams that reveal explanations and evaluation. Students will demonstrate how the transfer of light can be changed. Then Students could alter the appearance of the light in some way, hopefully using the known information from the shadow, reflection, refraction or absorbed light developed throughout the unit. I expect that the students will take one lesson to construct their maze,	Resources: • Plastic mirrors • Adhesive putty • Torch • Scissors • Tape • Black paper to show the light source as it exits doorway 2 • A small box, e.g. a shoebox • Cardboard