

Educator Workbook

CAPS-aligned

Grade 9

Growing tomorrow's
leaders through
career guidance

Life Orientation

English First
Additional
Language

Natural Sciences

sasol



Pick n Pay
School Club



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Section A

Introduction

Foreword

The Sasol Educator Workbook for Grade 9 learners has been developed to include the following subjects: Life Orientation, English First Additional Language and Natural Sciences. The Learner Activities in the workbook are based on the new CAPS curriculum that was introduced in 2012 and are grade specific. The Educator Workbook will direct you with lesson plans based around the Learner Activities.

The Learner Activities are divided into three themes, as follows:

Theme 1: Endless possibilities focuses on the benefits of Science and Pure Maths and introduces learners to various Sasol products (which have been made using different fields of Science). Learners create their own products and then develop their own personal value proposition statements.

Theme 2: Better together uses the Sasol Solar Challenge to introduce learners to the benefits of solar energy and other renewable energy sources, as well as to reflect on team work, as a general concept and in their own practice (when they design a solar house in a team).

Theme 3: The working world introduces learners to the members of the engineering team, focuses on artisanal careers and distinguishes between learnerships, apprenticeships and internships. Learners conclude by setting their own educational and employment goals and reflect on their subject choices, at the end of Grade 9, based on what they have learned in the previous Learner Activities.

These Learner Activities can be used in the classroom to supplement what you are already doing as part of the CAPS curriculum. The lesson plans in the Educator Workbook help you to implement each lesson successfully.

Here is a quick overview of the CAPS-aligned content that you will find in the educational pack:

Senior Phase (Grade 9)

Theme 1: Endless possibilities	
Learner Activity 1: Maths + Science = Endless Possibilities	Life Orientation • Topic: World of work
Learner Activity 2: Products and problem-solving	English First Additional Language • Reading and Viewing
Learner Activity 3: What makes you special?	Creative Arts (Music) • Topic: Performing and creating music (in an advert)
Theme 2: Better together	
Learner Activity 4: Sunstruck!	Natural Sciences • Topic: Energy and the national electricity grid
Learner Activity 5: Together Everyone Achieves More	English First Additional Language • Topic: Cost of electrical power
Learner Activity 6: Rising to the challenge	• Topic: Listening and Speaking
Theme 3: The working world	
Learner Activity 7: The engineering team	Life Orientation • Topic: World of work
Learner Activity 8: Is it artisanal?	Natural Sciences • Topic: Cost of electrical power
Learner Activity 9: Choices and goals	English First Additional Language • Topic: Writing and Presenting

Background and Context

Sasol is committed to supporting the educational and employment goals required by the countries in which we operate. Sasol offers compelling career opportunities for talented and motivated people in technical, operational and professional capacities. Sasol's entry-level learning programmes include the Sasol Bursaries, Sasol Inzalo Foundation Bursaries and the Sasol Learnership Programmes. This Educator Guide is designed to introduce learners not only to the opportunities available at Sasol, but also to give learners a broad understanding of the many options available to them after they finish school. While the Educator Guide focuses on careers that require Pure Maths and Science, with a particular slant towards engineering and artisanal careers, the activities are designed to give learners a broad view of the world of work, including product design, working in teams and applying for bursaries and learnerships. Your learners may choose not to do Pure Maths or Science, but they will find value in the many opportunities offered to explore their own interests and abilities, as well as the world of work, offered by the range of activities in this Educator Guide.

The material is designed to facilitate the learning process and culminates in the assessment of competency levels according to the standards set for each specific grade. The educator is supported by way of research and learning content that is presented clearly and is easy to implement in the classroom.

Visit www.e-classroom.co.za for additional Sasol educational content.

Acronyms

CAPS	Curriculum Assessment Policy Statement
GET	General Education and Training
FET	Further Education and Training

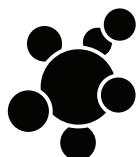
Section B

Senior Phase

Grade 9

Theme 1: Endless Possibilities

Name of Learner Activities Learner Activity 1: Maths + Science = Endless Possibilities Learner Activity 2: Products and problem-solving Learner Activity 3: What makes you special?	Time: 2 hours per Learner Activity	
Grade 9	Subject Life Orientation Term 1 and 3 English First Additional Language Term 1 Creative Arts Term 4	
Curriculum Standards (CAPS): Life Orientation Term 1 Topic: World of work <ul style="list-style-type: none">• Reading and writing for different purposes Life Orientation Term 3 Topic: World of work <ul style="list-style-type: none">• Career and subject choices:<ul style="list-style-type: none">◦ Careers related to different subjects◦ Qualities related to different careers and subjects: strengths and weaknesses; interests and abilities English First Additional Language Term 1 <ul style="list-style-type: none">• Reading and Viewing<ul style="list-style-type: none">◦ Read a newspaper report◦ Reading for comprehension Creative Arts (Music) Term 4 Topic: Performing and creating music <ul style="list-style-type: none">• Creating an advertisement for a product or event using own lyrics and music		
Objectives		
The learners will be able to: <ul style="list-style-type: none">• Reflect on the benefits of Pure Maths and Science for life• Define the functions of each STEM (Science, Technology, Engineering and Maths) field• Match products to branches of Science• Identify the components of products• Create a product and evaluate benefits and disadvantages of products• Match slogans to companies• Create their own value proposition and slogan• Design a poster		
Content	Skills	Values
Learner Activity 1: Maths + Science = Endless Possibilities <ul style="list-style-type: none">• Importance of Pure Maths and Science• STEM (Science, Technology, Engineering and Maths) fields• Branches of Science Learner Activity 2: Products and problem-solving <ul style="list-style-type: none">• Components of products• Product creation Learner Activity 3: What makes you special? <ul style="list-style-type: none">• Slogans and value propositions• Personal value propositions	Learner Activity 1: Maths + Science = Endless Possibilities <ul style="list-style-type: none">• Comprehending• Creating Learner Activity 2: Products and problem-solving <ul style="list-style-type: none">• Defining• Creating Learner Activity 3: What makes you special? <ul style="list-style-type: none">• Comprehending• Writing• Creating	Rationalism: Emphasising argument and reasoning. Empiricism: Emphasising, objectifying and applying ideas in Science. Control: Emphasising the power of knowledge through mastery of rules, facts and procedures.



Resources needed
<p>Learner Activity 1: Maths + Science = Endless Possibilities Pens; pencils; rulers; copies of the Learner Activity worksheet.</p> <p>Learner Activity 2: Products and problem-solving Pens; coloured pencils; koki pens; cardboard; copies of the Learner Activity worksheet.</p> <p>Learner Activity 3: What makes you special? Pens; coloured pencils; cardboard; copies of the Learner Activity worksheet.</p>
Teacher preparation before starting
Look through the worksheet and the lesson plan and collect all the necessary resources. Familiarise yourself with content for the three lessons. Collect the resources before the lesson. If the learners need to bring some of the resources to school, inform them in advance. Print sufficient learner activity worksheets.
Teaching the Learner Activities
<p>Learner Activity 1: Maths + Science = Endless Possibilities</p> <p>Introduce the lesson</p> <ol style="list-style-type: none"> Ask the learners why they think Pure Maths and Science are important subjects. Ask them to brainstorm ways in which Maths and Science can be useful in life. Explain that, in this lesson, they will find out about how Pure Maths and Science can help us in all sorts of interesting ways. <p>Explain</p> <ul style="list-style-type: none"> Every day you make decisions and judgments. Sometimes you're able to think about them carefully but other times you must make them quickly. Life would be exhausting if we had to think carefully about every single one of the hundreds of choices we make every day. For example, you wake up and decide what to wear, and what to have for breakfast quite quickly These mental shortcuts are important, but we need to recognise that our judgements about things are not always correct! <p>Ask</p> <ul style="list-style-type: none"> What do you think this has to do with Maths and Science? <p>Explain</p> <ul style="list-style-type: none"> We are now going to read an interesting article that will explain the connection <p>Refer learners to Part 1 of the Learner Activity:</p> <ul style="list-style-type: none"> Read the article with your learners Pause to discuss any points which may be difficult to understand or to take questions Let them measure the two lines to see that they are the same size! Let learners discuss the questions that follow the article, in their groups, before conducting a whole-class discussion that checks whether the learners have learned anything new about the benefits of Pure Maths and Science Note the learners' answers on the board so that they have access to them when they prepare their adverts (Part 4) <p>Refer learners to Part 2 of the Learner Activity:</p> <p>Explain</p> <ul style="list-style-type: none"> Science and Pure Maths form part of a group of subjects that is known by the acronym STEM An acronym is an abbreviation formed from the initial letters of other words and pronounced as a word <p>Ask</p> <ul style="list-style-type: none"> What do you think the 'T' and 'E' stand for in STEM? <p>Explain</p> <ul style="list-style-type: none"> S = Science; T = Technology; E = Engineering; M = Mathematics <p>Ask</p> <ul style="list-style-type: none"> Why do you think STEM subjects are important?

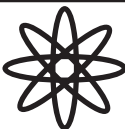


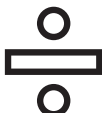
Section B Senior Phase Grade 9

Explain

- STEM is present in almost every part of our lives
- Science is our natural world: the sun, moon and stars; lands and oceans; weather, natural disasters, the diversity of nature, animals, plants and food; the fuel that heats our homes and powers transportation
- In today's world, technology means computers and smartphones, but it goes back to television, radio, microscopes, telegraph, telescopes, the compass, and even the first wheel
- Engineering designs buildings, roads, and bridges, but it also tackles today's challenges of transportation, global warming and environment-friendly machines, appliances and systems. We only have to look around to see what improvements to our lives and our homes have been engineered in the last decade alone
- We encounter Mathematics at the supermarket, the bank, and when dealing with the family budget. Every other STEM field depends on Mathematics

Let learners draw the tables in their workbooks and complete the activity.

Answers

STEM ...	Symbol	Statement
Science		Scientists... use a creative process to ask and investigate questions about the world around them.
Technology		Technology is... not only things like cell phones and computers... can be anything we create to meet a need or want.
Engineering		Engineers are... inspired to make things better. They identify problems and then work to design a solution to meet human needs and wants.
Maths		Maths is... a vital tool for scientists and engineers as they work to answer questions and solve problems.

Optional Extension Activity: Let learners create their own symbols for each of the STEM fields. Let other learners match the symbols to the field and use the activity to check for learners' understanding of each of the fields.

Let learners complete Part 3 of the Learner Activity by matching the products to the fields of Science, and comparing their answers with other members of the group.

Answers

Product	Science	Number
1. Soap	f. Chemistry	1 – f
2. Fire	e. Physics	2 – e
3. Fan	c. Forces and motion	3 – c
4. Light	b. Electricity	4 – b
5. Cars	d. Mechanics	5 – d
6. Bicycle	a. Physics and motion	6 – a



Refer learners to Part 4 of the Learner Activity:

Complete the lesson

- If possible, let learners watch some TV adverts to see what makes a successful or unsuccessful TV advert.
- In their groups, learners create a 90-second TV advert to promote the importance of Pure Maths and Science in life.
- Encourage them to incorporate music into their advert. Let them think of a catchy jingle about Maths and/or Science based on everything they have learned about in this activity.
- Remind them to incorporate the slogan "Maths + Science = Endless Possibilities" into their adverts as well.
- Let each group present their advert to the rest of the class and conduct a vote on the best advert.

Learner Activity 2: Products and problem-solving

Introduce the lesson

- Companies make products and offer services for people to buy. Services include car washing, hairdressing and fixing cars. Products are things such as cars, food and clothes that we buy.
- A company must know what customers want and deliver it to them. Companies must also know what makes them special.
- Explain that, in this lesson, the learners will explore products as well as the things that make companies special. Then they will think about what makes them special people.
- Show learners a product, such as a cell phone or computer. Let learners discuss why they would/wouldn't choose that product.
- Ask: What can you do with that product? What makes it special?

Explain

- Scientists and engineers at Sasol are involved in making many ingredients and substances that are used in products that we use every day

Let learners look at each of the products in **Part 1 of the Learner Activity**.

Discuss

- What is each product used for?
- Would you buy that product? Why/Why not?
- What do you think could be the connection between the work that Sasol does and each product?

Let learners complete the table in **Part 1 of the Learner Activity**.

Answers

Number	Product
2	Sasol Base Chemicals produces Acetone which is the main solvent used in this product.
4	This product, supplied by Sasol Energy, is used for one third of South Africa's total inland transportation requirements.
1	Sasol Wax products are used as ingredients in skin lotions and cosmetics such as this product.
6	Sasol Base Chemicals produce the compounds in these products which keep your clothes clean!
3	The soft lining in this product is made from very fine fibres produced from Polypropylene, a product of Sasol.
5	Various Sasol waxes are used in these products which are used on your shoes and your floors!

Refer learners to Part 2 of the Learner Activity:

Ask

- What products do you use and rely on every day?
- What would life be like without those products?

Section B

Senior Phase

Grade 9

Explain

- Those products exist because someone identified the need for them and then created them
- In this activity you are going to be product inventors!

Read through the activity with the learners and then let them, in their groups, create a product for the teenage market.

Complete the lesson

- Let each group present their product to the class and conduct a whole-class discussion to enable the learners to complete the benefits/disadvantages table (e).
- Let the learners vote on the best product.

Learner Activity 3: What makes you special?

Introduce the lesson

- The companies that sell products need to make sure that they present their products well. If the product does not make an impression on you, you will not notice it or buy it.
- Although people are definitely not products, it is very important that you also present yourself well. People make decisions about you based on how you present yourself. When you know yourself, it is easier to present yourself confidently.
- In this lesson we will look at how companies make sure you understand the benefits of buying their product and we will use this information to help you to answer a very important question about yourself: 'What makes you special?'

Read the quote at the top of the Learner Activity: "Sasol is expanding internationally based on a unique value proposition."

Explain

- A value proposition tells people why they should buy from you and makes the benefits of your products or services clear

Refer learners to Part 1 of the Learner Activity and proceed as follows:

Read the introductory paragraph and ensure that learners understand what a value proposition is.

Let learners match the slogans to the company.

Answers:

- | | |
|--|--|
| i. The smartest way to get around | A taxi service app |
| ii. Save Money Without Thinking About It | An app that helps people manage their money more effectively |
| iii. Make life worth watching | A video streaming app |
| iv. Move up in your career | An app for people looking for jobs |
| v. Invite anyone to a call | A video calling company |

Let learners, in their groups, answer the questions that follow.

Refer learners to Part 2 of the Learner Activity:

Read Sasol's value proposition.

Discuss the value proposition before reading what is meant by a personal value proposition.

Let learners complete the personal value proposition questions in the table and then use the answers to:

- Create their own value proposition statement
- Work with a partner to develop personal slogans

Complete the lesson

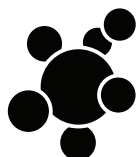
- Let learners use everything they have learned about in this lesson to create a poster that sells themselves.
- Have learners present their posters to the class.

Assessment

Refer to the Resource Section for the Assessment Rubric.

Teacher reflection

Is there anything you would do differently if you taught this unit again?



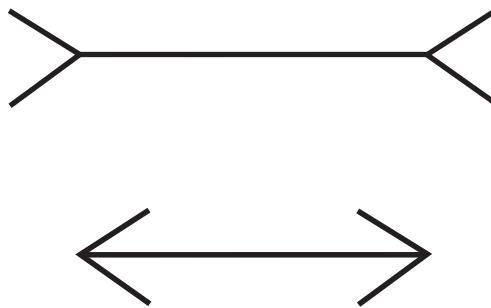
Maths + Science = Endless Possibilities

Name:..... Date:.....

Part 1

Read the following extract from an article, written by Gaurav Kulkarni, and then discuss the questions that follow in your group.

“When am I ever going to use this?” Have you ever said these words in a Maths or Science lesson? I know that I did when I was in high school, especially when Maths was hard! Now that I am an adult, I have seen that Maths and Science have helped me in all sorts of unusual ways. I may never actually have to solve a sum, but I realised that working out the answer actually taught me how to think! Maths and Science is like gym for the brain. When we try to solve an equation or test a hypothesis, we make our brains stronger. We learn to absorb information more easily and, when you are an adult, in the working world, the quicker you are able to take in new information, the better you will be at your job. When we do Maths and Science, we learn how to learn! But there is an ever more important reason that Maths and Science are important. You see, our brains like to look for patterns and to take short-cuts. Our brains are actually quite lazy! These short-cuts can be very helpful in a situation where we have to make a quick decision. For example, if you are in danger, your brain can’t think before it tells you to run! But, often, our brains take a short cut that leads to the wrong decision. For example, which line do you think is longer?



Now, take a ruler and measure them. They are the exact same size, but your mind tricked you! In life, we need to learn to test things and to check if what we believe is true or not. Maths teaches us that sometimes the answer is not what we thought it was! And Science teaches us that the world doesn’t always work in predictable ways. The truth lives in what is observed and studied in a controlled environment. Truth lives in studies that are replicated across multiple experiments. It lives in “doing the Maths” and arriving at surprising conclusions. It lives in well-formed logical arguments, not always in what “feels right” in your gut. And when we learn to seek truth, we can move our world forward. To me, that is why it’s important that every student gets a solid Maths and Science education, regardless of whether you enter a STEM (Science, Technology, Engineering and Mathematics) field.

Adapted from: <https://medium.com/@gauravkulkarni/the-importance-of-learning-math-and-science-a62e220623f5>

Learner Activity 1

Section B

Senior Phase

Grade 9

- Have you ever said the words, 'When am I ever going to use this?'
- Has this article changed your mind about Maths or Science in any way? Explain how.
- What do you think the writer means when he says that "Maths and Science is like gym for the brain"?
- The writer says: "Maths teaches us that sometimes the answer is not what we thought it was!" Talk about a time, in your life, when you realised that the answer was not what you thought it was.
- "Science teaches us that the world doesn't always work in predictable ways."
 - Do you agree with this?
 - Give an example of a time when you realised that life is not always predictable.
- Why do you think it is important to "seek truth"? How do you think Maths and Science can help us to do this?

Part 2

The writer says that Maths (not Maths Literacy) and Science is important "regardless of whether you enter a STEM field".



STEM stands for Science, Technology, Engineering and Maths. These four symbols, on the right, represent the four areas of STEM education.

Research shows that Science, Technology, Engineering and Mathematics are the best skills to have to ensure a good job, stable career and better-than-average salary.

- Draw this table in your workbooks.

STEM ...	Symbol	Statement
Science		Scientists...
Technology		Technology is...
Engineering		Engineers are...
Maths		Maths is...

- b) Draw the correct symbol for each STEM subject and then match each of the following statements to one of the STEM subjects. Write the statement in the correct row:

...inspired to make things better. They identify problems and then work to design a solution to meet human needs and wants.

...use a creative process to ask and investigate questions about the world around them.

...a vital tool for scientists and engineers as they work to answer questions and solve problems.

...not only things like cell phones and computers... can be anything we create to meet a need or want.

Part 3

Science is everywhere! Each of the products below has been created using, or is connected to, Science in some way.

- a) Match the product to the branch or topic of Science that you think it is connected to. Write the number of the product next to the letter of the Science field. The first one has been done for you.
- b) Discuss your choices with your group. Do you agree with each other's choices?

Product	Science	Number
1. Soap	a. Physics and motion	1 – f
2. Fire	b. Electricity	
3. Fan	c. Forces and motion	
4. Light	d. Mechanics	
5. Cars	e. Physics	
6. Bicycle	f. Chemistry	

Part 4

Use everything you have learned about Science and Maths in this activity to create a 90-second television advert to promote the importance of Maths and Science in life. Try to think of real-life examples that you could use to show how Maths and Science can be useful in unexpected ways. Incorporate this slogan, from the Sasol Guide, in your advert: "Maths + Science = Endless Possibilities" then present your adverts to your class. Remember to incorporate music into your advert to make it catchy. Vote on the best advert.

Section B

Senior Phase

Grade 9

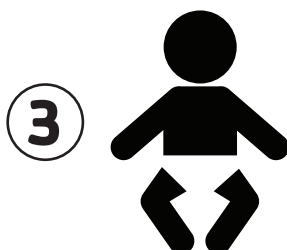
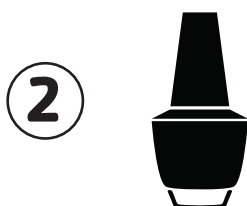
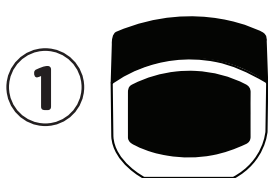
Products and problem-solving

Name:..... Date:.....

“Sasol touches your life every day and everywhere.”

Part 1

Look at each of these products. They all contain ingredients and substances that are manufactured by Sasol. Match the product to its description by writing the number of the product next to the correct description:



Number	Product
	Sasol Base Chemicals produces Acetone which is the main solvent used in this product.
	This product, supplied by Sasol Energy, is used for one third of South Africa’s total inland transportation requirements.
	Sasol Wax products are used as ingredients in skin lotions and cosmetics such as this product.
	Sasol Base Chemicals produce the compounds in these products which keep your clothes clean!
	The soft lining in this product is made from very fine fibres produced from Polypropylene, a product of Sasol.
	Various Sasol waxes are used in these products which are used on your shoes and your floors!

Part 2

In the previous exercise you identified various products. Companies make products that people need. If nobody wanted the product, there would be no need for it! A company must understand each product from the customers' point of view, know what the customers want, and deliver it to them. Your group has been asked by a company, which makes products for teenagers, to suggest a new product for the teen market.

- a) Begin by brainstorming the needs of teenagers. Then, use the list of needs to think about a product that could satisfy one of those needs.
- b) Use these questions to help you develop your product:
 - i. What functionality (uses) does your product provide?
 - ii. Who will use your product? Why will they use it?
 - iii. What problems can your product solve?
 - iv. What advantages does your product present?
 - v. Who will make your product?
 - vi. How will your product be made?
 - vii. What will you need to produce it (ingredients, materials)?
 - viii. Why is your product superior to other products?
- c) Draw a picture or write a description of your product.
- d) Present it to your class.
- e) After each presentation, your classmates will discuss and evaluate your product using the table below. Draw the table in your workbooks and create rows for the number of groups in your class.

Name of Product	Pros/Benefits	Cons/Disadvantages
Group 1:		
Group 2:		
Group 3:		

- f) Vote on the best product.

Section B

Senior Phase

Grade 9

What makes you special?

Name:..... Date:.....

“Sasol is expanding internationally based on a unique value proposition.”

When you go to the shops, you choose to buy a product because of what you will get by using it. This is called the benefits of the product. For example, when you buy shoe polish, the benefit you get is shiny shoes. If your shoes are polished and clean, people will get a better impression of you than if your shoes are dirty! The benefits of shoe polish are, therefore, more than shiny shoes; polished shoes help you to make a good impression!

Every company has a reason for being or something that makes them special. This is called a value proposition. A value proposition clearly tells you what the benefits of using a certain product (or service) are. Companies use their value proposition to ensure that you understand why you should buy their product! Companies communicate what their value proposition is in a short slogan that gets you to buy from them.

Part 1

Read the following slogans and match them to the company that you think they are describing. Write the number of the slogan next to the company.

- | | |
|--|--|
| i. The smartest way to get around | _____ A video streaming app |
| ii. Save Money Without Thinking About It | _____ An app for people looking for jobs |
| iii. Make life worth watching | _____ A video calling company |
| iv. Move up in your career | _____ A taxi service app |
| v. Invite anyone to a call | _____ An app that helps people manage their money more effectively |

In your group, discuss the following questions about each slogan:

- Can you identify what the value proposition of each company is?
- What problem does the product/service solve?
- What do you think are the benefits of using that product/service?
- Do you think the slogan clearly describes the benefits of the product or service?

Part 2

Read Sasol's Value Proposition:

To create superior value for our customers, shareholders and other stakeholders. Through our talented people, we use selected technologies to safely and sustainably source, produce and market chemical and energy products competitively.



Like a company's value proposition, your personal value proposition is a short statement that says:

- Who you are;
- What you are known for; and
- What you have to offer (what can you do for and give to the world?)

When you go for an interview for university or for a job, it is important that you are able to express your personal value proposition. People make decisions about you based on how you present yourself. The better you know yourself, and are able to express your strengths and good qualities clearly, the more likely it is that you will achieve your life goals.

a) Complete this table to develop your personal value proposition statement.

My Personal Value Proposition Questions

Who are you?	
Write down 3 things you are good at (your strengths).	
Write down 3 things that make you unique.	
Write down 3 things that you are interested in.	
What are you known for?	
What would your good friends say about you?	
Write down 3 positive character traits that you have.	
What do you have to offer?	
What work do you want to do?	
What difference would you like to make in the world?	

- b) Use all the answers to your questions in the table above to create your personal value proposition statement. Your statement should be about 4–5 sentences.
- c) Work with a friend to turn your value proposition into a slogan, such as the ones you read above, that describes you in less than 10 words.
- d) Make a poster, with words and pictures, of your personal value proposition. Be sure to include your slogan!

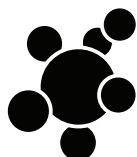
Section B

Senior Phase

Grade 9

Theme 2: Better together

Name of Learner Activities Learner Activity 4: Sunstruck! Learner Activity 5: Together Everyone Achieves More Learner Activity 6: Rising to the challenge	Time: 2 hours per Learner Activity	
Grade 9	Subject Natural Sciences Term 3 English First Additional Language Term 3	
Curriculum Standards (CAPS): Natural Sciences Term 3 Topic: Energy and the national electricity grid <ul style="list-style-type: none">Electricity generation<ul style="list-style-type: none">A power station is a system for generating electricityMost power stations in South Africa use coal as a fuel to boil waterThe steam from the water turns a turbine which turns a generator, which produces electricityThere are other alternative sources of energy besides coal, that can be used to drive turbines and generators including wind, falling water (hydroelectric), sun-heated steam, nuclear fission, waves in the sea Topic: Cost of electrical power <ul style="list-style-type: none">The cost of power consumption<ul style="list-style-type: none">There are also alternative appliances/systems such as solar heating panels for heating water English First Additional Language Term 3 Topic: Listening and Speaking <ul style="list-style-type: none">Participate in a debate		
Objectives		
The learners will be able to: <ul style="list-style-type: none">Create a solar ovenUnderstand how solar energy and solar panels workConsider the benefits and disadvantages of solar powerConduct a debateConsider what constitutes a teamReflect on the Solar Challenge from the perspective of teamworkCreate a short public relations piecePrioritise the qualities required for effective teamworkDesign a solar houseReflect on own team workDistinguish between renewable and non-renewable energy sources		
Content	Skills	Values
Learner Activity 4: Sunstruck! <ul style="list-style-type: none">Solar energySolar panels Learner Activity 5: Together Everyone Achieves More <ul style="list-style-type: none">TeamworkQualities of teams Learner Activity 6: Rising to the challenge <ul style="list-style-type: none">Solar energyRenewable and non-renewable sources of energy	Learner Activity 4: Sunstruck! <ul style="list-style-type: none">ExperimentingReflectingDebating Learner Activity 5: Together Everyone Achieves More <ul style="list-style-type: none">ReflectingComprehendingEvaluating Learner Activity 6: Rising to the challenge <ul style="list-style-type: none">Working as a teamReflectingClassifying	Rationalism: Emphasising argument and reasoning. Empiricism: Emphasising, objectifying and applying ideas in Science. Control: Emphasising the power of knowledge through mastery of rules, facts and procedures.



Resources needed
<p>Learner Activity 4: Sunstruck! Equipment for the experiment (cardboard pizza box; scissors; tin foil; sellotape; plastic wrap; black paper or paint; newspapers or shredded paper; ruler; glass dish or plate; biscuits with filling or marshmallows; oven gloves); copies of the Learner Activity worksheet.</p> <p>Learner Activity 5: Together Everyone Achieves More Pens; dictionaries or access to the Internet if possible; copies of the Learner Activity worksheet.</p> <p>Learner Activity 6: Rising to the challenge Pens; coloured pencils; koki pens; cardboard; copies of the Learner Activity worksheet.</p>
Teacher preparation before starting
Look through the worksheet and the lesson plan and collect all the necessary resources. Familiarise yourself with content for the three lessons. Collect the resources before the lesson. If the learners need to bring some of the resources to school, inform them in advance. Print sufficient learner activity worksheets.
Teaching the Learner Activities
<p>Learner Activity 4: Sunstruck!</p> <p>Introduce the lesson</p> <ol style="list-style-type: none"> Begin by discussing the role of the sun and its importance to life on earth: The sun is a star that is the source of light and heat for the planets in our solar system. Life on earth would not exist without the heat and light provided by the sun. We can also use the sun to create electricity. The electricity created using the sun is called 'solar energy'. Brainstorm the ways in which we depend on electricity every day. Ask the learners if they know where electricity comes from. Explain that, in the next three learning activities, they will be exploring the different ways we create electricity, with a special emphasis on solar energy. They will also investigate what it means to work effectively in a team. Read the short piece that introduces Learner Activity 4. Ensure that learners understand the content. Check for understanding: <ol style="list-style-type: none"> What is the Sasol Solar Challenge? Why is it important? Would you like to participate in something like the Sasol Solar Challenge? Why is it important that we develop solar power? <p>Refer learners to the Learner Activity:</p> <ul style="list-style-type: none"> Place learners into groups and ensure that they have all the equipment they need to complete the solar oven experiment, as described in Part 1 of the Learner Activity Let learners build their solar ovens and then leave the ovens in direct sunlight for as long as possible Answer the questions in Part 2 of the Learner Activity Read the explanation of how solar energy works in Part 3 of the Learner Activity <p>Explain</p> <ul style="list-style-type: none"> Solar photovoltaic (PV) devices, or solar cells, change sunlight directly into electricity Small PV cells can power calculators, watches, and other small electronic devices. Arrangements of many solar cells in PV panels can produce electricity for an entire house <p>Ask</p> <ul style="list-style-type: none"> What do you think are the benefits of solar energy? <p>Explain</p> <ul style="list-style-type: none"> Solar energy systems do not produce air pollutants or Carbon Dioxide Solar energy systems on buildings have minimal effects on the environment

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Ask

- What do you think are the limitations of solar energy?

Explain

- The amount of sunlight that arrives at the earth's surface is not constant. The amount of sunlight varies depending on location, time of day, season of the year, and weather conditions
- The amount of sunlight reaching a square kilometre of the earth's surface is relatively small, so a large surface area is necessary to absorb or collect a useful amount of energy

Read Part 4 of the Learner Activity and use the diagram to ensure that learners understand how solar panels work.

Let learners check their understanding by completing the multiple-choice quiz in **Part 5 of the Learner Activity**.

Answers

5.1 b

5.2 a

5.3 b

5.4 b

Ask

- Do you think that more people in South Africa should install solar panels or not?

Complete the lesson

- Refer learners to Part 6 of the Learner Activity** and conduct a class debate on the topic.
- Assign three members to the pro side and three members to the con side. The rest of the class will listen carefully, ask clarifying questions and, after the debate, they will vote on which side presented a better argument.
- Begin the debate with the pro side speaking first. Allow them five to seven minutes of uninterrupted time to explain their position. All members of the team must participate equally. Repeat the process for the con side.
- Give both sides about three minutes to confer and prepare for their rebuttal. Begin the rebuttals with the con side and give them three minutes to speak. Both members must participate equally. Repeat this for the pro side.
- Let the learners ask clarifying questions before voting on which side presented a better argument.

Learner Activity 5: Together Everyone Achieves More

Introduce the lesson

- Explain that, in the last lesson, the learners learned about the Sasol Solar Challenge and investigated it from the point of view of solar energy. But the sun is not the only thing that makes the Solar Challenge work!
- A lot of people work together to make sure the Sasol Solar Challenge is a success. The Sasol Solar Challenge cannot work if the team does not work together! In this activity, learners will use the Sasol Solar Challenge to learn more about teamwork.

Refer learners to Part 1 of the Learner Activity:

- In groups let learners brainstorm all the people that they can think of who are needed to make the Sasol Solar Challenge work
- Let learners report back on the results of their brainstorming activity
- Write all the roles on the board

Refer learners to Part 2 of the Learner Activity:

- Answer the questions as a whole-class activity

Refer learners to Part 3 of the Learner Activity:

Study the picture and read the description as a whole-class activity.

Let learners answer the questions in their groups.

Before learners complete 3(f), conduct a class discussion on the findings of the group discussions.

Explain

- Diversity means you have many different things or characteristics (it means understanding that everyone is unique, and recognising our individual differences)
- Groupthink is when people of one group all think the same and don't have individual opinions. It is not a good thing as groupthink can make people do things such as bullying or discriminating

Ask

- What have you learned about teamwork from this Learner Activity?
- Do you think you are a good team player? Why/Why not?
- What could you do to ensure that you are a better team player?

Let learners complete 3(f) in their groups in which they will write a short public relations paragraph promoting the Sasol Solar Challenge.

Refer learners to Part 4 of the Learner Activity and proceed as follows:

Assign each group with one set of the team qualities (you may assign one set to more than one group, depending on the number of groups in your classroom).

Let the learners complete the activity in their groups.

Complete the lesson

- Read the fun story on teamwork (**Part 5**)
- Discuss what the story teaches us about teamwork. Refer the learners to the name of this Learner Activity. Did anyone notice that the first letters of each word spell out the word TEAM? Teamwork is about working together!
- Write the following sentence on the board: "There is no I in team". What do the learners understand by it? How is it similar to the story they have read?
- Ask the learners if they will be better team players after this activity. In the next activity, they will have a chance to put teamwork into practice!

Learner Activity 6: Rising to the challenge

Introduce the lesson

- Explain that, in the last lesson, the learners have explored solar energy, as well as how to work effectively in a team.
- Now they will put both these learnings into practice.

Refer learners to Part 1 of the Learner Activity:

Revise the ways in which we use electricity in our homes every day (think about lighting, heating, cooling and electrical appliances).

Divide learners into groups.

Explain

- Your group is a team. You will have to work together as a team in this activity
- Design a house that uses solar energy
- When you are finished, you will have an honest discussion on how your team performed

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Assist learners to evaluate their teamwork by considering:

- Could they rely on each other?
- Did they listen to each other?
- Did they co-operate with each other?
- Did everyone participate?
- Were they respectful of each other?

Let learners present their houses, as well as their teamwork evaluations, with the rest of the class.

Refer learners to Part 2 of the Learner Activity:

Explain

- There are many different sources of energy in the world that can be used to generate power
- You have just learned about how the sun is used to generate energy
- Energy from the sun is called renewable energy because it does not get used up
- Energy sources are either renewable or non-renewable
- Non-renewable energy sources are those that are used faster than they can be replaced. They could be used up eventually
- Non-renewable energy sources include fossil fuels and nuclear fuels
- Fossil fuels are coal, oil, and natural gas
- They were formed from dead plants and animals that were buried millions of years ago. The earth is running out of fossil fuels
- The problem with fossil fuels is that they produce Carbon Dioxide, which some fear is causing global warming
- Renewable energy sources are those that can be replaced faster than they are used
- Renewable energy sources include solar power, wind power, tidal power and hydroelectric power
- They can also be used to generate electricity
- Wind power is the kinetic energy of the wind. Wind turns the turbines that drive the generators to generate electricity
- Scientists and engineers at Sasol continuously investigate new ways to generate electricity

Let learners complete both tables.

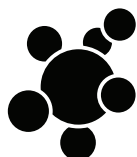
Answers

Renewable: Solar; Wind Power; Biomass; Hydroelectric Power; Hydrogen; Geothermal

Non-renewable: Oil/Petroleum; Coal; Natural Gas; Nuclear

Note: Although some scientists say that geothermal is non-renewable, the fact that it is provided by nature, will not run out and is replenished by nature, makes it renewable. See goo.gl/DEGJAC for more on this topic.

ENERGY SOURCE	DEFINITION
1. Wind	Energy derived from the movement of air.
2. Geo-thermal	Energy originates from the natural radioactive decay of elements under extremely high pressures that are located deep in the interior of the Earth.
3. Solar	Harvesting energy from the sun.
4. Biomass	Organic materials that have been derived from living or recently living organisms that contain chemical energy which was originally harnessed from the sun.
5. Hydro-electric	Produced by capturing the energy of flowing water of streams and rivers caused by gravity.
6. Hydrogen	Water contains two-thirds of this element. Once it is separated, it can be used as a fuel for generating electricity.



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Educator Guide

<p>Complete the lesson</p> <p>a) If you have access to the Internet watch this short fascinating film on the Top 10 Energy Sources of the Future: goo.gl/1NNkQS - the film is 13 minutes long.</p> <p>b) If you have time, let your learners research one of the energy sources covered in the film: Space-based solar power; Human Power; Tidal Power; Hydrogen (fuel cells); Geothermal heat from underground lava beds; Nuclear Waste; Solar windows; Bio-fuels (algae); Flying wind farms; Nuclear fusion.</p> <p>You will find Internet links for these different types of energy sources below the video.</p>
<p align="center">Assessment</p>
<p>Refer to the Resource Section for the Assessment Rubric.</p>
<p align="center">Teacher reflection</p>
<p>Is there anything you would do differently if you taught this unit again?</p>

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Sunstruck!

Name:..... Date:.....

Learner Activity 4

In English, the word 'solar' means 'something that comes from the sun'. A solar-powered car is a car that is fitted with panels that capture the sun's light and turns it into power for the car. Solar panels are also used to provide power (electricity) in homes and to electronic equipment such as computers and cell phones.

The Sasol Solar Challenge is a competition, held every two years, in which participating teams design, manage, build and drive solar-powered vehicles across South Africa. The eight-day event sees local and international cars travelling as far as they can on looped routes in towns between Pretoria and Cape Town. In 2016, some cars broke records by covering distances of over 4 500 km! Combined, the teams covered more than 25 000 km on the power of the sun.

The sun is our closest star in the solar system and the largest object in our solar system. The sun is at the perfect distance from the Earth and is able to provide heat and light. There is a lot of power packed in our sun that all living things on earth depend upon. The energy from the sun provides enough light to grow plants and warm the oceans. Plants use the sun's energy in photosynthesis, cleaning our air and providing fresh oxygen.

Solar power is known as being "eco-friendly" since it doesn't emit toxic (poisonous) gases into the environment. It represents a clean, green source of energy. Because solar power doesn't release any greenhouse gasses, it does not pollute Mother Nature. It is a safe and environmentally-friendly way to generate electricity.

Solar energy is also renewable, meaning we can never run out of sunshine! By harnessing energy from natural renewable sources like the sun, dependence on more environmentally harmful sources such as oil and coal can be decreased.

Part 1

You are now going to create a solar-powered oven to demonstrate the power of solar energy.

You will need:

- Cardboard pizza box
- Scissors
- Tin foil
- Sellotape
- Plastic wrap
- Black paper or paint
- Newspapers or shredded paper
- Ruler
- Glass dish or plate
- Biscuits with filling or marshmallows
- Oven gloves

Procedure:

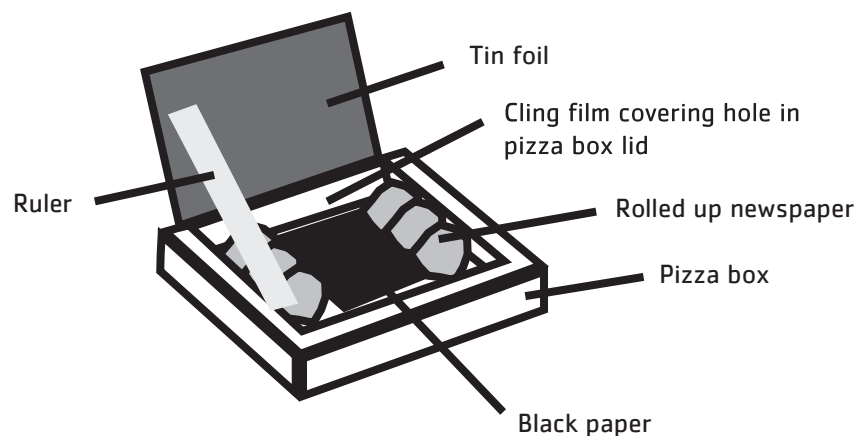
- i. Use the scissors to cut a flap in the lid of the pizza box.
- ii. Cut along three sides, leaving around two centimetres between the sides of the flap and the edges of the lid.
- iii. Fold the flap back so it stands up when the box lid is closed.
- iv. Cover the inner side of the flap with tin foil.
- v. Sellotape plastic wrap over the hole in the lid of the pizza box. This will create a clear, air tight seal.
- vi. Paint the bottom of the box black, or line it with black paper.
- vii. To insulate your oven so it keeps in heat, put shredded paper or rolled up sheets of newspaper around the sides of the pizza box.
- viii. Make sure you leave enough space for your food! You should still be able to close the box lid.
- ix. Set up your solar oven outside on a sunny day, between 11am–3pm. Make sure you choose a sunny spot.
- x. Adjust the flap so that it reflects the most sunlight possible onto the cling film covered hole in the box lid. Use a ruler to prop open the flap at the right angle. This will pre-heat the solar oven and make sure the inside is hot when you put your food in.
- xi. After you have pre-heated the oven, put the food you want to cook on a clear glass dish or plate and put it inside your solar oven.
- xii. Wait for the biscuits or marshmallows to melt!
- xiii. When the biscuits are done, open the lid of your solar oven and use oven gloves to lift the glass plate out of the oven.

<http://www.planetsmarty.com/2015/06/10-fun-solar-experiments-for-kids.html>

Part 2

Answer these questions:

- a) How long it did it take for the biscuits to melt?
- b) How did covering up the plate help melt the biscuits?
- c) Why did you line the plate with tin foil?
- d) How does this activity demonstrate how the sun could be used to help us to do daily tasks?



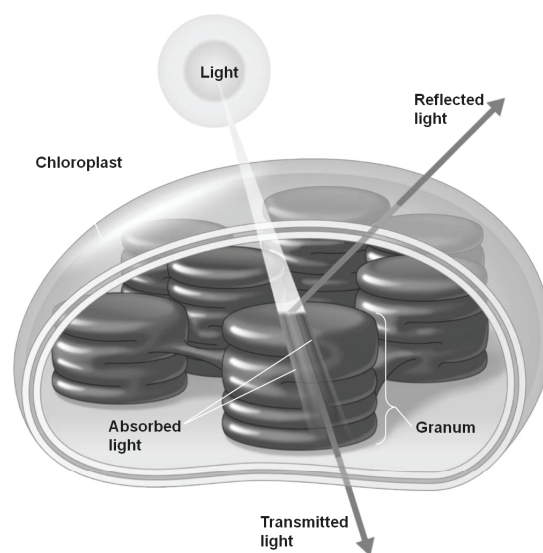
<http://www.planet-science.com/categories/experiments/outdoors/2011/07/build-a-solar-oven.aspx>

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Part 3

Read the following to understand how solar energy works.

A solar cell is what converts sunlight into electricity. In plants, these solar cells are called chloroplasts. They collect sunlight and transform it into usable energy. When we use the sun to generate energy the solar cells are called photovoltaic or PV cells. Photovoltaic (meaning "light electricity") cells convert the sun's energy into electrical power. The cells are made up of materials (usually silicone) that can carry electrical current and help capture light. The sun's rays are made up of tiny particles of light energy. When the sunlight hits a photovoltaic cell, it is either reflected, passes right through, or is absorbed (just like when a plant's chloroplast cells absorb light). Only absorbed light provides energy that can be used for electricity.

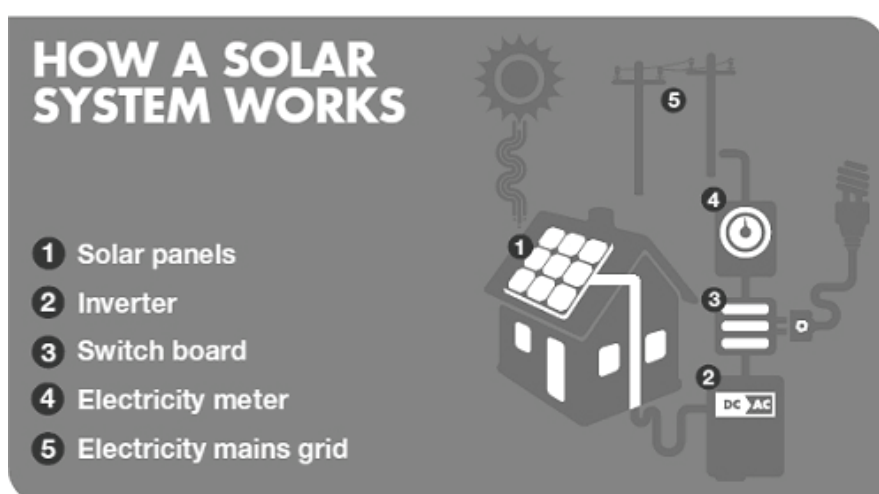


<https://socratic.org/questions/what-occurs-after-sunlight-is-absorbed-by-a-chloroplast>

Part 4

Now that you know how sunlight is converted into electricity, look at this picture, and read the explanation below, on how solar panels work:

- The sun shines on the solar panels, generating "DC" (Direct Current) electricity
- The electricity is fed into a solar inverter that converts into "AC" (Alternating Current) electricity
- The AC electricity is used to power appliances in your home
- Any power not required by your home goes via your home's switchboard into the mains power grid for others to use



<https://www.energymatters.com.au/residential-solar/how-solar-power-works/>

Part 5

Answer these multiple-choice questions to show your understanding of solar energy.

5.1 Devices that convert sunlight directly into electricity are called...

- a. photosynthetic b. photovoltaic c. photo-converters

5.2 Sunlight is composed of which type of energy particle?

- a. photons b. electrons c. neutrinos

5.3 What material is used in solar panels that help absorb the sun's energy?

- a. sulphur b. silicone c. carbon

5.4 Solar power is non-renewable

- a. true b. false

Part 6

Based on your group discussions, organise a class debate on the following topic:

Solar energy is the answer to future energy supplies.

Section B Senior Phase Grade 9

Together Everyone Achieves More

Name:..... Date:.....

"We are better together
1 team = 1 Sasol"

Part 1

The Sasol Solar Challenge, is a competition, held every two years, in which participating teams design, manage, build and drive solar-powered vehicles across South Africa. It is only possible because people work together to make it happen. This is called teamwork.

- In your group, think about the Sasol Solar Challenge – from beginning to end – and make a list of all the people that you think are needed to make sure that the event is a success.
- Compare your lists with other groups in your class. See how many people, as a class, you can come up with!

Part 2

Read this description of the Sasol Solar Challenge:

The South African event now attracts some of the best teams from across the globe to partake in its 2 000 km challenge, varying road conditions and altitude drops of nearly 2 000 m. Primarily entered by university teams, the Sasol Solar Challenge exposes students to a range of real-world skills. The event requires engineers to work with mathematicians and scientists, as well as

business and finance experts, practical minds and great communicators.

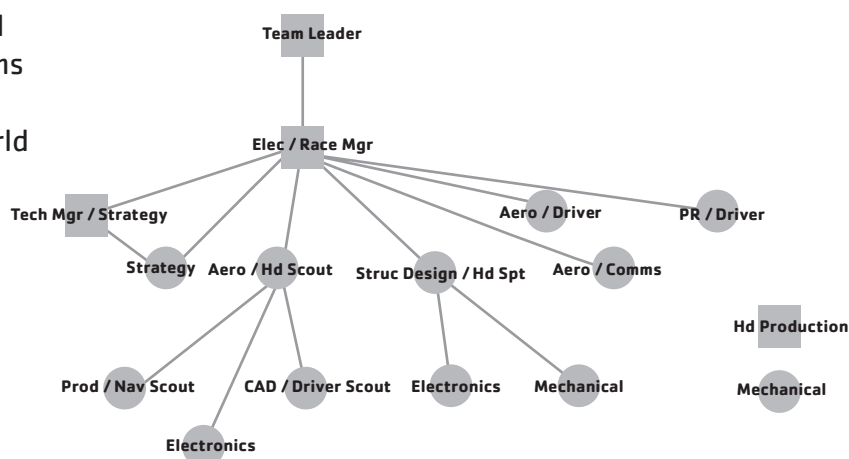
- Are there any people mentioned in this paragraph that you did not think of?
- What do you think is the role of each of the people mentioned in the paragraph?
- Look up the following two words in a dictionary: 'pragmatic' and 'logistical'. Why do you think these two qualities are required for the Solar Challenge team?
- Why do you think 'great communicators' are required by the Solar Challenge team?

Part 3

In your groups, look at this picture, and read the description, of one of the teams that raced in the 2016 Sasol

Solar Challenge, and won the 2013 World Solar Challenge, before answering the questions that follow:

There are 4 Mechanical Engineers, 8 Aerospace Engineers, an Electrical Engineer, an Applied Physicist, and an Applied Mathematician. Along with the various technical skills, the team



includes three Glider Pilots, a semi-professional cyclist, and an experienced PR person. Diversity within a team reduces the chance of groupthink, and increases the chance that the full space of engineering design options will be thoroughly explored.

The team is also well-structured. For example, the Industrial Design Engineer is also the team's Public Relations person, as well as being a driver. The other driver is a graduate in Aerospace Engineering who worked on both aerodynamic design and production of the car. Each team member had a labelled shirt that reinforced their specific team role and expertise. These 16 people have certainly done a fantastic job together!

Source: <https://scientificgems.wordpress.com/2013/10/15/wsc-2013-revisited-what-makes-a-winning-team/>

- a) Are you surprised by how many people are needed to make the Solar Challenge happen?
- b) Are there jobs in the paragraph that you did not think of earlier?
- c) Is there anything that surprises you about the people that make up the Solar Challenge team?
- d) What is meant by:
 - "diversity within a team"?
 - "groupthink"?
- e) How do you think diversity reduces the chance of groupthink?
- f) A "public relations person" is a person who makes sure that people know about a company or an event. Public relations people use writing and advertising to promote events. Pretend that your group has been hired to promote the Sasol Solar Challenge. Use everything you have learned about solar energy, as well as the Solar Challenge, to write a 10-line paragraph promoting the Challenge.

Part 4

Successful teams have certain qualities in common, that ensure they work together well. People do not always agree on what these qualities are, however. Below are three different sets of qualities that make up an effective team.

SET ONE	SET TWO	SET THREE
Unified commitment to a goal	Communication	Sense of purpose
Participation	Respect	Competency
Open communication	Collaboration	Cooperative spirit
Decision-making	Problem-solving	Playing by the rules
Efficient use of ideas	Common goal	Accountability

In your group:

- a) Choose one set of qualities.
- b) Discuss the meaning of each quality, and why it is important for teamwork.
- c) Rank the 5 qualities in order from most important to least important. You must do this activity as a team! That means that you need to work together to decide the order of the qualities. You will need to argue your point of view and reach agreement!

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Part 5

Read this fun story about teamwork. What can you learn from it?

There was once a team of four individuals called: Everyone, Someone, Anyone and Nobody.

There was an important job to be done and Everyone was sure that Someone would do it.

Anyone could have done it, but Nobody did it.

Someone got angry about this, because it was Everyone's job.

Everyone thought Anyone could do it, but Nobody realised that Everyone wouldn't do it.

It ended up that Everyone blamed Someone when Nobody did what Anyone could have done.

Rising to the challenge

Name:..... Date:.....

Part 1

In the previous two Learner Activities you have learned about solar energy and teamwork. Now, you will have an opportunity to put what you have learned into practice!

- In your group, work as a team to discuss and then draw a house that uses solar energy to its fullest potential.
- Once you have finished, assess how you worked as a team, using the qualities that you discussed in Learner Activity 'Together Everyone Achieves More'. Give yourself and your team a score out of 10. Compare your scores with your teammates.
- Discuss:
 - What worked?
 - What didn't work?
 - What could you do better next time?
- Prepare a short presentation of your houses to your classmates, as well as how you worked as a team.

Part 2

Energy sources are divided into two groups:

- Renewable: an energy source that can be replenished and can be used over and over again, such as solar, that you have been learning about
- Non-renewable: an energy source that we are using up and which cannot be replenished

- Here is a list of energy sources. Place each source in its correct column (renewable or non-renewable) in the table below:

Biomass Coal Geothermal Hydroelectric Power Hydrogen
Natural Gas Nuclear Oil/Petroleum Solar Wind Power

Renewable	Non-renewable

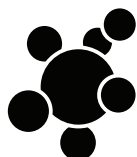
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- b) Complete this table on the different sources of renewable energy by matching the type of energy to its definition.

ENERGY SOURCE		DEFINITION
1. Wind		Produced by capturing the energy of flowing water of streams and rivers caused by gravity.
2. Geo-thermal		Energy derived from the movement of air.
3. Solar		Energy originates from the natural radioactive decay of elements under extremely high pressures that are located deep in the interior of the Earth.
4. Biomass		Organic materials that have been derived from living or recently living organisms that contain chemical energy which was originally harnessed from the sun.
5. Hydro-electric		Water contains two-thirds of this element. Once it is separated, it can be used as a fuel for generating electricity.
6. Hydrogen		Harvesting energy from the sun.



Theme 3: The working world

Name of Learner Activities Learner Activity 7: The engineering team Learner Activity 8: Is it artisanal? Learner Activity 9: Choices and goals	Time: 2 hours per Learner Activity
Grade 9	Subject Life Orientation Term 2, 3 and 4 Natural Sciences Term 3 English First Additional Language Term 4
<p>Curriculum Standards (CAPS):</p> <p>Life Orientation Term 2 Topic: World of work</p> <ul style="list-style-type: none"> Options available after completing Grade 9: National Senior Certificate (NSC – Grades 10–12) and National Certificate Vocational (NCV – FET Colleges) qualifications <ul style="list-style-type: none"> Implications of choices: choice between NSC and NCV <p>Life Orientation Term 3 Topic: World of work</p> <ul style="list-style-type: none"> Career and subject choices: <ul style="list-style-type: none"> Subjects in Grades 10, 11 and 12 Careers related to different subjects Qualities relating to different careers and subjects: strengths and weaknesses; interests and abilities <ul style="list-style-type: none"> Decision-making skills: steps in choosing subjects relating to interests and abilities and career of interest <p>Life Orientation Term 4 Topic: World of work</p> <ul style="list-style-type: none"> Study and career funding providers Plan for own lifelong learning: goal-setting for lifelong learning <p>Natural Sciences Term 3 Topic: Cost of electrical power</p> <ul style="list-style-type: none"> The cost of power consumption <ul style="list-style-type: none"> Discussing the many careers in the energy sector, including electricians, electrical engineers, artisans, IT specialists for maintaining and improving the power grid <p>English First Additional Language Term 4 Topic: Writing and Presenting</p> <ul style="list-style-type: none"> Long transactional text: Letter of application 	
Objectives	
<p>The learners will be able to:</p> <ul style="list-style-type: none"> Define the roles of the people in the engineering team Define the fields of engineering Write a letter of application Understand what an artisan is and does Consider the benefits of becoming an artisan Unscramble different artisanal jobs Reflect on own entrepreneurial qualities Consider own reasons for becoming an entrepreneur Understand the differences between learnerships, apprenticeships and internships Determine own education and employment goals Consider own subject choices 	

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Content	Skills	Values
Learner Activity 7: The engineering team <ul style="list-style-type: none"> Engineering activity (people and fields) Letter of application Learner Activity 8: Is it artisanal? <ul style="list-style-type: none"> Artisanship Entrepreneurship Entrepreneurial qualities Learner Activity 9: Choices and goals <ul style="list-style-type: none"> Post-school choices Learnerships Internships Apprenticeships Goal setting Subject choices 	Learner Activity 7: The engineering team <ul style="list-style-type: none"> Defining Matching Writing Learner Activity 8: Is it artisanal? <ul style="list-style-type: none"> Comprehending Decoding Reflecting Learner Activity 9: Choices and goals <ul style="list-style-type: none"> Comprehending Setting goals Choosing 	Rationalism: Emphasising argument and reasoning. Empiricism: Emphasising, objectifying and applying ideas in Science. Control: Emphasising the power of knowledge through mastery of rules, facts and procedures.
Resources needed		
Learner Activity 7: The engineering team Pens; dictionaries or access to the Internet if possible; copies of the Learner Activity worksheet.		
Learner Activity 8: Is it artisanal? Pens; dictionaries or access to the Internet if possible; copies of the Learner Activity worksheet.		
Learner Activity 9: Choices and goals Pens; copies of the Learner Activity worksheet.		
Teacher preparation before starting		
Look through the worksheet and the lesson plan and collect all the necessary resources. Familiarise yourself with content for the three lessons. Collect the resources before the lesson. If the learners need to bring some of the resources to school, inform them in advance. Print sufficient learner activity worksheets.		
Teaching the Learner Activities		
Learner Activity 7: The engineering team Introduce the lesson Ask <ul style="list-style-type: none"> Do you like: <ul style="list-style-type: none"> Using your imagination to solve problems? Teaming up with other people? Designing ways to make something better? Organising a group of people or process to get things done? Being challenged in new and interesting ways? Working on big, complex projects? Explain <ul style="list-style-type: none"> These are some of the things that engineers do! The word "engineering" comes from the Latin word that means "cleverness." Engineering is just a fancy word that means solving a problem by using Science, Maths, and common knowledge. People use engineering to design and create things or processes that are useful Science and Maths are the building blocks of engineering. An engineer needs to study different Science topics to become as knowledgeable as possible about the world. Knowing this information makes it possible to solve problems successfully After an engineer identifies a problem or a need, the engineer then brainstorms possible solutions for the problem. But engineers don't work alone! 		

- A group of people, known as the engineering team, will work together to share ideas and come up with a plan. The team will choose the best idea and then create a plan together. Drawing diagrams and listing materials are important parts of the design process. The team may work together on a prototype. A prototype is a practice model of the design, which the team will use for testing. This process helps the team to fix mistakes and make changes for the best final design. After making adjustments, the team will then create the final design to solve the problem

Read the text that introduces **Learner Activity 7** with the learners.

Explain

- You do not have to be an engineer to be part of the engineering team. You could choose to be a technologist, technician or an artisan!

Let learners complete Part 1 of the Learner Activity.

Answers

- This person is responsible for applying established technologies when solving problems. **Technologist**
- This person is the Science-based problem solver, developer of new technology and pioneer of innovative applications. **Engineer**
- This person makes things with his/her hands. **Artisan**
- This person performs established procedures in the support of engineering applications. **Technician**

Refer learners to Part 2 of the Learner Activity:

Explain

- The field of engineering is a broad one. Within this field, engineering is divided into different specialties
- These specialties include Mechanical, Civil, Chemical, Software, and Electrical Engineers, to name a few:
 - A Civil Engineer designs and builds buildings, roads, and bridges
 - A Mechanical Engineer works to design mechanical systems, tools, and machines
 - An Electrical Engineer knows all about electricity, which makes it possible to design circuits and computer chips
 - Chemical Engineers are special scientists who work with raw materials and chemicals
 - A Software Engineer knows how to design and research to make new and faster computer software
- There are many types of engineers and each type of engineer requires members of the engineering team to assist

Let learners complete Part 2 of the Learner Activity.

Answers

Field		Definition
1. Mechanical	f	Deal with all kinds of machines and are involved in the manufacture, construction, layout, operation, maintenance and supervision of moving machinery and mechanical appliances. Activities include transport, power generation, air-conditioning and other services such as water supply to mines, factories and large buildings.
2. Industrial	e	Design and develop facilities for the economical manufacture of products, such as household equipment and furniture, equipment for cars, the interiors of aircraft and medical equipment.
3. Agricultural	i	Design structures and machinery for farming purposes, such as dairies and wine cellars, irrigation, water storage and drainage, soil conservation and processing.

Section B Senior Phase Grade 9

Field		Definition
4. Aeronautical	g	Design, plan, develop, manufacture and test aircrafts, missiles and satellites.
5. Metallurgical	a	Involved in extraction of various kinds of metal from ore. The ore is crushed, concentrated and then processed to metal, either through a melting or chemical process.
6. Civil	h	Involved in the control and adaptation of the physical environment to mankind's advantage. This includes the design and construction of bridges, roads, docks, airport runways, railways, tunnels, reservoirs, canals, sewerage and drainage systems, gas and water supplies and other large structures.
7. Electrical	d	Involved in the design and testing of equipment before it leaves the factory, or in the installation and testing of power plants.
8. Chemical	c	Manufacture chemicals on an industrial scale, as well as work with the industrial processes that convert raw material into products.
9. Electronic	j	Produce electronic products such as computers, microwave and satellite communication systems and electronic medical equipment.
10. Mining	b	They ensure effective and safe production in mines. They are engaged in ore extraction activities from both underground and from the surface.

Refer learners to Part 3 and 4 of the Learner Activity:

- Learners must choose which member of the engineering team they are interested in, as well as a field that interests them
- Let learners use the Sasol Learner Guide to find out how to apply for a career in this field
- Then let learners write a letter of application to be accepted for a bursary or a learnership

Note: Your learners may not be specifically interested in engineering. However, finding out about careers, learnerships and bursaries should be of interest to them nonetheless. In addition, writing a letter of application is a skill that all learners need!

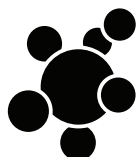
Assess your learners' letter using the following criteria:

- Is the purpose clear?
- Is the format correct?
- Is the letter written professionally?
- Is the letter well-written (spelling, grammar)?

Learner Activity 8: Is it artisanal?

Introduce the lesson

- During your grandparents' lives, and even during your parents' lives, most jobs were divided into two main groups: Men's jobs and Women's jobs. Most men grew up to become bricklayers, welders, chefs, bankers, doctors etc., while women became nannies, housekeepers, nurses, teachers or secretaries etc. Now, life is very exciting. Due to new, non-sexist legislation, you (a man or a woman) can become anything you want to be. Absolutely anything!
- One of the categories of jobs that used to be mainly for men was that of artisans, especially artisans in the engineering team. But this is no longer the case. Women can be bricklayers, boilermakers and chefs, just as men can be secretaries and florists.



- c) If you think you can do the job of your dreams, physically and mentally, there are many opportunities available in South Africa for you to study towards it.
- d) Ask yourself these questions:
 - i. What am I good at?
 - ii. What do I LOVE doing?
 - iii. What is my passion?
 - iv. What would be my ideal job?
 - v. Am I physically and mentally right for this job?
 - vi. How can I prepare myself for this job?
- e) In this learning activity we will focus specifically on artisanal jobs.
(Source for above introduction: www.careerplanet.co.za)

Read the introductory text, in **Part 1 of the Learner Activity**, with the learners.

Let the learners answer the questions, in **Part 2 of the Learner Activity**, in their groups.

After the group discussions, discuss the final two questions as a whole-class discussion:

- Would you consider becoming an artisan? Why/Why not?
- If you were to consider becoming an artisan, which artisan would that be? Why?

Note: There is a list of artisanal careers in the Resource Section of this Educator Workbook. You may also wish to refer learners to the Sasol Learner Guide 'It's cool to be a 21st century artisan'.

Refer learners to Part 3 of the Learner Activity in which learners must unscramble the artisanal jobs.

Answers

- a) Welder
- b) Electrician
- c) Fitter
- d) Turner
- e) Boilermaker
- f) Mechanic
- g) Toolmaker
- h) Patternmaker
- i) Bricklayer
- j) Plumber
- k) Carpenter
- l) Glazier
- m) Plasterer
- n) Tiler

Optional Extension Activity: Let learners, in pairs, research one of the above artisanal jobs and do a small project on the job. Create a display of the artisans on the classroom wall.

Complete the lesson

- a) This lesson concludes by introducing learners to the concept of entrepreneurship. One of the advantages of becoming an artisan is that it offers learners the opportunity, in the future to start their own business. Many artisanal careers are 'portable' meaning that artisans can, if they choose, work for themselves.
- b) Read the information in **Part 4 of the Learner Activity**, with your learners, and then let them complete the activity in which they must rate themselves against the entrepreneurial characteristics.
- c) Let learners complete the two sentence starters and then have a class discussion on the advantages of opening a business and what businesses the learners would like to open.

Section B

Senior Phase

Grade 9

Learner Activity 9: Choices and goals

Introduce the lesson

- In order to become an artisan, you need to pass a Trade Test. In this lesson we will look at different options that are available to those learners who wish to pass the Trade Test and become an artisan.
- Read the text, in **Part 1 of this Learner Activity**, with the learners. Thereafter, assign each of the three options (Learnership, Apprenticeship and Internship) to different groups. Let each group read the information and then present what they have read to the rest of the class. You can have more than one presentation on each option. Let the groups with the same option check that their option was correctly presented!
- After the presentations, read the short summary below the table.
- Let learners check their understanding of the three options.

Answers

- You can do an internship without a qualification. False
 - A learnership is a combination of work and study. True
 - An apprenticeship gives you broad skills in a variety of jobs. False
 - Interns are employed by a company. True
 - An apprenticeship is a work-based learning programme. False
- Refer learners to the Sasol Learner Guide in order to see what bursaries and learnerships are on offer. Ensure that learners know that there are many companies, in South Africa, that offer bursaries and learnerships
 - Refer your learners to goo.gl/HsrNch to find out about the 2018–2019 bursaries available in South Africa and goo.gl/byc5Fh to find out about the 2018–2019 learnerships available in South Africa

Refer learners to Part 2 of the Learner Activity:

Ask

- Why is planning important?
- What do you plan for?
- Why do you think that it is important to plan for your future?

Explain

- Life is like a journey (or trip). If you have no idea where you are going, you will be without purpose. Planning and setting goals ensures that your life will have a direction and purpose.
- You can begin planning for your future education and career by asking yourself these questions:
 - What do I like to do?
 - What are my strengths?
 - What is important to me?
 - What am I interested in?
 - What would I be happy doing every day?

Let learners complete the table in which they will set education and employment goals.

Complete the lesson

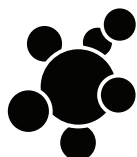
- Your learners are approaching a very crucial time as, at the end of Grade 9, they will have to choose the subjects that they will be doing for their Grade 12 school-leaving certificate. Based on everything they have learned about careers in these activities, let learners complete this activity by completing the table of subject choices in **Part 3 of this Learner Activity**. Let learners provide reasons for their subject choice.
- If you are able to, let each learner sit with you and review their subject choices. Ensure that the learners are doing subjects that will equip them to meet their educational and training goals!

Assessment

Refer to the Resource Section for the Assessment Rubric.

Teacher reflection

Is there anything you would do differently if you taught this unit again?



The engineering team

Name:..... Date:.....

When you read about the Solar Challenge, you found out that many different types of engineers are involved in ensuring that the car works. If you are interested in making things and in how things work, an engineering career may be just the thing for you! There are many kinds of engineering jobs in the world. In this learning activity we will focus on four types of career choices:

- Engineers
- Engineering technologists
- Engineering technicians
- Engineering artisans

Together, these four career types make up the 'engineering team'. If you wish to be part of an engineering team, you will need to do Maths (not Maths Literacy) and Science at Grade 12 level.

The engineering team provides society with the services and products that they need, such as water, housing, transport, electricity, communication, manufacturing, entertainment, medical equipment etc.

Engineering activity involves one or more of the following:

- Using natural resources
- Harnessing or controlling forces of nature
- Using/provide materials and substances with useful physical or chemical properties
- Using machinery and equipment
- Transferring, storing and processing information
- Constructing, maintaining, refurbishing and deconstructing buildings and infrastructure
- Organising and controlling systems or processes

Engineers research, design, test and build everything from machinery to electrical devices. Technologists and technicians work closely with engineers and help them with the research and testing of new products or upgrades to old systems.

Graduate engineers are educated at universities while technicians and technologists study at universities of technology and FET colleges. In South Africa, technologists must have a national higher diploma or B. Tech, while a technician will have a national diploma. Technologists have a wider range of duties when compared to a technician. A technologist is mainly responsible for innovative ideas, and the technician is responsible for the application of those ideas. Artisans are technical artists who have trained in a particular trade or field to create practical or artistic objects. Artisans usually work exclusively in certain mediums; woodworkers might build cabinets or dining room tables, metal experts might melt and shape metal to make earrings or necklaces, and glass artists blow glass to create vases or sculptures.

Section B

Senior Phase

Grade 9

Woodworkers work with different types of woods (such as oak, teak, or pine), veneers and stains. Craft artists can be found creating original, unique works, such as urns, quilts, clothing, or furniture. Technical artisans include mechanics, electricians, welders, plumbers and carpenters. There are a range of opportunities available at Sasol, as well as at many different places of work in South Africa. In fact, artisans are so badly needed in South Africa that the government has called 2014 to 2024 'The Decade of the Artisan' to promote artisanship as a career of choice for South Africa's youth.

We will look more closely at artisanal jobs in the next Learning Activity.

Part 1

Read each of the following statements and decide which member of the engineering team is being described. Write Engineer, Technologist, Technician or Artisan next to each description.

- This person is the science-based problem solver, developer of new technology and pioneer of innovative applications. _____
- This person is responsible for applying established technologies when solving problems. _____
- This person performs established procedures in the support of engineering applications. _____
- This person makes things with his/her hands. _____

Part 2

Whichever member of the engineering team you may wish to look at becoming, there are many fields of work that you can work in. Use a dictionary or the Internet to match each of these fields to its definition:

Field		Definition
1. Mechanical		a) Involved in extraction of various kinds of metal from ore. The ore is crushed, concentrated and then processed to metal, either through a melting or chemical process.
2. Industrial		b) They ensure effective and safe production in mines. They are engaged in ore extraction activities from both under ground and from the surface.
3. Agricultural		c) Manufacture chemicals on an industrial scale, as well as work with the industrial processes that convert raw material into products.
4. Aeronautical		d) Involved in the design and testing of equipment before it leaves the factory, or in the installation and testing of power plants.
5. Metallurgical		e) Design and develop facilities for the economical manufacture of products, such as household equipment and furniture, equipment for cars, the interiors of aircraft and medical equipment.



6. Civil		f) Deal with all kinds of machines and are involved in the manufacture, construction, layout, operation, maintenance and supervision of moving machinery and mechanical appliances. Activities include transport, power generation, air-conditioning and other services such as water supply to mines, factories and large buildings.
7. Electrical		g) Design, plan, develop, manufacture and test aircrafts, missiles and satellites.
8. Chemical		h) Involved in the control and adaptation of the physical environment to mankind's advantage. This includes the design and construction of bridges, roads, docks, airport runways, railways, tunnels, reservoirs, canals, sewerage and drainage systems, gas and water supplies and other large structures.
9. Electronic		i) Design structures and machinery for farming purposes, such as dairies and wine cellars, irrigation, water storage and drainage, soil conservation and processing.
10. Mining		j) Produce electronic products such as computers, microwave and satellite communication systems and electronic medical equipment.

Part 3

Use everything you have learned about the engineering team in this learning activity to:

- Choose which member of the engineering team you think would most interest you
- Choose which field of engineering most interests you
- Use the Sasol Learner Guide to find out how to apply for a career in this field

Part 4

Write a letter of application to Sasol to be accepted for a study bursary or a learnership. A letter of application introduces you to an employer or college. The letter needs to be personal and provide information about yourself. It needs to show your best qualities and needs to make you stand out from the other people applying for the bursary or learnership.

Your letter needs to include:

- Why you are interested in the bursary/learnership
- Your career ambitions and goals
- The skills and abilities that would make you a successful employee
- Why Sasol should choose you

Note: Opportunities are available at Sasol based on the needs of the company at that point in time. Visit www.sasol.com/careers to find out what opportunities are available.

Section B

Senior Phase

Grade 9

Is it artisanal?

Name:..... Date:.....

Part 1

Read the following newspaper article.

When you finish school, you may choose to go to university. But it is important to remember that a university degree is not the only qualification you can get. You could choose to become an artisan. An artisan is a person who is taught a skill, usually using their hands, so that they know how to perform a specific function or make something special.

If you decide to become an artisan, you will be learning practical skills that you may find useful in day to day life. Artisans work primarily in a technical field, doing skilled manual labour. This may be as a plumber, electrician, carpenter as well as a chef and baker! There are many types of artisans. To find out more about what artisans do, you can read Sasol's Learner Guide 'It's cool to be a 21st century artisan'. There's a great need for qualified tradespeople in South Africa - we don't have enough skilled artisans in our country. By becoming an artisan, you can uplift yourself and contribute to developing your country.

According to Sean Jones, CEO of Artisan Training Institute (ATI), "A 50% failure rate at university is far too high, meaning many students are out of their depth. If they opt, instead, to enrol for artisan training they will get an apprentice placement with an employer literally from the time of enrolment and earn a stipend, from the employer, from their first year of training. Almost all our learners are assigned to an employer from enrolment stage." Artisans are almost guaranteed formal employment and, upon graduation, can earn R20 000 or more per month.

Additionally, becoming an artisan – whether it is as a nurse, baker, electrician, diesel mechanic or tractor technician for example, is a springboard to other careers in engineering, sales, training, management or entrepreneurship. Jones said it is a pity that many learners don't take the vocational training option, as there is a far greater need for artisans than university graduates. The irony is that many jobs in the corporate world will simply disappear in the very near future. But there will always be jobs for artisans.

<https://www.fin24.com/Economy/mind-shift-needed-in-sa-about-artisans-20160125>

Part 2

In your group, discuss the following questions:

- What is an artisan?
- Do you have to go to university to become an artisan?
- How does becoming an artisan help South Africa?
- How can becoming an artisan help you in other ways in the future?



- e) Why do you think there will always be jobs for artisans?
- f) Would you consider becoming an artisan? Why/Why not?
- g) If you were to consider becoming an artisan, which artisan would that be? Why?



Learner Activity 8

Part 3

In the engineering team, there is a great need for artisans. There are many artisanal careers! The following artisanal careers have been jumbled up. Unscramble the letters to work out the artisan career and then use a dictionary or the internet to find out what each of these artisans do. The first letter of the artisanal career has been highlighted to help you.

- **W**ldere
- **E**actelnrtici
- **F**ttier
- **T**rrneu
- **B**rkmeioleae
- **M**cnheaic
- **T**rkmaloeo
- **P**rkmrtatenae
- **B**rylcrikae
- **P**rbulme
- **C**rterapen
- **G**rialez
- **P**rrtalsee
- **T**rlei

Section B Senior Phase Grade 9

Part 4

One of the advantages of being an artisan is that you can start your own business! Many plumbers, electricians and mechanics have opened their own businesses and offer their services to people and other companies. When you start your own business, you are an entrepreneur. An entrepreneur is a person who operates a business and/or works for himself or herself, rather than working for others. Entrepreneurs must generally work hard to be successful and assume the risk of business failure in order to make money.

While each entrepreneur is unique, many share a number of common characteristics that may include:

- Creative
- Innovative (they like to do new things)
- Risk taker
- Hardworking
- Driven (very motivated)
- Open to new ideas
- Always trying to improve

- a) Rank yourself (from 1 to 5 on each of the characteristics, 1 = not at all; 5 = very) to find out if you could be an entrepreneur. The higher your score, the more likely you are to be an entrepreneur!

Characteristic	Rating 1 = not at all; 5 = very
Creative	
Innovative (they like to do new things)	
Risk taker	
Hardworking	
Driven (very motivated)	
Open to new ideas	
Always trying to improve	
TOTAL	_____ / 35

A score of 25 or more = you could definitely be an entrepreneur!

So... get your qualification, gain some experience and consider starting your own artisanal business!

- b) Complete the following two sentences in your class workbook:
- Reasons I would consider opening my own business include...
 - The type of business I would like to own is...

Choices and goals

Name:..... Date:.....

Part 1

Read the following information before completing the quiz that follows.

If you want to become a certified artisan, you will need to pass a Trade Test. You must qualify to be allowed to write the Trade Test.

There are three ways to get the qualification you need to be allowed to write the Trade Test:

- Study at a TVET College (and do an internship thereafter)
- Be an apprentice
- Join a learnership programme

You can find out more about these three options in the Sasol Learner Guide 'It's cool to be a 21st century artisan'. For now, you are going to find out about the differences between a Learnership, Apprenticeship and Internship. The reason that it is essential to know the difference between the three is due the fact that you will be able to apply for the correct thing based on your knowledge or highest qualification, whether it be a Grade 12 certificate or a degree.

Learnership	Internship	Apprenticeship
<p>A learnership is a work-based learning programme that leads to a nationally recognised qualification that is directly related to an occupation (job).</p> <p>Learnerships combine a structured learning component with practical work experience that is acquired while being employed in a company, government department or small business.</p> <p>Learners in learnerships have to attend classes at a college or training centre to complete the classroom-based learning, and they also have to complete on-the-job training in a workplace.</p> <p>Note: A bursary is an amount of money given to you, by a company, to study at a University or TVET College. You may need to work for the company, which awarded you the bursary, after you finish studying.</p>	<p>An internship, is an opportunity for people with a degree or diploma to gain practical experience in a possible place of employment or in their field of study.</p> <p>Interns are employed at a company for a limited amount of time which lasts from one week to 12 months. Most times, an internship is required during your study course in order to complete your qualification. Just as with a learnership, you also get paid during an internship.</p> <p>An internship exists because in a lot of instances a university education on its own, may not give you all of the skills and knowledge to prepare you to understand your job of choice.</p>	<p>An apprenticeship is a position that allows individuals to train for a particular job. Apprenticeships are regarded as proper employment programmes which will help an individual prepare for a particular job. An apprenticeship is mostly handed in trades such as plumbing, engineering, electrician, etc., and it is very specific to the trade.</p> <p>An apprenticeship could last 3-4 years depending on the duration of the programme.</p> <p>The experience and skills are gained through practical labour at a possible place of employment and is very particular to the trade.</p> <p>It is possible to earn an authorised qualification during the course of an apprenticeship and possible employment after the completion of the programme.</p>

Section B Senior Phase Grade 9

Summary:

A learnership is better suited for someone with a Grade 12 as their highest education, while an internship benefits someone who is actively completing their degree or diploma and an apprenticeship is a 3-4-year labour programme that trains you in a very specific trade.

Check your understanding of the differences by completing the following TRUE or FALSE quiz.

- | | | |
|---|---|---|
| a) You can do an internship without a qualification. | T | F |
| b) A learnership is a combination of work and study. | T | F |
| c) An apprenticeship gives you broad skills in a variety of jobs. | T | F |
| d) Interns are employed by a company. | T | F |
| e) An apprenticeship is a work-based learning programme. | T | F |

Part 2

Read this exciting information about opportunities that are available to you, before completing the table on the next page, to start achieving your goals now!

Sasol offers bursaries for learners wishing to do a qualification, as well as learnership opportunities for learners who wish to become artisans. You can find out what is on offer, as well as how to apply, by reading the Sasol Learner Guide. Many companies offer bursaries and learnerships, including Sun International, Multichoice, Shoprite, Telkom and Eskom. Visit goo.gl/HsrNch to find out about the 2018-2019 bursaries available in South Africa. Visit goo.gl/byc5Fh to find out about the 2018-2019 learnerships available in South Africa.

Whether you choose the university or learnership route, it is important that you start planning your career now, as this will influence your choice of subjects at the end of Grade 9. In order to have a career plan you need to set goals. Goals are things that you want to achieve in the future. They are things that will help you to be prepared for your life. It is important that you think about goals early because then you can work out how to achieve them. Thinking about goals means that you will be prepared to study the subjects you like, do the types of jobs you prefer, and keep your future options open. If you meet a goal throughout the year, set another new one for yourself – maybe a more challenging one.

Education and Training Goals			
What is my goal?	How will I do it?	Why is it important?	When will I do it by?

Employment Goals			
What is my goal?	How will I do it?	Why is it important?	When will I do it by?

Part 3

Based on what you have learned about, in these activities, and the goals that you have set, what subjects will you choose at the end of Grade 9? Write them down here and write a short sentence on why you are choosing these subjects:

Subject Choice	Reason
Maths / Maths Literacy	
Choice 1:	
Choice 2:	
Choice 3:	

Section C

Resource Section

Assessment Rubric:

Assessment	
Rating code	Description of competence
7	Outstanding achievement
6	Meritorious achievement
5	Substantial achievement
4	Adequate achievement
3	Moderate achievement
2	Elementary achievement
1	Not achieved

List of artisans

Engineering artisans

- Welders
- Electricians
- Fitters
- Turners
- Millwrights
- Sheetmetal Workers
- Boilermakers
- Mechanics
- Toolmakers
- Patternmakers
- Bricklayers
- Plumbers
- Carpenters
- Joiners
- Shutterhands
- Steel fixers
- Glaziers
- Plasterers
- Tilers
- Sound technicians
- Instrumentation and electronics technicians

Other artisans

- Furniture makers
- Glass artists
- Hat makers
- Jewellers
- Landscape or garden designers
- Leatherworkers
- Music instrument makers
- Shoemakers
- Tailors / Fashion Designers
- Bakers

Refer to the Sasol Learner Guide 'It's cool to be a 21st century artisan' for a comprehensive look at artisans and how to become an artisan.

Notes

Notes

Lined area for notes.

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