



education

Department:

Education

PROVINCE OF KWAZULU-NATAL

## Just-in-Time Training Workshop Term 3

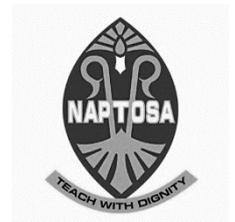
# Facilitators' Guide

**Grades: 8 & 9**  
**Subject: Natural Sciences**



**Jika iMfundo**  
what I do matters

Endorsed by:



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## DOCUMENT MAP

<b>SESSION 1 (08:30-10:00)</b>						
Content & Objectives	Key points/probing questions	Activities	Duration	pg. no.		
				PM	CAPS	CT
<b>1. Unit 1: Get to know your tracker</b> <b>2. Unit 2: Cognitive level demands</b> <b>3. Unit 3: Electricity</b>	Remind HODs about the benefits of Tracker (PM-p.6). Mention that: <ul style="list-style-type: none"> <li>• tracker does not replace “lesson plan”, it is only a plan that directs to what you want.</li> <li>• There are 8 authorised textbooks that are tracked.</li> <li>• The Notional NS teaching hours MUST be observed!</li> <li>• Highlight what will be done in session 2</li> </ul>	Activity 1	40 min			
		Activity 2	30 min			
		Activity 3	20 min			
<b>SESSION 2 (10:30-14:00)</b>						
		Activity 4				
		Activity 5				
		Activity 6				
		Activity 7				
		Activity 8				
		Activity 9				
		Activity 10				
		Activity 11				
<b>Total time for activities</b>						

## UNIT 1: TRACKER

Activity 1: Get to know your Term 3 Tracker		
Resources	Method	Duration
Natural Sciences Tracker for grade 8 Term 3	Group activity; question and answer	30 min

Question	Suggested answers to the question	Additional information
Q1	<p>Weekly reflection is a very crucial component of the curriculum coverage tracking process. This reflection differs from the reflection which is found in lesson preparation. The Grade 8 (p8) tracker lists ideas for that teachers could share among themselves and with the HOD. What are these ideas?</p> <p>The weekly reflection provides ideas that could be used to inform discussions between the HOD and teachers in his/her department during reflection meetings. When reflecting they can think about things such as:</p> <ul style="list-style-type: none"> <li>• Was my preparation for the lesson adequate? Did I have all necessary resources; had I thought through the content so that I understood it fully and so that I could teach it effectively?</li> <li>• Did the purpose of the lesson succeed? For instance, did the learners reach a good understanding of the key concepts for the day; could they use the language expected from them; could they write what was expected of them?</li> <li>• Did the learners cope with the work set for the day, For instance, did they finish the classwork; was their classwork done adequately; did I assign any homework?</li> <li>• What can I do to support learners who did not manage the work or to extend those who did so easily?</li> <li>• What might I change next time I teach this same content? Will I try a different approach?</li> </ul>	
Q2	Page 97 – 98 of Grade 8 curriculum tracker	

Q3	Worksheet number and content	Worksheet page No.	Answer page No.
	Worksheet 1 static electricity	105	106
	Worksheet 3 components of a circuit	109	110
	Worksheet 4 circuit diagrams	111	112
	Worksheet 6 advanced questions	115	116
	Worksheet 8 test your knowledge about light	119	120
	Worksheet 9 understanding diagrams about light	121	122
Q4	A <b>mind map</b> is a diagram used to visually organize information. A <b>mind map</b> is often created around a single concept, drawn as an image in the centre of a blank landscape page, to which associated representations of ideas such as images, words and parts of words are added. (Page 5)		
Q5	<p>Some teachers have difficulties for various reasons, to complete the work planned for the term. What would you say to them as an HOD? You can refer to page 3 of the tracker.</p> <p>The CAPS for term 2 prescribes three hours of Natural Sciences per week, and sets out content over nine weeks. To accommodate this, the tracker for each term contains planning for 54 half -hour sessions organised into six sessions per week. Depending on the school's timetable the teacher may use two of these sessions in one double period. The teacher might also need to adjust the week prescribed for a session to meet demands of his/her timetable. However, the week's work should always be covered in a week. The breakdown of work to be done each week corresponds to the work schedule and programme of assessment drawn up by the department of Education but the tracker gives a more detailed outline of what should be done each day.</p> <p>If some learners complete some work well ahead of time the teacher should consider providing them with enrichment activities that are provided with the tracker. If some learners do not complete their written work in time, they can complete the activity as home work. If for any reason a teacher miss a lesson, or find out he/she needs more time than planned on some aspect of work, he/she should find a way to get back on track so that the curriculum for the term is covered as required.</p> <p>Term 3 is eleven weeks long. This means that there are two weeks after the nine weeks for which planning have been provided in the tracker. This means that time is available for completing work not yet done in the nine weeks, and for assessment and feedback on assessment, and for remediation. What should best be done in these two weeks will vary from class to class, and the two weeks has been left so that teachers can plan for them as per their individual class needs.</p>		

Q6	<p>People are not the same. Learners will attend the Natural Sciences class with different needs, styles of learning and also with a variety of alternative ideas about scientific phenomena. The tracker provides valuable information to teachers on how to deal with this challenge as well as information on where “additional information” could be found. What are the suggested strategies of teaching learners with special needs that are suggested by the trackers? Refer to page 6</p> <p>For different learning styles, the teacher can use a variety of teaching methods. These include whole class teaching, peer interaction, small-group learning, writing activities, drawing and mind-mapping activities, presentations, debates and role play. Where possible, teachers should encourage reading, writing and speaking skills.</p> <p>There is also a large amount of additional information to help teachers in the teachers’ guide and the DBE has published some excellent materials to support teachers in working with learners with barriers. Two such publications are:</p> <ul style="list-style-type: none"> <li>• Directorate Inclusive Education, Department of Basic Education (2011) <i>Guides for responding to learner diversity in the classroom through curriculum and assessment policy statements</i>. Pretoria. <a href="http://www.education.gov.za, www.thutong.doe.gov.za/inclusiveEducation">www.education.gov.za, www.thutong.doe.gov.za/inclusiveEducation</a></li> <li>• Directorate Inclusive Education, Department of Basic Education (2011) <i>Guides for inclusive teaching and learning. Education White Paper 6. Special needs education: Building on inclusive education and training system</i>. Pretoria. <a href="http://www.education.gov.za, www.thutong.doe.gov.za/inclusiveEducation">www.education.gov.za, www.thutong.doe.gov.za/inclusiveEducation</a></li> </ul>	
Q7	Answer as per teacher’s experiences	
Q8	Answer as per teacher’s experiences	

Activity 2: Cognitive demands for formal assessment		
Resources	Method	Duration
Gr 7-9 NS CAPS document Natural Sciences Tracker for grade 8 Term 3	Group activity	30 min

**Purpose: How to assess the questions in the test.**

Question(s)	Cognitive demand			
	Knowing science	Understanding science	Applying science	Evaluating, Analysing, synthesising scientific knowledge
	Low order	Middle order		High order
1.1	✓			
1.2		✓		
1.3		✓		
1.4	✓			
1.5	✓			
1.6		✓		
1.7		✓		
2.1	✓			
2.2		✓		
2.3				✓
3		✓		
4.1		✓		

### Additional information about the Bloom's taxonomy

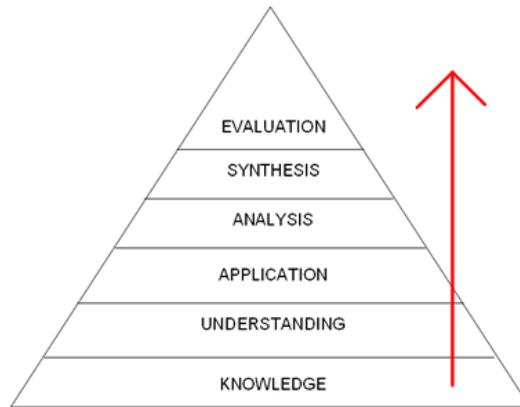
Bloom's taxonomy is a classification system for levels of behaviour that are important in learning. The KSA's (knowledge, skills and attitude) that trainers often refer to are derived from Bloom's taxonomy.

Benjamin Bloom headed a committee of educational psychologists that devised the classification system in 1956. The committee was formed out of a meeting of the American Psychological Association (APA). The group came up with three major areas of educational activities:

- **Cognitive:** mental skills (**K**nowledge)
- **Psychomotor:** manual or physical skills (**S**kills)
- **Affective:** growth in feelings or emotional areas (**A**ttitude)

The committee focused on the cognitive (knowledge) domain and developed six levels within it. The levels build on top of each other with the simple recall of facts as the lowest level and then moving on up to evaluation which is ranked as the highest order.

### Cognitive Domain



Essentially Benjamin Bloom and his colleagues popularized the idea that knowledge is acquired at certain definable levels. Trainers should be sure to test students based on the level of knowledge that is taught in the training setting.

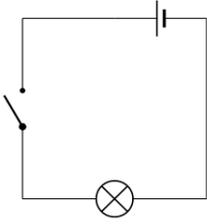
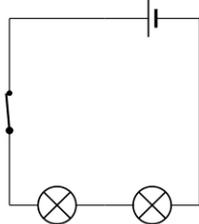
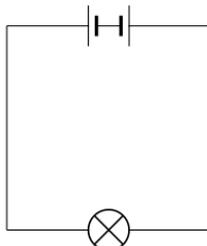
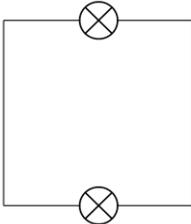
Bloom's taxonomy views the recalling of knowledge as less sophisticated than translating that knowledge and applying it in new contexts. Higher levels of the taxonomy (classification system) involve analyzing knowledge, synthesizing it, and evaluating it.

Trainers can use Bloom's taxonomy when developing questions or assignments by varying the level of sophistication of what they ask their students to accomplish based on what has been taught. The following chart lists verbs that can be used to develop assignments. The verbs are grouped under the six levels of the cognitive domain of Bloom's taxonomy:

Definition	I. Remembering	II. Understanding	III. Applying	IV. Analyzing		V. Evaluating		VI. Creating	
<b>Bloom's Definition</b>	Exhibit memory Of previously Learned material by recalling facts, terms, basic concepts, and answers	Demonstrate Understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	Examine and break information into parts by identifying motives or causes, make inferences and find evidence to support generalizations.		Present and Defend opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria.		Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.	
<b>Verbs</b>	Choose Define Find How Label List Match Name Omit Recall Relate Select Show Spell Tell What When Where Which Who Why	Classify Compare Contrast Demonstrate Explain Extend Illustrate Infer Interpret Outline Relate Rephrase Show Summarize Translate	Apply Build Choose Construct Develop Experiment with Identify Interview Make use of model Organize Plan Select Solve Utilize	Analyze Assume Categorize Classify Compare Conclusion Contrast Discover Dissect Distinguish Divide Examine Function Inference	Inspect List Motive Relationships Simplify Survey Take part in test for Theme	Agree Appraise Assess Award Choose Compare Conclude Criteria Criticize Decide Deduct Defend Determine Disprove Estimate Evaluate Explain importance	Influence Interpret Judge Justify Mark Measure Opinion Perceive Prioritize Prove Rate Recommend rule on select Support value	Adapt Build Change Choose Combine Compile Compose Construct Create Delete Design Develop Discuss Elaborate Estimate Formulate Happen Imagine Improve Invent Make	Modify Original Originate Plan Propose Solution Solve Suppose Test Theory Maximize Minimize Modify Predict

Anderson L.W., & Krathwohl D.R. (2001). A taxonomy for learning, teaching, and assessing, Abridged Edition. Boston, MA: Allyn and Bacon.

Activity 3: Components of a circuit		
Resources	Method	Duration
Natural Sciences Tracker for grade 8 Term 3 (week 2)	Group discussion	5 min

Circuit	Glow/Not Glow	Explanation
	Will not glow	<i>The switch is open, so the circuit is incomplete.</i>
	Will glow	<i>The switch is closed and there is a complete circuit.</i>
	Will not glow	<i>There is a closed circuit but the two negative terminals of the cells are connected, rather than a negative connected to a positive terminal. One of the cells is reversed. Same terminals are connected.</i>
	Will not glow	<i>This is not a circuit diagram, there is no energy source.</i>

Activity 4: Series circuits		
Resources	Method	Duration
1. Natural Sciences Tracker for grade 8 Term 3 (week 5) 2. Electric kit	Group discussion	15min

### Procedure

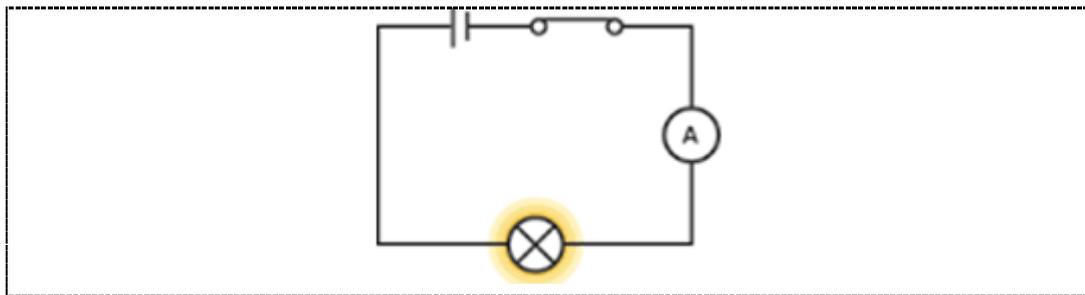
1. State your investigative question.

**What happens to the current when the number of bulbs connected in series increases?**

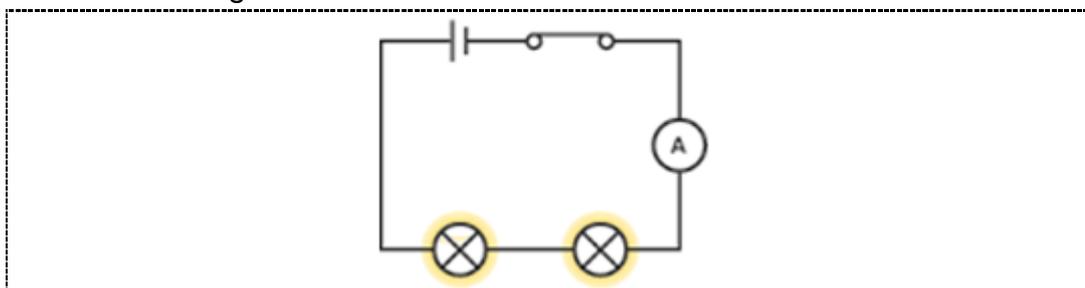
2. State your hypothesis.

**An increase in the number of bulbs in series decreases the current.**

3. Construct the circuit with the cell, the ammeter, 1 bulb and the switch in series.
4. Close the switch.
5. Observe the brightness of the bulb and record the ammeter reading in the table below.
6. Draw a circuit diagram for the circuit you constructed in steps 3 & 4 above.

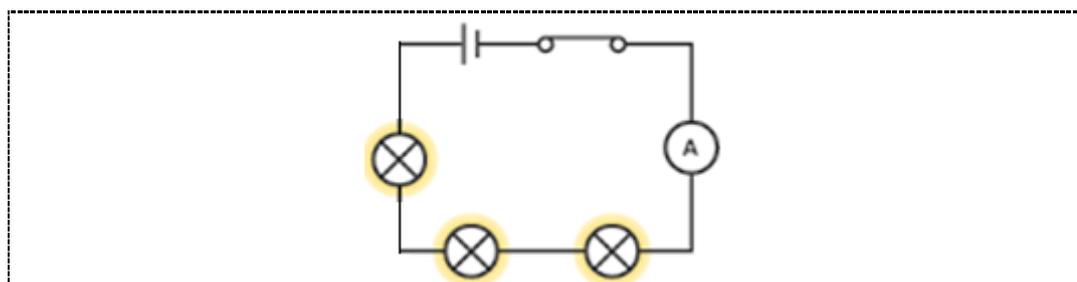


7. Open the switch; add another light bulb into the circuit, in series with the first one.
8. Close the switch, observe the brightness of the bulbs and record the ammeter reading.
9. Draw a circuit diagram.



10. Open the switch; add the third light bulb into the circuit, in series with the other two light bulbs.
11. Close the switch, compare the brightness of the bulbs with your previous observations.

12. Draw a circuit diagram for the last circuit you built.



13. Record your observations for questions 5, 8 and 11 in the table below.

Number of bulbs in series	Brightness of bulbs	Ammeter reading
1	<i>Brightest</i>	
2	<i>Brighter</i>	
3	<i>Bright</i>	

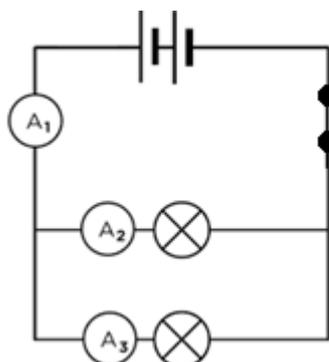
Write down your conclusion

Increasing the number of bulbs in series decreases both the brightness of the bulb and the ammeter reading.  
This indicates that the more the number of bulbs in series, the smaller the current strength.

Activity 5: Parallel circuits		
Resources	Method	Duration
1. Natural Sciences Tracker for grade 8 Term 3 (week 5)	Group discussion	15min
2. Electricity kit		

### Procedure

- 1) Construct the circuit with the cell, ammeter, one bulb and the switch in series.
- 2) Close the switch, note the brightness of the bulb and write down the ammeter reading in the table on page 12.
- 3) Open the switch; add the second light bulb into the circuit, in parallel with the first one.
- 4) Close the switch, observe the brightness of the bulbs and record the ammeter readings for the 3 positions shown in the table on page 12.



- 5) Open the switch; add the third light bulb into the circuit, in parallel with the first and second one.
- 6) Close the switch, observe the brightness of the bulbs and record the four ammeter readings in the table on page 12.
- 7) Draw a circuit diagram for the circuit you have constructed in steps 5 & 6 above.

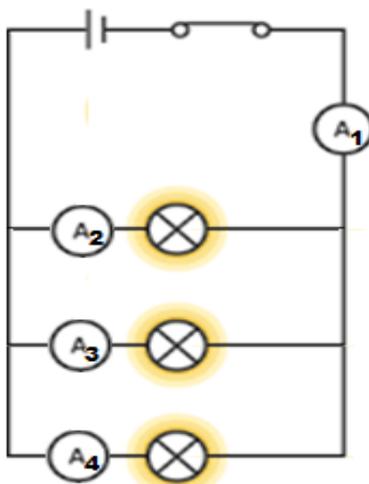


Table to record results from steps 2, 4, and 6

Number of bulbs in parallel	Brightness of bulbs	Ammeter reading			
		A <sub>1</sub> _____			
		A <sub>1</sub> _____	A <sub>2</sub> _____	A <sub>3</sub> _____	
		A <sub>1</sub> _____	A <sub>2</sub> _____	A <sub>3</sub> _____	A <sub>4</sub> _____

Answer the questions below based on your investigation:

Write down your investigative question

- a) State your hypothesis.

The greater the number of bulbs in parallel the greater the current strength.

- b) What happened to the brightness of the bulbs as the number of bulbs increased?

The brightness of the bulbs stays the same as more bulbs were added.

- c) When you had two bulbs, did they glow with the same brightness or was one brighter than the other?

The bulbs had the same brightness.

- d) When you had three bulbs, did they glow with the same brightness or was one brighter than the others?

The bulbs glowed with the same brightness.

- e) What do your answers to the previous questions tell you about the current in the parallel branches of the circuit?

As all the bulbs are identical, if they all glow with the same brightness, then they all use the same current. This means that the voltage is the same in each branch.

- f) What happened to the reading  $A_1$  on the ammeter as you added more bulbs in parallel?

The ammeter reading increased.

- g) Based on your answers, what happened to the current in  $A_1$  when more bulbs were added in parallel?

As more bulbs were added the current increased.

- h) Do you accept or reject your hypothesis?

This answer will depend on the hypothesis written at the start of the investigation.

Activity 6: How to connect an electric plug		
Resources	Method	Duration
Natural Sciences Tracker for grade 9 Term 3 (week 6)	Group discussion	15

- (a) What do letter N, E and L stands for on the plug?

N	Neutral
E	Earth
L	Live

- (b) Why must the end of the wires be bare when it joins the pin of the plug?  
In order to expose the copper wire-thereby ensuring proper connection between the pins and the wires

- (c) What is the purpose of the earth pin of the plug. Where does the earth wire go?

The earth wire connects the metal frame of the electrical appliances to the ground. The purpose of earth pin is that in case of an insulation failure in some appliance, this wire connected to the metal body will provide a path for the current to flow to the ground. Earth wire goes to the ground.

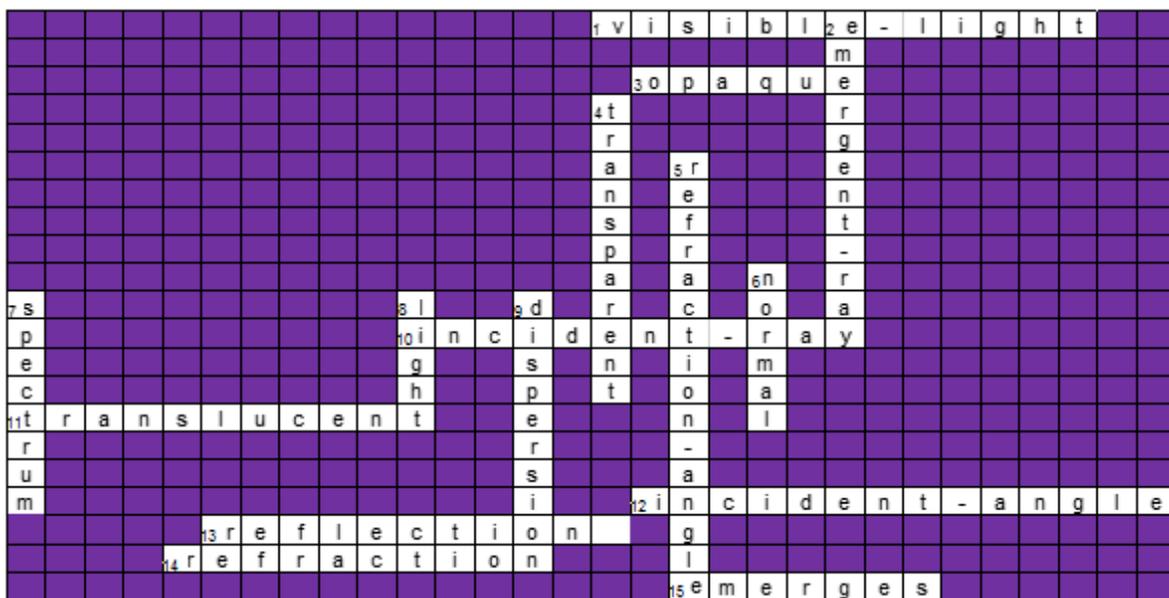
- (d) Some 3-core cables still have red, black and green insulated wires. Which is the live wire, neutral wire and the earth wire

Black	Neutral
Green	Earth
Red	Live

- (e) Give two safety tips one should observe when inserting a plug into wall socket
- Only use 3-pin plugs which comply with the safety requirements and standards.
  - Never insert electric cable cores direct into a socket outlet to get power.
  - Insert and remove plugs by grasping the plug, not the cord itself
  - Do not touch electrical plugs with wet hands
  - Damaged plugs should not be used and need to be changed immediately.
  - Check all cords are in good conditions and no part of the cable is worn, split, cracked or frayed.
- (f) Why are plugs made of plastic?

Plastics are good insulators

Activity 7: Visible light: Complete the crossword below		
Resources	Method	Duration
Natural Sciences Tracker for grade 8 Term 3 Grade 7-9 NS CAPS doc.	Group discussion	15



Activity 8: Spectrum of visible light		
Resources	Method	Duration
1. Natural Sciences Tracker for grade 8 Term 3 (week 7) 2. Light kit	Group discussion	15min

To investigate: the visible spectrum that forms when white light passes through a prism

(a) Write a description of what you observed.

When white light strikes a prism at a particular angle it forms a coloured spectrum on the screen (white paper). Spectrum is a band of light in which all rainbow colours are present.

(b) Write down the order in which the colours appear.

ROYGBIV

(c) If **you** repeat the experiment, does the order of the colours change?

The order does not change

(d) What do the different colours we see tell us about the composition of white light?

White light composes of 7 different colours

(e) How does this patten compare with the colours we see in a rainbow?

The pattern is the same as that of rainbow colours

(f) How is a rainbow formed?

Rainbows happen when sunlight and rain combine in a very specific way. The beams of sunlight separate into the colours we see in the rainbow as they enter a raindrop. Sunlight is actually made up of different colours that we don't usually see. When a beam of sunlight comes down to Earth, the light is white.

Activity 9: Opaque and transparent substances		
Resources	Method	Duration
Natural Sciences Tracker for grade 8 Term 3 (week 8)	Group discussion	15min

(a) When you held the cardboard up to the light, did it allow light to pass through it? How do you know this?

No, because no light was cast on the screen.

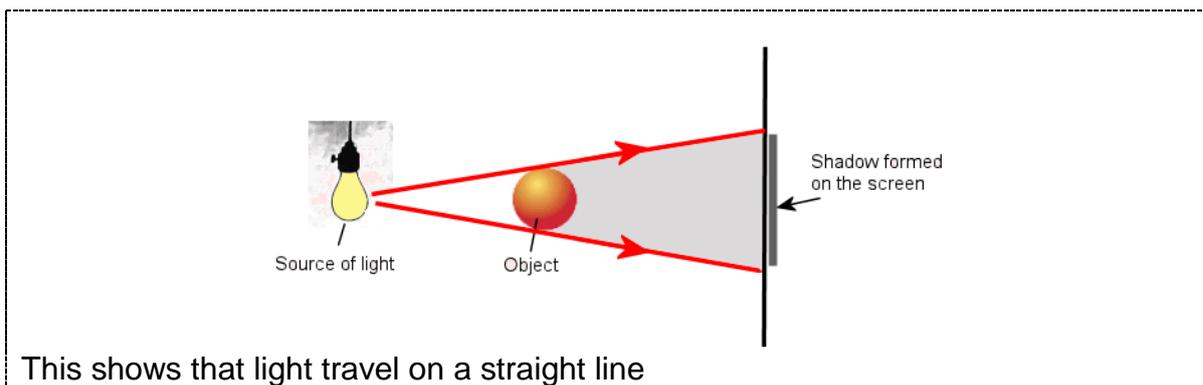
(b) Is the cardboard shape opaque or transparent?

Opaque

(c) What did you notice about the shadows formed by the different size cardboard shapes?

The smaller the size of the cardboard the smaller the shadow. The shadows are the same shape as the objects and are cast on the side of the object that is furthest from the light source.

(d) Draw a diagram to show how the shadow is formed behind the opaque shape. Use straight lines with arrowheads to represent the rays of light.



- (e) The distance between the shape and the light source was kept the same. What do you think would have happened to the shadow if the distance was increased?

The distance between the source of light and the object affects the size of the shadow. As you move the light closer to an object, the shadow becomes larger. As you move the light away from the object, the shadow becomes smaller.

- (f) Test your idea from question (f) by moving your cardboard shapes closer to and further away from the light source. What do you see? Were you correct in your prediction?

Teachers' responses either reject or accept their hypothesis

- (g) Is the clear plastic shape opaque or transparent?

Transparent

- (h) Did the clear plastic cast a shadow?

No

- (i) Explain why the cardboard casts a shadow but the clear plastic does not.  
Clear Plastic allows light to pass through

Cardboard is opaque and clear plastic is transparent.

- (j) Is the plastic shopping bag opaque or transparent?

Transparent

- (k) Explain why the shopping bag casts a lighter shadow.

Because it absorbs some of the light – we say it is translucent

Activity 10: Reflection of light		
Resources	Method	Duration
1. Natural Sciences Tracker for grade 8 Term 3 (week 8)	Group discussion	30min
2. Light kit		

**Practical activity:** To investigate the relationship between the angle of incidence and the angle of reflection.

- a) Write down your investigative question

What is the relationship between the angle of incidence and the angle of reflection?

- b) Write your hypothesis

The angle of incidence is equal to the angle of reflection

- c) Fill your results in the following table

Trial	Angle of incidence	Angle of reflection
1	30 <sup>0</sup>	30 <sup>0</sup>
2	45 <sup>0</sup>	45 <sup>0</sup>
3	63 <sup>0</sup>	63 <sup>0</sup>
4	23 <sup>0</sup>	23 <sup>0</sup>

**Answer the questions below**

(a) What happens when the incoming ray strikes the mirror?

Incoming rays are reflected

(b) What happens to the reflected ray from the mirror when you change the angle of incident ray?

Reflected ray also changes by the same increment

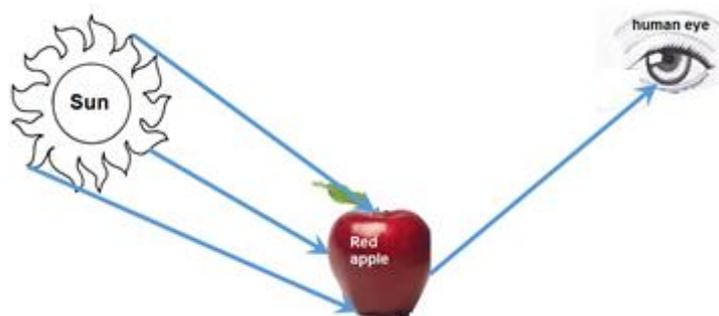
(c) What happens to the reflected ray when it strikes a rough (e.g. crumpled aluminium) surface?

Diffuse reflection occurs-law of reflection ceases.

(c) What conclusion can you make about the angle of incident and the angle of reflection?

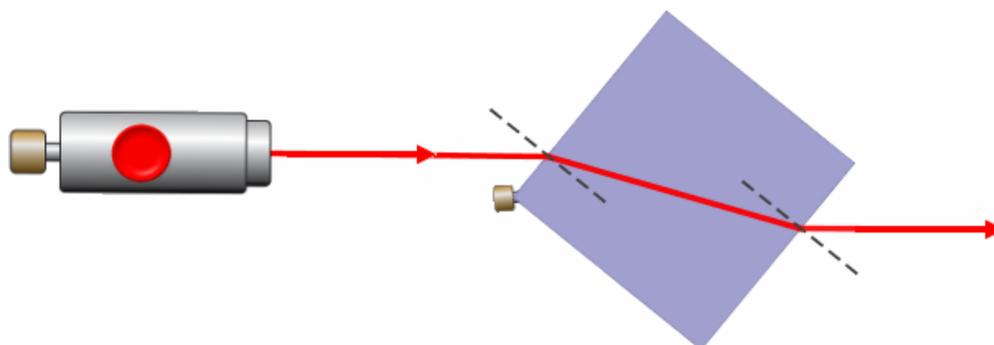
If the surface is smooth (specular) like a mirror, the angle of incident is equal to the angle of reflection.

(d) Use the diagram below to explain how human eye see a red apple.



Red apple absorbs all frequencies except red.

Activity 11: Refraction of Light		
Resources	Method	Duration
Natural Sciences Tracker for grade 8 Term 3	Group discussion	30min



(a) A learner setup the apparatus as shown above in order to investigate the refraction of light. What does the solid line represent in this diagram?

A ray of light

(b) What does the dotted lines represent? Label this on the diagram.

Normal

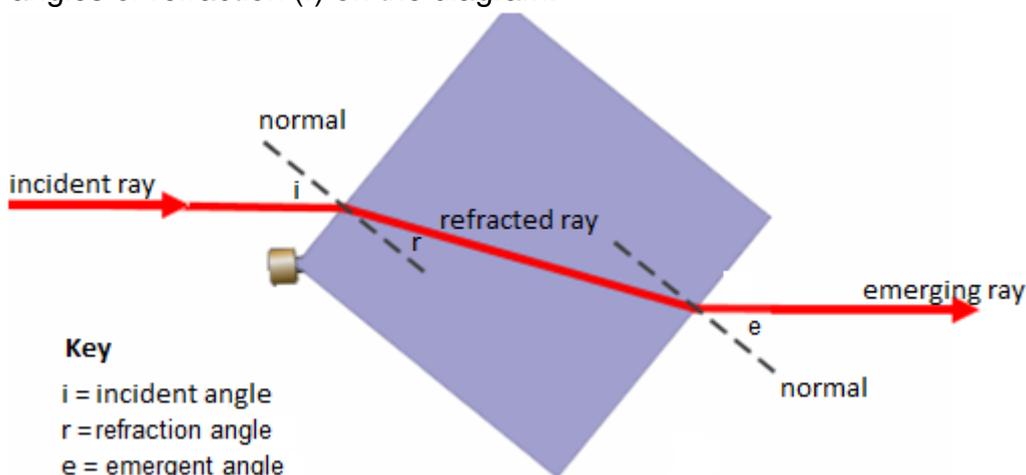
(c) The light passes from the air and into a block of another medium. Is this medium more or less dense than air? Give a reason for your answer.

More dense. When light propagates from less dense to more dense medium it bends towards the normal.

(d) What type of medium could the block be made from?

Glass or plastic material

(e) Label the incident ray, refracted ray, emergent ray, angles of incidence (i) and angles of refraction (r) on the diagram.



(e) What happens to the path of the light ray when it pass from air into rectangular block?

It bends towards the normal

(f) Redo the experiment and measure the angle of incident, the angle of refraction and the angle between the normal and emergent ray

Trial	Incident angle	Angle of refraction	Emergent angle
1	0°	0°	0°
2	20°	12.58°	20°
3	24.19°	15.85°	24.19°

(g) Discuss you observation when the angle of incident is 0° (i.e. when the incident ray coincides with the normal line).

The light pass through the prism on a straight line. The ray is not refracted

(h) Write down you conclusion

When light propagates from less dense to optically more dense medium it bends towards the normal.