

# A BLUEPRINT FOR BECOMING “ENERGY WISE”

A resource by the ESKOM ENERGY AND SUSTAINABILITY PROGRAMME and WESSA for use by educators and facilitators working with classes, environment clubs, youth development organisations, as well as other school or community groups.



**With the current** power crisis in South Africa, and the international investment in climate change issues, it would be futile to believe that it is not up to each and every one of us to play a part in helping to manage our daily energy requirements. It is therefore crucial that young learners are encouraged to think about, and develop, those core principles for living that would make them “wise environmental citizens” and wise consumers of energy resources.

The “blueprint for becoming energy wise” is a valuable teaching resource that can be used to enable learners to think about their place as energy consumers - both now and in the future. This resource enables the achievement of outcomes set for various parts of the curriculum in the intermediate phase (grades 7-9). It may also be adapted for use with groups whom have other agendas in that it provides

learners with the opportunity to engage in social responsibility the initiatives, both in becoming wise consumers of energy, and then teaching others to do the same.

# A blueprint is a detailed plan for a particular design

([www.wikipedia.com](http://www.wikipedia.com), accessed 04/05/2008). This blueprint outlines how to enable learners to become “energy wise” through the process of creating an educational game. It allows for flexibility in teaching and learning and can be adapted for your own specific needs. This is done by structuring differently the way the game is developed when working with learners in different situations and contexts.

Your ideas and knowledge of the learners with whom you work is therefore important in establishing how you will use this blueprint.

# CONTENTS

**P1:INTRODUCTION**

**P2:SOME BACKGROUND INFORMATION**

**P9:HOW TO USE “THE BLUEPRINT FOR BECOMING ENERGY WISE”**

**P19:WORKING WELL WITH GROUPS**

**P27:REFLECTION ON ACTION**

**P33:PHASE 1: UNDERSTANDING ENVIRONMENTAL ISSUES MORE DEEPLY**

**P46:PHASE 2: CONTEXTUALISING ENERGY AND SUSTAINABILITY ISSUES**

**P52:PHASE 3: PLANNING OUR GAMES**

**P56:PHASE 4: MAKING OUR GAMES**

**P59:PHASE 5: TESTING OUR GAMES**

**P60:PHASE 6: PRESENTING OUR GAMES AND LEARNING**

**P62:ADDENDUM: LESSON PLANS**

**The Eskom Energy** and Sustainability programme is a national environmental education programme that focuses on energy and sustainability issues. The programme's aim is to encourage young South Africans to develop their understanding of leading sustainable livelihoods by considering closely the energy that is used for life on a daily basis.

With climate change issues being of prominence on the political agenda in South Africa at present, the way we use energy and its resultant impact on the environment is a core consideration for each and every one of us. Our current young learners and their children will be those who are most influenced by the impact of climate change. People will need to reconsider what they do now in order to reduce the impact of climate change on what they do later. The Eskom Energy and Sustainability Programme is

# INTRODUCTION

thus a key role player in bringing about both attitude and behaviour change for young learners in a bid to change the way people both care for and live in their environments.

Regional co-ordinators working for the Eskom Energy and Sustainability Programme all over South Africa conduct projects with young learners that focus on the way they understand and use energy and ultimately the way that sustainability is either enhanced or curtailed. A regional co-ordinator working for the Eskom Energy and Sustainability programme in Cape Town in the Western Cape worked on a project with a group of grade 7 learners that focused on teaching others about energy and sustainability issues. This group of

## SO WHO'S BEHIND ALL OF THIS?

learners decided to build a game known as "Energy-Wise", which they used to educate their peers about the energy and sustainability issues they felt were of importance. In the process these learners themselves gained a deep understanding of energy and sustainability issues and developed their commitment to care for their environment.

The "Blue Print for Becoming EnergyWise" has been developed based on the "Energy-Wise" game. The author has used her understanding and knowledge gained from facilitating the project process to construct a guide that can be used by different teachers in different contexts to facilitate learning about energy and the

environment. It also draws on learning done through projects facilitated by other regional co-ordinators working on the Eskom Energy and Sustainability Programme. As a result it does not focus on simply re-creating Energy-Wise, but rather on the facilitation of a process that is exclusive to the group of learners working through the process. It is with this in mind that we begin the journey on the way to becoming EnergyWise...



# **SOME BACKGROUND INFORMATION**

To give you a better idea of where this blueprint came from, read the story of “Energy Wise” and its potential to bring about learning and change for those involved.

# THE STORY OF ENERGY WISE

**Energywise is the** story of how 6 young learners embarked on a process to both learn and teach others about what needs to be done in order to become knowledgeable about energy issues and effect environmental change. Throughout the process the learners logged their reflections about key aspects using questions posed in log books.

## Phase 1

The process began with learners engaged in the study of fundamental environmental aspects relating to issues of energy and sustainability.

PAGE 3

This was important as learners in the intermediate phase needed to develop a deeper understanding of the environment. This was thus an

opportunity to build on what had been previously taught in the curriculum.



**Learners play an environmental game from Share-Net that focuses on prominent environmental issues in cities and towns such as the one in which they live.**

## Phase 2

In learning first about the environment and then linking this learning to their own community these 6 learners realised that the choices they

made, for both energy use and to ensure environmental sustainability, were not wise and compromised the integrity of the environment. They began to see that other children in their school environments lacked this self-same knowledge and became passionate about educating others about their responsibility toward the environment. In order to understand what others knew about energy and sustainability the learners created a survey that enabled them to understand the extent of other learners' knowledge. They then engaged in a process that involved analysing and interpreting the results of the survey to understand how other learners could learn about energy and sustainability issues.



**Discussing the content for the survey**

## Phase 3

The 6 learners involved in this project became known as the "Energy Girls." They began to think critically about how they

**could become wise** environmental citizens and teach other learners to do the same. In exploring various teaching and learning methods they discovered that when they were involved in something that is fun and enjoyable they were able to learn and remember things more easily. In continuing along these lines of thinking they began to look at how environmental knowledge could be learnt through playing educational games with one another. They began to construct a game known as “Energy Wise”. This was a key opportunity to build the learners’ capacity to work in a group with one another and learn about democratic processes for decision-making. Learners also engaged in strategic thinking in order to decide on the content of the game that they were manufacturing to teach others about energy and the environment.



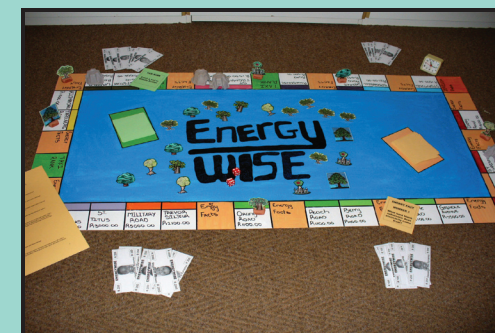
**Playing Monopoly (on which EnergyWise was eventually based) [ABOVE] and playing Twister [BELOW]. Both these games were used as a way to introduce learners to the concept of games and to get them to think about how games could be used as learning tools.**



## What is Monopoly?

**Some of you might have heard of Monopoly before and for some it might be completely foreign. According to the Wikipedia ([www.wikipedia.com](http://www.wikipedia.com), accessed 04/05/2008) Monopoly is “a board game where players compete to acquire wealth through economic activity involving the buying, rental and trading of properties using play money, as players take turns moving around the board according to the roll of the dice. The game is named after the economic concept of monopoly, the domination of the market by a single player.”**

As the Energy Girls began to manufacture their game they needed to consider their own choices for resource use and needed to build on their capacity to work together as a group. This was a key opportunity for learning regarding resource use and its energy and sustainability implications. The learners considered how they could comply with the three R's: reduce, reuse and recycle.



**The completed game**

## Phase 4

# Phase 5

**Once the game** was complete learners used it as a teaching tool with other learners in grade 7. They found that it was necessary to play the game more than once in order for learners to consolidate knowledge and that they themselves benefited from playing the game multiple times. The game was thus a valuable teaching tool in providing an enjoyable learning experience that learners wanted to engage in multiple times. It therefore served not only to achieve outcomes for the learners involved in the process of constructing the game but also for those who played the game in terms of their development as 'wise environmental citizens.'



**The Energy Girls played their game with other learners [ABOVE] teaching them much about energy and sustainability**



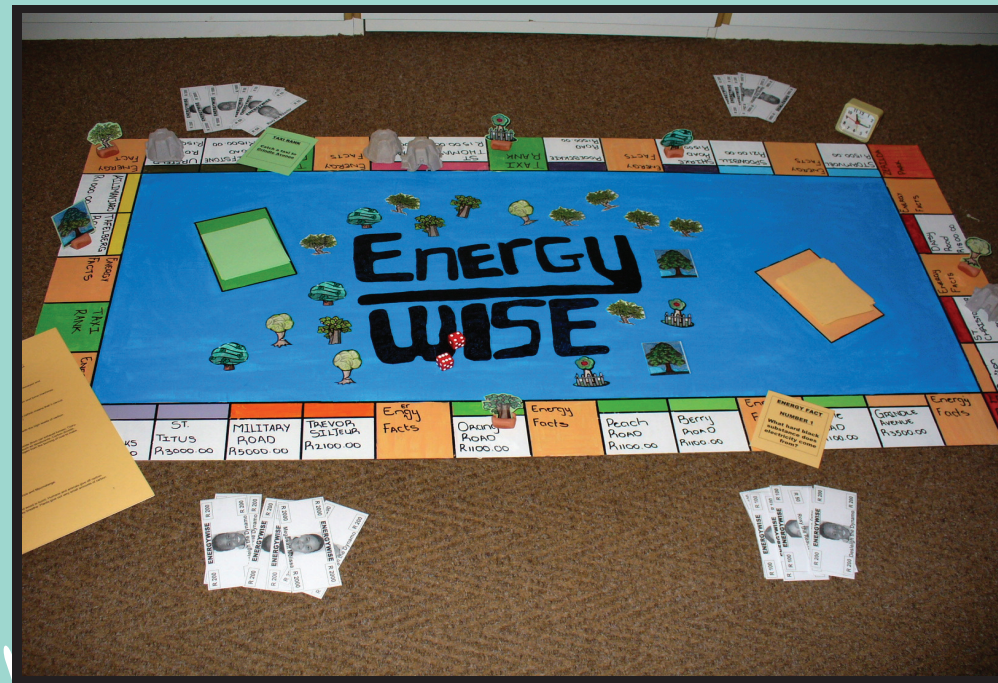


# THE INS AND OUTS

## OF ENERGY WISE

**In order for** you to understand more clearly how this resource can be used to create the just-right-challenge for your learners, and set realistic outcomes for them, it is important to elaborate on how the original Energy Wise game that the Energy Girls created actually works. What follows is a detailed explanation of the specifics of the game as well as the rationale for some of the choices that were made. If you wish to simply get your group or class to recreate the game for use in the learning setting then this section will help you to do so more effectively. For those of you who wish to base your process on the original one this will give you some ideas on which to build when facilitating the process with your learners.

**Let us begin by taking a closer look at the game board below:**



board to counteract their use of resources from the environment throughout the game. The player with the most trees in the centre of the game board at the end of the game is the winner.

The purpose of the game is to encourage children to think about their use of energy and other resources in their community and to teach the following principle:

**“If I take from the environment, I must try and give back to the environment”**

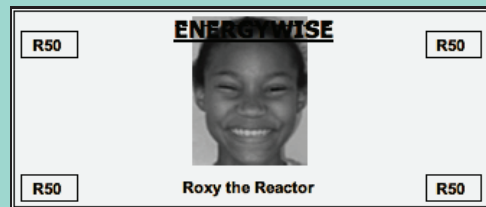
The object of the game is for each player to try and be the “most responsible environmental citizen in the community”. This is achieved by planting the most trees in the centre of the game

**As you can** see the board game is comprised of different blocks around the edges of the board called properties – these are named after streets in the Energy Girls’ own community – “energy facts” squares, “taxi rank” squares, and “school” squares – named after schools in the community. The latter three are basically resting blocks in the game.”. There is also a block called “Begin” which is where learners start the game and is a marker for moving around the game board.

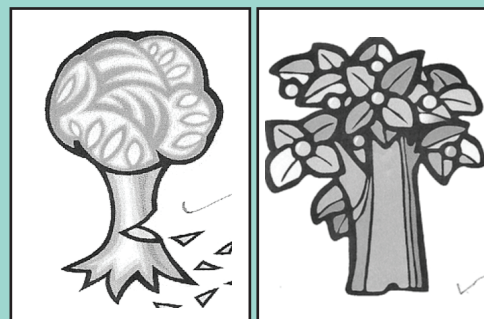
The playing pieces in the game are representations of different trees that the girls selected. Our ability to find representations of indigenous trees was difficult. We had an important conversation about the importance of indigenous trees and their comparison to exotic trees in terms of environmental impact.

The economy used in the game for learners to

transact with consists of play money and trees. Each player receives a certain amount of money when the game begins, but has to acquire trees as the game progresses. The Energy Girls created the “play” money themselves. Their faces were represented on the different “bank notes” and they gave themselves names that linked to ideas around energy. An example of one of the notes is represented below:



As each playing piece is represented by a tree, learners transact with the trees that are the same as their own playing piece. Some examples of pictures of trees that the Energy Girls chose are represented below:



The properties that the Energy Girls designed looked as follows:

They included an indication of what it would cost to construct a house on the property and also what it would cost for a player in the game to “rent” a house on a property. The properties come in sets of two.

<b>TAFELBERG ROAD</b> R1000.00 <b>Houses: R100</b> <b>Rent:</b> 1 property = 1 tree 2 properties = 2 trees + 1 tree for each house on the property	<b>KILIMANJARO</b> R1000.00 <b>Houses: R100</b> <b>Rent:</b> 1 property = 1 tree 2 properties = 2 trees + 1 tree for each house on the property
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**The players need** to acquire and build houses in order to make an income from the properties that they buy during the course of the game.

In an effort to be responsible in their construction of the game the Energy Girls decided to use old egg boxes that would otherwise have been thrown away and cut these up to represent the houses. If players build houses or stay in other player's houses during the game play they are required to give back to the environment by planting trees. While this is a responsible environmental action it also helps players to win the game! Those players who become wealthy in terms of properties can acquire trees through this process, however, they must choose between trees and money which can be a difficult decision!

The game can be played with a maximum of 6 players and one "banker" who facilitates the process. The environmental learning achieved is done so not only through the core principles in the game, but also through "Energy Fact and Fortune" cards which either ask learners questions about energy and sustainability or indicate a positive or negative action that they take. These actions are connected to consequences that are either in the players' favour or pose difficulties for them in the game. There is thus an opportunity to gain knowledge about energy but also learn appropriate ways of acting in relation to this knowledge.

# The game has a time limit of one and a half hours. The game ends when the time is up.



# HOW TO USE “THE BLUEPRINT FOR BECOMING ENERGY WISE”

**This section explains** how the “Blueprint for Becoming Energy Wise” is structured and the outcomes that can be achieved through engaging in this process. Before you embark on this process with your group or class of learners, read this resource in its entirety to get an overall idea of how the process could emerge and be shaped by your expert guidance.

As mentioned previously this is a kind of prototype for a process. Although every game produced by using the “Blueprint for Becoming Energy Wise” will be called “Energy Wise” each group of participants has the potential to produce a different game, with different rules that

responds to learners’ needs and local knowledge. This is important because:

- An open and flexible format provides possibilities for incorporating different learning styles and ideas in the classroom environment; and
- It provides the educator or group facilitator the opportunity to take control of the process and design it in a way that is meaningful and relevant in specific teaching and learning environments.

The “Blueprint for Becoming Energy Wise” is written using

a phase approach that covers various aspects of the process in chronological order. The first two sections, “Working Well in Groups” and “Reflection on Action” cover general aspects of relevance to the entire process while the other sections follow a set sequence for completion of the project.

“The Blue Print for Becoming EnergyWise” is designed for use in different contexts and situations:

- Primarily it has been designed for use with a class of learners that is divided into groups.

- It can, however, also be used with a small group of learners such as an environment club or youth club in the school or community.

Whatever the case may be, certain sections of the “Blue Print for Becoming Energy Wise” will be more or less relevant for you. A comprehensive design is presented so that you can use what is presented in ways that have relevance for you – feel free to adapt as much as you see fit for the needs of your learners.

# Using the “Blueprint for Becoming Energy Wise” when working with a whole class:

**-The size of** classes in many schools means that working with a whole class is challenging. The section on “Working Well in Groups” provides some hints and tips for managing this process in a classroom situation.

- The outcomes of this process are across various learning areas. You may therefore choose to approach this task in different ways:

- If you teach a grade 7 class you may wish to use the “Blueprint for Becoming EnergyWise” as a means to achieving outcomes across different areas. You could spend a particular period of

time where you work only on the design of the EnergyWise game with your class. For example, you could choose to work on this process over a period of three to four weeks which will provide you with ample opportunity to achieve a number of different outcomes across different learning areas, whilst being focused on one central task.

- If you teach grade 8 or 9 learners you may wish to “team teach” using the “Blueprint for Becoming Energy Wise.” This means that a group of teachers who teach in different learning areas will work on the process collaboratively at one time. The “Blueprint for Becoming Energy Wise” will be the unifying factor. For example, the natural sciences teacher and social sciences teacher might use the process to teach learners aspects of the curriculum of relevance to designing their own games. At the same time the life orientation teacher will use the process to achieve different out-

comes linked to the life orientation curriculum. The technology teacher will assist in the design and manufacture of the game, whilst the learner’s first language teacher will use the presentation of the process to achieve the outcomes set for Languages. This means that different teachers manage different parts of the process but focus on one particular task that holds different parts of the curriculum together at one time.

- Although the “Blueprint for Becoming Energy Wise” is aimed at learners in grades 7-9 it is possible to adapt it for use with grades 10-12. It will require restructuring the complexity of the process and aligning it with the more complex outcomes in the different learning areas in the higher grades.

# Using the “Blueprint for Becoming Energy Wise” when working with a small group of learners:

- As you are not working in a classroom format you need not worry about curriculum outcomes. This provides you with more carte blanche in adapting the process to the needs of your particular learners.

- **If you are** working with a small group of learners the process may be more manageable and it may provide you the opportunity to engender deeper understanding of core aspects for those involved.

- You would still need to pay attention to group dynamics, however, and the section on “Working Well in Groups” provides some tips which may be useful.

- The section on “Reflection on Action” might be of particular interest. As you are working with fewer learners at a time there will be more opportunity for conversations that facilitate learning and change. It will be important to take advantage of this opportunity.



# SETTING OUTCOMES: ■■

## Key learning areas covered through “A Blueprint for Becoming Energy Wise”

**I have explained** earlier the learning experience that learners will be engaged in by telling the “Story of Energy Wise.” We see here that learners were engaged in a process which taught them about energy and sustainability in relation to themselves and their own contexts, the way that learning may happen for others and mechanisms through which to teach others, how to work together as a team, how to construct a valued end product, how to make decisions that are in line with themselves as valued members of a team and their own community.

You read earlier in this section a full description of the rules and other aspects of the EnergyWise game. It is not important, however, whether or not your group or class of learners copies the original EnergyWise game or aspects thereof, or comes up with their own unique ideas. What is important is that their games reflect their own unique understanding of issues of energy and sustainability of relevance in their communities. Learners need to attain a sense of understanding of their own rights and their environmental rights so that they learn new ways of conceptualizing themselves, and their actions in the world, as they relate to the environment. Depending on the complexity of the games that learners choose to produce

the level of outcomes achieved will differ. There are, however, some outcomes that are generic if the core ideas of the “Blueprint for Becoming EnergyWise” are followed.

So let us begin by considering some of the key aspects that this Blueprint may enable learners to achieve. If we stick to the core learning possibility above we see that outcomes could be set in relation to the following learning areas:

- Natural Sciences
- Life Orientation
- Technology
- Language, literacy and communication

**Depending on the** kinds of games that the learners produce, achievement of further outcomes may be possible through continued playing of their games in the classroom environment, but you will only be able to discern the nature of these outcomes once the process is complete. For example the original EnergyWise game involved the use of money as economy as well as the use of properties that learners could purchase and sell. When engaged in the decision-making around the value of properties in constructing this game learners had to consider the current economic system in the country and the property market. This would obviously enable outcomes in relation to the learning area of Economic and Management Sciences. When learners play the game they need to work with money as one of the dominant forms of economy and thus need to engage

with skills linked to the mathematics enabling attainment of some outcomes related to the learning area of Mathematical Literacy. As learners in grade 7-9 have not yet chosen particular subject areas they still need to engage with most learning areas.

If you are a life orientation teacher you may wish to partner with a teacher who teaches natural sciences as much of the key learning done regarding energy and sustainability falls into this learning area. You could look at the content covered in these classes and then use it as a basis for action in your life orientation classes. For example if learning the basic facts about energy and sustainability is covered in another class, then during life orientation classes you could link this learning to how it applies to the learners' lives so that they learn to use the knowledge that they gain to become responsible citizens. If you are working with a

small group you may not have this luxury and will need to cover all basic learning independently as learners require this knowledge before they can think effectively about its application.

Included in the table on the next 2 pages are the learning areas (Department of Education) that could be covered using "A Blueprint for Becoming EnergyWise" as well as the related outcomes.

# LEARNING AREA

## Natural Sciences

## Life Promotion

# RELATED OUTCOMES (AS PER CURRICULUM STATEMENT)

## LO1: Scientific Investigations

“The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.”

## LO2: Constructing Scientific Knowledge

“The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.”

## LO3: Science, Society and the Environment

“The learner will be able to demonstrate an understanding of the inter-relationships between science and technology, society and the environment.”

## LO1: Health Orientation

“The learner will be able to make informed decisions regarding personal, community and environmental health.”

## LO2: Social Development

“The learner will be able to demonstrate an understanding of and commitment to constitutional rights and responsibilities, and to show an understanding of diverse cultures and religions.”

## LO3: Personal Development

“The learner will be able to acquire life skills to achieve and extend personal potential to respond effectively to challenges in his or her world.”



# LEARNING AREA

# RELATED OUTCOMES (AS PER CURRICULUM STATEMENT)

## Technology

### LO1: Technological Processes and Skills

“The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.”

### LO2: Technological Knowledge and Understanding

“The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.”

### LO3: Technology, Society and the Environment

“The learner will be able to demonstrate an understanding of the inter-relationships between science and technology, society and the environment.”

## Language, Literacy and Communication

### LO1: Listening

“The learner will be able to listen for information and enjoyment, and respond appropriately and critically in a wide range of situations.”

### LO2: Speaking

“The learner will be able to communicate confidently and effectively in spoken language in a wide range of situations.”

### LO3: Reading and Viewing

“The learner will be able to read and view for information and enjoyment, and respond critically to the aesthetic, cultural and emotional values in texts.”

### LO4: Writing

“The learner will be able to write different kinds of factual and imaginative texts for a wide range of purposes.”

Please note that “A Blueprint for Becoming EnergyWise” will only allow for achievement in part of the outcomes listed in the table above.



# ENCOURAGING LEARNERS' PARTICIPATION THROUGH ALLOWING THEM TO SET THEIR OWN OUTCOMES:

**It is important** that learners understand what they will achieve through becoming involved in this process so that they are motivated not only by the excitement of the process, but also by the goals that they set for themselves. Evaluation of these goals should thus be a valuable and noteworthy experience for learners when this occurs. Once learners understand what they will be embarking on it will be important for them to set their own outcomes.

Guidance will be required to enable learners to set outcomes in a manageable way. It may be best to start by highlighting the core learning possibility that could result from engaging in the process that “A Blueprint for Becoming Energy-Wise” suggests.

# Activity: “Learners thinking about Learning”

**Once you have** explained to your group or class of learners what they will be doing encourage them to begin thinking about what they wish to learn through the process. Depending on the age of your learners they may come up with more, or less, complex outcomes. The number of outcomes is not important but rather that learners have thought about what they wish to learn so that they are motivated to participate.

Design a visual compilation of all these outcomes so that learners are accountable for ensuring that they learn what they wish to learn.

An idea of capturing the learners’ outcomes visually is as follows:

## “Our Outcome Tree”

- Draw a large tree with branches on a large piece of paper or a section of the board that is not often used for teaching
- Assign a “branch” to each learner
- Each learner must record one or more outcomes that they wish to achieve on their branch
- As learners move through the process of designing their game they can tick off the outcomes that they feel have been achieved
- As these outcomes are their outcomes they are free to add more outcomes to their branches as they learn more and wish to know more. For example a learner may indicate that he wishes to understand how electricity is

produced. He might understand this after the first lesson. Once he has understood this he may wish to add another outcome that covers how he can make sure he uses electricity wisely at home. He should then add this new outcome to his list on his branch.

It is up to the facilitator of this process to structure it in ways that enable learners to achieve the outcomes that they set for themselves at the outset and throughout this process. It is therefore imperative that we hold to the principle of ensuring learners’ outcomes are realistic.

Conversations should be encouraged with learners around the possibilities that they suggest for the outcomes they could achieve so that these are realistic and learners are not disappointed when they do not achieve what they set out to.

**Here are some** questions you may wish to pose to learners regarding some of the outcomes they wish to achieve through this process. This enables learners to take some responsibility for the process:

- What do learners wish to learn about energy and sustainability issues? What do they wish to learn about the application of knowledge to their own lives? What do they already know and what are they curious about?
- What do learners wish to learn about their own and other's cultures? This will include the way that resources are used in terms of the way daily life is lived.
- How do learners want to communicate with one another during this process? What do you think is important for learners to learn in terms of

communication? How do learners wish to consider other peoples' opinions and ideas?

- What do learners want to learn about working as a group and democratic decision-making?
- How might learners wish to improve their literacy skills? This could be linked with their exploration into environmental issues and the prescribed reading.
- What do learners wish to learn about technology and how they will use it in the development of a game? This could include aspects of reducing, reusing and recycling and how these concepts play a role.
- What do learners wish to learn about presentation skills and presenting?

**Although learners may set diverse outcomes remember that you can “nip and tuck” this process accordingly so that outcomes may be achieved.**

# WORKING WELL IN GROUPS

As you may be used to teaching a large class and may not have worked with small groups previously some consideration of relevant key issues are crucial here. This section may also be helpful for those facilitators working with small groups.



# ISSUE ONE:

## WHOM SHOULD BE IN WHICH GROUP?

**Think about which** learners you place together in groups. It is important that groups have learners who are diverse and who can learn from one another. It is also an important learning curve for learners to learn to work with people different from themselves. While this is an important issue it is also important to place learners who can work well together and where learners who are “different” will not be victimised or discriminated against during the process.

If you do not know your learners well at the start of the process you will need to be more aware of any issues that arise as a result of diversity and you will need to manage these as the group process moves along.

# ISSUE TWO:

## HOW DO I CONTROL A NUMBER OF GROUPS OF CHILDREN DOING SIMILAR, BUT AT THE SAME TIME DIFFERENT, TASKS AT ONCE?

**Here it is** important to think about the structure of your classroom environment. Perhaps you have a big classroom or a small one. Whatever the case it will always be important to consider the structure of the learning environment. For example groups may be required to work together for the full duration of the time allocated or they may be required to

come together as a large class at some points.

In order to structure your sessions more effectively you need to consider the following:

- the nature of the activity being completed in groups – do you need to have full control over the learners at all times or can they work relatively independently?
- whether you will need

to work together with the whole class at any stage – i.e. the structure for learning might change during the course of one learning period.

Although at first glance it seems easier to have a large classroom this is not always the case.

A large area in which to work is often not “containing” for learners. By this it is meant

that it is easier for learners to become distracted and not to focus on the task at hand, whatever this may be. A small classroom also poses its own challenges. The most predominant of these would probably be the fact that small groups intrude on each other's space leading to low productivity when performing the set tasks.

# So, what to do about these issues?

- **For a classroom** that is too large and not containing it would be a good idea to map out spaces for different groups with masking tape on the floor of the class. This provides a space that is containing for each group as learners begin to think of the space differently.

- For a class that is too small it may be good to investigate the other spaces around your classroom. When doing this you will need to consider which groups you will need to keep within your line of vision, which will be dependent

on usual behaviour and concentration spans of learners in your class. Perhaps there is a passage just outside your classroom that you can use, or maybe there is a quad nearby. This task will require you to be creative and to see the potential of the space for group work. When doing this it would probably also be good to map out the spaces with masking tape or objects so that learners feel contained.

- If your classroom is not of the typical variety you will need to do a brief assessment of the environment at the school and determine where the best place might be to perform the group work required for this project. The important principle to remember is that groups need their own space that is containing and not too big. They also need a space in which they are able to concentrate and work effectively. The space does not have to be completely quiet but

should not be distracting depending on the task at hand. Should you wish to work outside with your learners you need to consider the weather. If it is too hot learners will become tired easily and if it is too windy they may not be able to conduct their activities efficiently. However, there may be a tree under which they could sit in the shade and work together. This kind of space often works well as it gives small groups responsibility in trusting them to conduct the task in an environment that is conducive to working.



# ISSUE THREE:

## HOW DO I MAKE SURE THAT EACH GROUP IS WORKING EFFECTIVELY AND ACHIEVING THE RELEVANT OUTCOMES?

**This part of** the process is often quite challenging as a facilitator as it requires that you spend some time with each group, which is often difficult with larger classes.

**PAGE 23** It is necessary, however, to determine how you will divide your time between the various groups.

As you will not be able

to get to each group as, and when, their questions arise, it may be necessary to put certain guidelines in place to ensure that you are able to address the needs of your class appropriately. These guidelines may include groups writing down their questions so that they are able to ask you once you get to them. It may also include a requirement that groups document during the task that they are

required to do, so that they have relevant information to share when returning to the large group.

- The space you allow small groups to work in will also be important when determining how you will ensure you are available to each group.

- As an introduction to democratic processes it may be a good idea to negotiate with the class as a whole as to

how they feel the best way will be to work when they are in smaller groups. In this case the majority will decide on what is best but it will begin the process of ensuring learners take responsibility and are aware of their own role.

# ISSUE FOUR:

## HOW DO I GIVE EQUAL ATTENTION TO EACH GROUP IN THE CLASS?

**As a group** facilitator you will learn that it is not necessary to give exactly equal attention to every single group that is participating. Different groups will have different needs as the learners participating in the groups require different amounts of assistance.

PAGE 24

As your knowledge of the learners and dynamics present in each group increases you can use this knowledge to structure the physical space so

that groups requiring more assistance are situated nearer to you when working on individual group tasks. Equity is more important than equality in this regard. As an educator you will need to give to each group what they require to complete the task effectively – in a way that achieves the outcomes set for the process. This will mean that some groups of learners might receive more hands-on time than others, but will mean that all groups receive what they need in order to achieve the set outcomes.

# ISSUE FIVE:

## WHAT ARE THE RULES OF ENGAGEMENT?

### (I.E. WHAT BOUNDARIES SHOULD I SET FOR GROUPS WHEN WORKING TOGETHER?)

**As mentioned previously** it is imperative that guidelines are drawn for the way groups will work together. This can be negotiated collaboratively with the class in a democratic process. The list of guidelines should be recorded and will be more effective if they are visible in the classroom environment when groups are working. As a facilitator you are then able to bring learners' attention to the guidelines when they are not being used efficiently and their work is suffering as a result.

Examples of guidelines could include:

- Designing a mechanism to ensure that all learners participate appropriately. This may be in the form of a small group report form that each learner fills in at the end of the session. The class will need to decide how learners who do not pull their weight will be dealt with. The fact that groups are diverse needs to be considered here. Learners from a minority may not be able to participate equally for a number of different reasons. You will need to use your discretion as a facilitator when

dealing with issues of unequal participation appropriately.

- Setting times for working together and keeping to these.
- Guidelines for managing conflict will need to be considered. This aspect will be covered under the next issue.
- Guidelines for how learners will address one another and respect one another in the space.
- Guidelines for how the time will be used most efficiently.
- Guidelines for logistical issues that may include the use of cell phones and toilet breaks, etc.

This list of guidelines is by no means exhaustive and you need to use your discretion as an educator when drawing up the list with the group/class. Your understanding of your class and their needs will be crucial in developing how they will work together. Learners should be encouraged extensively to contribute as their own suggestions enable them to take responsibility for their actions more appropriately.

# ISSUE SIX:

## HOW SHOULD I DEAL WITH ISSUES OF CONFLICT IN THE GROUP SPACE?

**This is a complex** issue and needs to be dealt with sensitively. Again issues of diversity will come to the fore in some cases and need to be managed by facilitating discussion around what the conflict is about.

**PAGE 26** In situations of conflict the group will need some active facilitation from you as the educator. You will need to help the group manage the conflict so that they

can move past it and continue to work together for the duration of the process. In these instances it will be important to listen openly to the learners involved, giving each a fair chance. It will also be important not to allow your own assumptions about learners, and the “labels” that they have often been assigned, to cloud your perspective on the situation. Remember you are not there as a judge, but rather as a mediator. It is the group that must come to

their own conclusion about what they wish to do about a particular situation. In instances where learners are unreasonable you will need to assist them to think differently about all the aspects involved by challenging them to do so during the conversation. It will be important for each party involved in the conflict to speak to one another without interruption so that there is no blaming. You will need to ensure that each party has the opportunity required to

speak in this way. To do this it might be necessary to give a set amount of time for each person involved to speak so that there is equity in the process.

**It is best** to begin reflection on all aspects of the process early on so as to maximise learning.

Suggestions in this section for how you can reflect on actions taken by learners are drawn from ideas by James Taylor, Dirk Marais and Allan Kaplan (1997). These authors provide an “action-learning framework” that one can use to assist the learning process for members of a team or organisation. Central to their ideas is the fact that action learning is about learning from concrete experience through conscious recognition of this learning (Taylor et al, 1997).

A process is followed whereby actions are taken and reflected upon and key learnings are identified that can then be applied to future actions (Taylor et al, 1997). As the purpose of using the “Blueprint for Becoming Energy Wise” is to promote the development of

# REFLECTION ON ACTION

energy wise learners, who are cognisant of theirs and others influence on their environment, both social and bio-physical, reflecting in this way becomes crucial to the learning process.

The action-learning process may be represented as follows:

**ACTION→REFLECTION→LEARNING→PLANNING**



Moving through each stage of the process is important for learners to learn effectively.

The following table provides some questions you could pose for learners to assist them in moving through the different stages of this process, when reflecting on the actions they take in producing their games. Remember that we can also reflect on and learn from the actions or stories of others which is an important tool for learning (Taylor et al, 1997). Using reflection on our own and others actions will be important for considering the learners’ influence on their environment.

ACTION LEARNING PHASE/STAGE	KEY QUESTIONS TO HELP LEARNERS LEARN
<b>Action</b>	<ul style="list-style-type: none"> <li>• Describe the events.</li> <li>• What aspects are of significance?</li> <li>• Who was involved, what did they do?</li> <li>• What picture emerges?</li> <li>• What was the result of this action?</li> <li>• How did I/we feel?</li> <li>• How might others have felt?</li> </ul>
<b>Reflection</b>	<ul style="list-style-type: none"> <li>• Why did it happen, what caused it?</li> <li>• What helped, what hindered? What did we expect?</li> <li>• What assumptions did we make or are we making?</li> <li>• What really struck us?</li> <li>• Do we know of any other experiences or thinking that might help us look at this experience differently?</li> </ul>
<b>Learning</b>	<ul style="list-style-type: none"> <li>• What would we have done differently? Or what could we have done differently?</li> <li>• What new insights have we gained?</li> <li>• Which of our assumptions have been confirmed?</li> <li>• Could we still be wrong about these assumptions?</li> <li>• What new questions do you have?</li> <li>• Is there any other information or point of view that will help us to deepen these learnings?</li> </ul>
<b>Planning</b>	<ul style="list-style-type: none"> <li>• So what does this mean for our daily lives and interaction with others?</li> <li>• What do we want to do?</li> <li>• What do we want to happen?</li> <li>• How do we want this to happen?</li> <li>• What are we going to do differently?</li> <li>• How can we ensure we do not repeat the same mistake?</li> <li>• What do we need to stop doing?</li> <li>• What ways can we use to build these new learnings into our everyday lives and our work on this learning process?</li> </ul>



# SO HOW CAN I USE THESE IDEAS FOR REFLECTION IN A CONCRETE FORMAT?

• **If learners have** life orientation books then they may want to use these to reflect on key questions that you pose to them throughout the process. These could be centred around reflection on the subject matter in terms of environmental learning, or around parts of the process that the learners are engaged in. Learners must make realistic connections to the actions they take in daily life in order to demonstrate responsibility to themselves, others and the environment. Acknowledging the fact that there is something they wish to change is the first step in making this change. Through out the “Blueprint for Becoming EnergyWise” you will see that there are opportunities for

learners to not only learn about knowledge linked to different learning areas, but also to evaluate their attitudes and their actions towards others. Using reflection will assist in this process.

• Alternatively, you may want to allow the learners to reflect after each action they take in the process or each lesson they have that pertains to the process. You could make the action-learning cycle explicit for them so that they are provided with key questions that help them to reflect and learn appropriately.

• For younger learners it may be necessary to pose a specific question that they can focus on after each lesson. This will help to structure their reflection as it will be a new process for them. This

will especially be the case for learners who are not used to having to convey themselves in writing. It may also be a good tool to use to strengthen learners’ writing ability. Some examples for questions could include the following (these will make more sense once you have read “A Blueprint for Becoming Energy Wise” in its entirety):

• An extremely important point to note is that reflection, especially for learners who are not used to it, should be done in the learners’ first language. Having to think in a second language will hamper the reflective process.

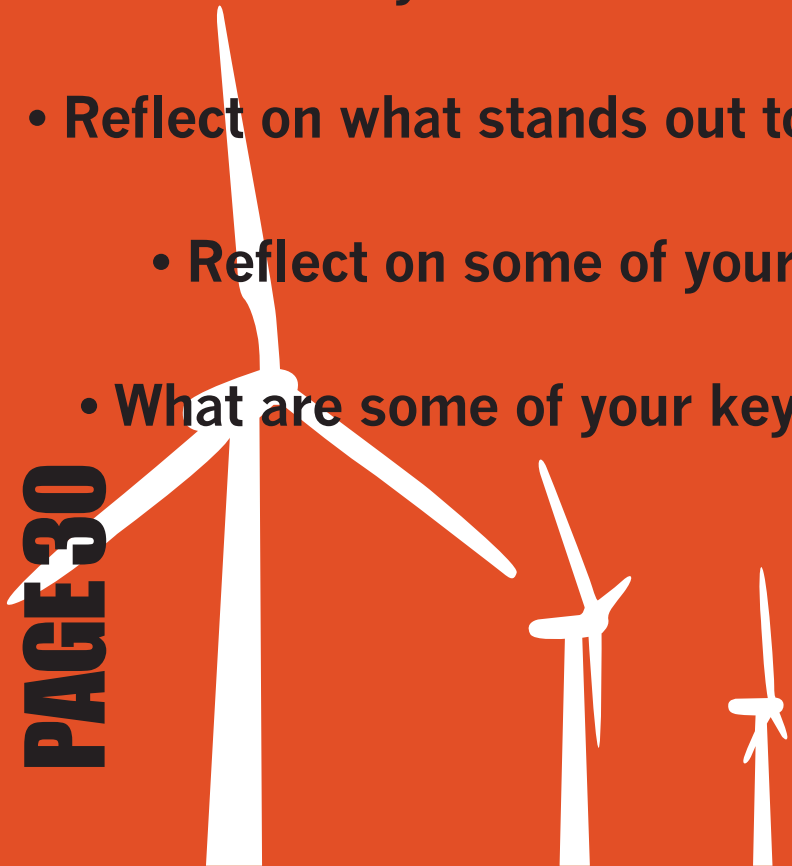
Reflection through writing may be a Western concept

and therefore may not suit all the learners with whom you work. It would be important in this case to find out from the learners what type of format they would feel comfortable reflecting in.



# **POSSIBILITIES FOR REFLECTIVE QUESTIONS:**

- What have you learnt about working together in groups?
- What have you learnt about culture and different ideas?
- What have you learnt about working together with people who may be different from yourself?
- Reflect on what stands out to you as being the most important things you have learnt about energy and sustainability
- Reflect on some of your thoughts around relevant issues related to this in your community
- What are some of your key ideas around what life is like in your community?
- What have you learnt about presentation skills?



# Once the process is complete you can draw on the individual reflections done to consolidate the learning in a class discussion.

**It may be** a good idea to allow the learners to first discuss their different reflections in their small groups and then to look at some different ideas as a class. The way in which this reflection happens will obviously depend on the maturity of the learners with whom you work. Grade 9 learners for example may be capable of a deeper reflection than grade 7 learners, but this will be dependent on their previous experience and learning.

It is a good idea to make this opportunity as fun and interesting as possible for the learners.

- Think about the place in which this occurs – you could possibly reflect outside in the school yard if it is quiet enough, or you could push your desks aside in your classrooms and allow the learners to sit in a large circle where they are all able to see one another. If you are working with a small group you may be able to take your group on an outing, depending on the funds available, or you could use other creative strategies for reflection such as finding interesting spaces in the school environment where this could occur. The point is to find a space or structure that is conducive to thinking and says back to learners ‘you matter’ (Kline, 1999).

Nancy Kline (1999), the author of *Time to Think*, has developed a way in which

interacting should happen and the environment be structured in order to create a environment in which people can think naturally and easily (Kline, 1999). You may want to think about putting in place the following guidelines for learners when they discuss their own reflections:

- Give your full attention to others and do not interrupt when others are speaking
  - Give each other equal turns and attention
  - Be appreciative of what others are sharing
  - Be free from rush and urgency
  - Do not compete with others but encourage them
  - Provide appropriate information where necessary (as the facilitator)
  - Acknowledge our richness due to our diversity
- Kline, 1999, p. 35

At the end of this section a uniform set of guidelines are included that you could use to

help you create a thinking environment in which learners can reflect effectively. You can print this page out directly from the resource. Be aware that you may need to help learners interpret the meaning of certain words depending on their language capability.

It may also be possible to get learners to give their own guidelines first for what they think would make a good ‘thinking environment’ and then to look at combining these with what Nancy Kline puts forward in her theory on what needs to be present in order to think more effectively.

# **A THINKING ENVIRONMENT FOR REFLECTION: OUR GUIDELINES**

- 1. When other people are speaking listen with your full attention**
- 2. Do not interrupt others when they are speaking**
- 3. Appreciate what others have to share**
- 4. Do not be in a rush**
- 5. Do not compete with others – this is not about winning**
- 6. Remember that because we are all different we all have different perspectives and something valuable to share**

Guidelines adapted from Kline (1999)



# PHASE ONE

**PAGE 33**



# UNDERSTANDING ENVIRONMENTAL ISSUES

**It is intended** that the knowledge that learners need to gain from an environmental perspective will be covered in the natural science learning area. The application of this knowledge will be addressed in life orientation. It might be pertinent at this point for learners to be informed that they will be producing a game that focuses on energy and sustainability issues in groups. Since they will be aware of the need for them to use the knowledge they are acquiring they may be more motivated to work to gain this knowledge.

Remember that the ideas presented here are intended to give ideas for what could be covered in teaching, but are by no means comprehensive in terms of covering the curriculum. This will be dependent on the grade

with whom you are working. You could use these ideas to build on, integrate them into your teaching, or you could follow your own ideas entirely. What is presented here is intended solely as a guide in terms of some of the important issues of relevance to ensure learners learn what they need to learn to be wise environmental citizens.

As this project focuses specifically on energy and sustainability the key environmental issues considered here are focused on these aspects. This does not mean that other key issues that your group or class finds important cannot be included. Remember – you have carte blanche in this process and this is only a Blueprint. As a result your Energy Wise game may have its own unique “twists” and can be tailored to your specific learners’ requirements.

So, to begin, let us look at some of the key energy and sustainability issues requiring exploration and then consider how these can be learnt, revised or recapped in ways that are interesting and informative for learners.

Three broad categories have been used to show the necessary knowledge, skills and values that learners need to acquire in order to produce games that demonstrate a good understanding of energy and sustainability.

These categories are:

- Energy and electrical efficiency
- Global warming and climate change
- Alternative lifestyles and Alternative livelihoods

A brief description of each of these categories follows with some ideas for learning as well as links to internet websites

## MORE DEEPLY

that may help you in your teaching. At the end of “A Blueprint for Becoming Energy Wise” is a compilation of lesson plans designed by co-ordinators from the Eskom Energy & Sustainability Programme. These may assist you in teaching the lessons necessary for a deep understanding of energy and sustainability issues and provide a more in-depth look at the issues which compliments the basic ideas presented in this section.

# 1. ENERGY AND ELECTRICAL EFFICIENCY:

**Learners need to** learn how electricity is produced in South Africa and the main ways in which we generate electricity. Since we currently find ourselves in a power crisis in South Africa learners should understand the economic implications for the way electricity is produced and used here. It would be interesting for learners to look at our main source of electricity production, which is coal, and then to compare this with the other sources of electricity production. In South Africa not many renewable energies are used in the production of electricity but this is on the increase. A number of families may fit solar panels for water heating where this is affordable and there is the recent production of wind-powered electricity in South Africa. To understand renewable

energy in more depth you may want to look at another resource manual produced by the Eskom Energy & Sustainability Programme entitled "Energy for Keeps." This resource is available from Share-Net . It gives some good ideas for how you can look at renewable energy and learn about it with your class.

In terms of energy issues it would be imperative for learners to understand the difference between non-renewable sources of energy, and renewable sources of energy. This is key in terms of the choices they make for energy use in their homes as they get older. Let us consider some of the renewable sources of energy:

- Geotherma
- Wind
- Water
- Solar

Do your learners understand the way in which these sources are used in the generation of electrical energy? An important activity would be to explore how energy for use is generated from the above sources in different ways. One of the most common renewable energies that learners may have come across in their daily lives is the use solar power.

## Activity idea: using solar power to dry clothes

Many people in different communities use the power of the Sun to dry their clothes. It would be a good idea to compare the use of

the Sun for drying clothes with the use of tumble dryers or heaters. Where learners have access to solar heaters in their community to heat water this may be another interesting avenue to look at.

'To order resources from Share-Net you need to do the following: Contact Claire Peddie at Wessa National Office on 033 330 3931 or go to the following website: <http://wessa.org.za/sharnet.asp>

**Understanding this difference** would also give them a good basis to inform the decisions they make for learning when creating the EnergyWise game. As you may have focused on the use of renewable energies for electrical generation in the previous section it may be a good idea to look at the non-renewable sources of energy that we use in our daily lives. These include the following and need to be explored in more detail in terms of how the learners/community use these resources within their different contexts:

- Wood
- Paraffin
- Coal
- Oil
- Petrol
- Natural gas
- Nuclear power

## Activity idea: exploring the uses for non-renewable energies

A good idea might be to look at what these different energy sources (above) are used for on a daily basis in different learners' lives and the impact of these choices on the environment, both in the short and long-term. A good place to start would be in your local supermarket and to trace the manufacturer of different products from start to finish. What learners will find is that most products used are oil-based and require electricity to produce

meaning higher carbon-load for the environment.

The use of different energies for cooking would also be an important aspect to look at. Due to the fact that learners in South Africa come from different socio-economic circumstances they often use different energy technologies for cooking from open fires to electric and gas stoves. Comparing the impact of different cooking technologies and how their influence on the environment can be minimised would be important when becoming wiser consumers of energy.



# THE FOLLOWING WEBSITES MIGHT BE USEFUL FOR YOUR TEACHING:

- <http://www.leonardo-energy.org/drupal/node/892print>
- <http://www.renewableenergyworld.com/rea/news/ate/story?id=35457>
- [http://en.wikipedia.org/wiki/Efficient\\_energy\\_use](http://en.wikipedia.org/wiki/Efficient_energy_use)
- <http://www.savingenergy.co.za>
- <http://www.solarchallenge.org.za>
- [http://www.dme.gov.za/pdfs/energy/efficiency/ee\\_strategy\\_05.pdf](http://www.dme.gov.za/pdfs/energy/efficiency/ee_strategy_05.pdf)



Learners will need to understand what global warming is before they can move on to understanding climate change. The best way to understand global warming would be to first understand the natural greenhouse effect that exists on our planet. Although it may be possible to do this through interactive discussions it may be best if the learners have an opportunity to actually see and feel the greenhouse effect in reality. So if you have access to a greenhouse on your school property you may want to take learners there for your lesson on this particular aspect. However, for many schools this will not be reality and so there is a way to create a greenhouse through an easy experiment.

# 2. GLOBAL WARMING AND CLIMATE CHANGE

## Experiment idea: creating green house gasses in a Coke bottle

**To do this you will need:**

- **A 2 litre plastic cooldrink bottle**
- **Potting soil**
- **A small seedling/ alternatively some seeds**

Take the plastic bottle and cut it in half. Make drainage holes in the bottom half of the bottle.



Fill the bottom half of the bottle with some soil (about two thirds of the way up). If you are growing seeds read the seed preparation on the seed packet. If you are growing a small seedling then you should understand how to care for it before you plant it. Plant the seeds/seedling and water it. Replace the top half of the coke bottle and place the bottle in the garden where it

can get some sun. As the bottle is exposed to the conditions you will be able to witness the greenhouse effect on the inside.



Source: <http://mrbrownthumb.blogspot.com/2007/01/seed-starting-ghetto-greenhouse.html>

**As learning about** global warming and climate change is an important part of understanding energy and sustainability issues, it may be a good idea to spend a little bit longer on this section as a basis for learners' knowledge. If you wish to get your learners building their own greenhouse then this is possible. Other learners involved in the Eskom Energy and Sustainability Programme have done this previously. The directions for this can be obtained by e-mailing the national coordinator for the Eskom Energy and Sustainability Programme, Avril Wilkinson, at the following e-mail address: [avwil@worldonline.co.za](mailto:avwil@worldonline.co.za).

There has been much debate around the causes of global warming and whether or not it is a natural process or if it is as a result of man's influence on the earth. This is an interesting

topic to explore in that it will expose your learners to thinking about both points of view.

## Activity idea: debate

**Get your class to divide into two halves - one half of the class needs to argue that global warming is as a result of man-made processes and the other half needs to argue that it is as a result of natural processes. Learners will need to research different sides of the argument in order to participate but all will be exposed to the different ideas presented. You may need to hold a class discussion once the debate is over because although one side may win in a debate the truth is that there is not a conclusive answer to the question posed (Holland, 2003)...**

It will be imperative that the effects of climate change are explored in depth so learners have a good idea of our impact on the earth. It may be a good idea to do a historical analysis over the last 1000 years in order to determine the effects of cycles of heating and cooling on the earth. Once learners have established what may happen when the earth's temperature rises, they will need to understand the influence of extreme weather events of which we have seen many over the last year or two. You may want to look at news archives with your class or groups to examine these changes in weather in more detail. Some pertinent issues or possible effects of climate change that need to be considered are:

- Rising ocean levels and the possibility of "climate refugees" – individuals who will need to seek refuge in other countries as a result of their homes being covered by water
- Increasing droughts and

their effect on food production

- The increase of illness and disease as a result of higher temperatures

Conceptual depth will be established by enabling learners to understand the effects of climate change in depth so that they are motivated to take action to change this in their daily lives.

**Learners would benefit** from taking a political perspective of climate change. They will need to examine what has happened politically around the issue in terms of documents and policies produced by the Intergovernmental Panel on Climate Change (IGPCC) and other organisations. Understanding which countries are committed to curbing the effects of climate change by reducing greenhouse gases and those which aren't, and their reasons for not doing so, is important in understanding the influence of the global environment on the world that we live. Our environmental rights come into play here as we seek to create a better environment for all South African citizens.

## Activity idea: taking a political perspective

**What would happen if we lived in a hotter world?**

**Get learners into groups. Each group represents a country around the world of their choice. The group representing a country is responsible for investigating that country's policy on climate change and the environment. They will then hold a panel discussion where each group elects one representative to sit on the panel.**

**The panel discussion focuses on the**

**decision-making that needs to be done. The topic is:**

**“What can we do about the issue of climate change?”**

**Remember that learners need to represent their chosen country from that country's perspective. This might help to give learners insight into the political aspects surrounding climate change. Once the panel discussion is complete you may want to assist learners to follow the reality surrounding the political decision making around climate change issues.**

**In South Africa** our main source of energy for transport is petrol/diesel generated from oil, which is a fossil fuel as described in the previous section. South Africa also has a working rail system that is run on electricity generated from coal. Many people use trains, taxis, buses or cars to get around. It would be important for learners to understand the associated effects of using different transport mechanisms and their effects on the environment due to the use of fossil fuel for their power. This is important in terms of carbon emissions and their link to climate change.

In more affluent communities most people have access to one or more cars. Many of these cars have big engines and they require more fuel than smaller engines to power them. A survey to determine the use of larger cars for transport

would be an important first step in understanding the impact that this may be having on the environment. Data is readily available on the internet to indicate that larger engines consume more gas than smaller engines. It would be interesting for learners to research the differences in consumption for different sized vehicles and the resultant impact on the environment. This would bridge over into a discussion on public transport and the benefits of a number of commuters travelling together to different destinations. Calculations looking at consumption should therefore include buses and taxis.

Another exercise may be to compare the amount of energy consumed and resultant carbon emissions between a bus load of people travelling to a destination and the same number of people each travelling in individual cars, with the same sized engines, to the same destination.

As the focus here is on wise environmental choices one cannot ignore the issues of safety involved in the transport choices learners make on a daily basis. Exploring how learners feel about taking certain kinds of transport is important in looking at how decisions for transport use are made. The use of lift clubs would also be an important aspect to consider in areas where this does occur. One should also recognise that in some communities learners have no choice as to which transport source to use as their choice is limited and restricted by their social circumstances. In such cases learners often have the choice as to walk (and in some cases cycle) or to take public transport – although there is not always money for this. Safety is a definite concern in this regard, but where learners do make the choice to walk instead of taking public transport this should be emphasised as a positive choice.

Learners living in affluent communities should also consider how they could make choices with no environmental impact such as walking or cycling to various destinations where practical and possible.

# THE FOLLOWING WEBSITES MAY BE HELPFUL TO ASSIST LEARNERS IN ACQUIRING KNOWLEDGE ABOUT CLIMATE CHANGE:

- <http://beattheheat.hrdc.org/?gclid=CPGktaqpspQCFQ6T1QodRDdbMUQ>
- <http://www.stopglobalwarming.org/default.asp>
- <http://www.gcrio.org/gwcc/index.htm>
- [http://www.greenfacts.org/studies/climate\\_change/index.htm](http://www.greenfacts.org/studies/climate_change/index.htm)
- <http://www.worldviewofglobalwarming.org/>
- <http://www.boards.youthnoise.com/eve/?gclid=CKHG1YO5spQCFQKcFQodRDRbTw>
- <http://ecoliteracy.org>
- <http://www.empowerment.institute.net/lcd/index.htm>





### 3. SUSTAINABLE LIFESTYLES AND SUSTAINABLE LIVELIHOODS

It will be imperative for learners to link the information they have learnt back to their own lives. In certain instances under the previous headings we have covered certain aspects of actions that make learners' lifestyles more sustainable. It would be valuable at this point to get learners to look more critically at their own lifestyles and how these may be influencing the environment. One way of doing this would be to calculate each learners' ecological footprint. This can be done by referring to the following website:

- <http://ww2.earthday.net/footprint.php>

Where computers are not freely available you could get learners to fill in the information to the questions in hard-copy and then process these yourself on a computer before showing the learners the results. What is important is that learners have conver-

ations about how they and their families are making choices in their daily lives and how these choices influence the environment. It would be important to explore more sustainable ways of living so that learners are aware of the positive choices that themselves, their family and community could be making. Many of these are included on the websites listed under "Energy and Electrical Efficiency."

Sustainable livelihoods focuses on how people sustain themselves and survive whilst taking into account the environment and its role in this regard. It would be important for learners to explore the kinds of occupations that they and other people in their community partake in. This could be focused on work occupations or other occupations done in the home environment. Learners need to understand

how their and other peoples' survival mechanisms should work in harmony with environmental aspects in order to ensure that they can continue doing what they need to do for years to come. An analysis of the links between what people do in the community, and how this influences the environment, would be a crucial aspect in determining how changes can be made in a realistic framework. Focusing on biodiversity would be a key aspect as well as projecting the potential changes in our environment in the future.

<sup>2</sup>Occupations are considered to be the "ordinary and extraordinary things that people do everyday" (Watson, 2004, p. 3).



# EXAMPLE: MANGROVES IN SIERRA LEONE

A group of disabled people working as part of a community rehabilitation project as fishermen in Sierra Leone found that the mangrove, which was a plant growing close to the shoreline, had been completely depleted because of people building close to the shore. The mangrove is a key ecosystem in this country. This group of people began to replant the mangrove. This led to the restoration of the clam population, which these individuals could then use to produce an income for themselves. Of course care needed to be taken to not deplete the clam population in unsustainable ways. (Thibeault, 2008).

# Are there any examples such as the one on the previous page, that learners can think of in their own community?

**The above section** serves to illustrate the importance of ensuring conceptual depth when learning about energy and sustainability. Conceptual depth is not only about depth in knowledge about environmental issues, but also about the way learners use this knowledge as it relates to their own lives. As learners are still young, conceptual depth includes how learners grasp this knowledge now and take it with them into the future. In the lessons you structure make sure to include time for conversations about what is being learnt and how this links back to practical actions in daily life. Use the reflective space suggested in the section on “Reflection on Action” in order to enable learners to make sense of what they are learning.



# PHASE TWO:

**PAGE 46**



# CONTEXTUALISING

## Cultural difference:

Culture is a blueprint for organizing what we do and how we perceive aspects of the world around us. Unpacking our own culture is a means to understanding ourselves more deeply. At the same time a deeper understanding of ourselves feeds into the notion as to how we may be different to others.

# ENERGY WISE ISSUES

PAGE 47



# WHAT DOES “CULTURE” CONSIST OF?

My own personal understanding and view of culture is that it exists for individuals as an individual and collective phenomenon. That is, it is influenced by a number of different aspects relevant to the person in question. These aspects include but are not limited to the person's current and previous geographical location, their religion, their gender, their sexuality, their socioeconomic status, their previous educational background, their age, their language, their ethnicity, their race, and the institutions they form part of. Therefore two learners from the same religion and socioeconomic status, who now go to the same school, and are part of the same class enjoy many similarities, but at the same time may be very different. One learner may be a black boy who has been brought up in a Xhosa family who originated from the Eastern Cape. Part of this learner's schooling took place in the Eastern Cape. The other learner may be a girl from a white family who emigrated to South Africa from Sweden five years ago. Part of this learner's schooling took place in Sweden and she only recently learnt to speak English when she arrived in South Africa.

The way that these two learners learn as well as the way that they do things in their daily lives will be different.

**As we are** focusing on the development of a game that allows learners to explore the way that they work with others and learn about energy and sustainability, it becomes necessary to deconstruct their individual understandings of play and playfulness and how they experience their own learning.

EnergyWise requires learners to consider how both themselves and others live in terms of sustainability and how this in turn influences the use of energy resources. It also aids in understanding how others may learn about energy and sustainability issues. Learners will therefore need to consider how others might use energy in their community differently, and in the context of different life styles, as well as how learners who are different from themselves may learn differently.

In today's educational

context classes are often made up of children from different backgrounds and cultures. Being able to appreciate how someone is different from yourself and valuing who they are is important for children to learn at a young age. As culture is most visible in terms of what, how and why we do things in our daily lives it will be important to begin with a discussion of how each of our lives may be different and how this links to how people live in relation to their environments, how they use resources and what they value in terms of environmental sustainability.

Remember that values are often shaped by the contexts from which we come and learners who have been exposed to different socio-economic contexts may have been encouraged or constrained in terms of understanding their environments.

## Activity idea:

**Begin by posing the following question to your class:**

**What makes you different to other children in this classroom?**

**Encourage children to raise their ideas in a haphazard fashion similar to that of a brainstorm. Record learners' ideas on the board or on a large piece of paper at the front of the classroom.**

**As a facilitator of this learning experience you will then need to use the ideas that learners provide to have a conversation about the value of diversity. Get your learners to think about the value that they bring because of their differences.**



**Divide your class** into groups of 6 learners. If you have an odd number of learners in your class it is not a problem to have slightly more or less than 6 learners in a group, but it is important that groups do not get too big or they may be difficult to manage in the classroom environment. Eight is probably the maximum number of learners that should be in a group in order to promote efficiency during the overall learning experience.

Each group of learners will then be required to think about the kinds of games that they used to play as children and that they may still play daily. These kinds of games may be board games, computer games, educational games or playground games. The important thing for the learners to think about is what they enjoy about the games that they play and what they were

able to learn through playing them. The discussion that takes place in the various groups will then be used to have a class discussion regarding the value and excitement that different kinds of games offer. This conversation can also be used as a means to understand how different games may appeal to different children. The important thing is to highlight the elements of the games i.e. excitement, fun, learning, enjoyment, socialisation etc. It will also be important to discuss where learners are different in terms of these elements. For example one learner who finds a particular playground game exciting may be different from another learner who finds the same game boring.

Once this has been done it is imperative that learners contextualise the issues that they have learnt about in phase one of “A Blueprint for Becoming Energy Wise.” They will need to think about

their own communities and what issues might be of relevance. Where learners in the same group are from different communities it will be important for them to think about all the communities involved. They could also choose to focus on the community in which the school is situated as this is common ground. The activity that follows will be helpful in enabling learners to contextualise energy and sustainability issues of relevance.

## Activity idea:

Get children to take photographs of their daily lives and what it is that they do in terms of their resource use. Remember to refer them back to what they have learned about energy and sustainability. Before doing so it will be necessary to teach children how to “read” photographs (Edwald, 2001). This is a process where learners are taught to look at visual images and to consider the stories that these images tell. You can use any visual images at your disposal. The important point is that learners have the opportunity to consider other images so that they think more carefully about the images they choose. Some key

concepts when teaching learners to read photographs would be to provide learners with the opportunity to examine images and to describe what they see and to think critically about what goes into taking a photograph (Edward, 2001, pp.17-18). Once learners have taken their own photographs you can use these images to have a class discussion surrounding how we live and the way we use energy. The discussion can be turned to our diversity and how the differences between us change the way we live. The focus of the discussion can be around learners considering whether or not they feel they lead sustainable livelihoods. If learners have access to digital cameras then allow them to take

their photographs on these and then look at the photos as a class digitally. Otherwise look at using disposable cameras (one per group) and then developing the photographs once learners are complete. If the school you work for, or the learners you work with, has no budget to do this there are other creative ways that learners may be able to represent their lives and their use of energy. Get your learners to think creatively of other ways that they may be able to do this. Another way that this could be done is through the use of cell phone cameras that are often more accessible than cameras in resource-poor environments. Learners could bring one photo on their cell phone to school and this could be

examined in their small groups and then shared with the rest of the class. An alternative way of exploring how people live in the community would be through story telling or alternatively, learners could visit different parts of their community and design a survey that would allow them to generate information about their own context, which is relevant to the structuring of their game.

# PHASE THREE:

**PAGE 52**



## Now the exciting part!

Ask your learners to begin thinking in their groups around the elements that they think would need to be present in their game to appeal to other learners their age who might be different from themselves. This activity will enable you, as the facilitator, to determine how well the learners have grasped concepts in the previous section and whether or not the outcomes you set for them have been achieved. you will need to draw on the knowledge that they gained through looking at different ideas around play and playfulness. It is important that learners grasp the key elements that they need to focus on:

- 1) The game should be situated in their own context and based on their daily lives.
- 2) The game should focus on energy and sustainability issues and what the learners have

learnt about the environment and their responsibility towards it.

3) the game should be fun for others to play and should teach them about being wise consumers of energy and leading sustainable livelihoods.

## Activity idea:

If you have educational games in your class or at your disposal allow your learners to play these games with an understanding of the core elements that the game is trying to teach. Once learners have done this get them to critique the game and how it promoted their own learning.

This may be difficult for younger learners and will require some expert facilitation from you to allow them to engage effectively.

# PLANNING OUR GAMES...

## Activity idea:

If learners are unsure about the content linked to energy and sustainability that they would like others to learn through playing their game they may wish to survey the class or other learners at their school in terms of what makes learning fun for them and what they already know about energy and sustainability. The group(s) may want to consider what they did not know about environmental issues prior to engaging with them in “Understanding the Environment

more Deeply.” Learners may want to include in their survey questions around what makes learning fun for other learners so that they can structure the game accordingly. The learners will then have the opportunity to interpret the results of the survey before deciding specifically on the exact content of the game.

**If you are** choosing to follow the outline of EnergyWise that was constructed by the Energy Girls then it would be necessary to present your learners with this pre-constructed game and get them to critically analyse its components. From this they may wish to make changes to the game in some regard. It will always be necessary for learners to come up with their own content for the “Energy Fact and Fortune Cards” as these will be based on their own unique environmental learning done in the classroom.

As this part of the resource involves learners making decisions together it will be necessary for them to decide how this will occur in their groups, or if you are working together as a class, then as a large group. Your learners may or may not be politically aware but now would be a good time to look at such processes. Looking at how different countries function in terms of gover-

nance would be a good place to start. It may be good to compare a country like South Africa, who has a democracy, with a country like North Korea where a dictatorship exists. Learners need to understand the basics of how decisions are made and laws passed in such countries. Furthermore it may be a good idea to link to what learners may be covering in history and to look at how South Africa was governed during Apartheid and how it is currently governed. It would be good to highlight the injustice that occurred here in terms of denying black people their basic human rights but with specific focus on denial of the right to have a say in matters that concerned them. Focusing on such issues may help learners to decide on how they think the fairest way is to make decisions in their group where opinions and ideas may be diverse. An interesting resource from Share-Net that promotes learning in this regard is called “Haded Island.” This resource introduces learners to the concept of

democratic decision-making in a way that is easier for younger learners to understand. This may be most beneficial if you are working with grade 7 learners. At this point it will probably be necessary to work closely with individual groups to help them establish how they will choose to work together. It will be important for each group to draw up a contract for the way that they will work together and to hold each other accountable in this regard.

Once learners have decided how to make decisions together they need to start making them!

Facilitation of the planning phase will be crucial in helping learners come to the decisions they need to make in order to promote their own and others’ learning through the games that they produce. You know your learners best and so will understand what needs to happen here in order for learners to proceed effectively. If you have slightly older learners and/or learners who are inter-

nally driven then you would probably be able to allow a very open format at this time. Once groups have decided how they are going to make decisions they will simply require the space and time to do so. An opportunity for peer review might be good at this point, specifically when looking at the content of environmental learning that will be included as learners will need to integrate what they have learnt thus far.

If you, however, have learners who do not work well independently and struggle if they are not given any structure then it will serve you well to provide some sort of agenda for the groups. It would be good to focus on each part of the decision-making process so that they can complete the task effectively. The agenda that you present to the group(s) could look something like this, but once again is open to change as you see fit:

# Agenda:

1. Begin by presenting the learners with the purpose of the game:

“To consider our choices in terms of energy and the environment and to teach others about energy and the environment so that they can make wise choices in this regard.”

Allow the learners to consider how they think they could do this in their group(s). They will need some time to be creative here.

2. Focus on the board game - what will it look like? What will be included? Since we have decided to focus on our own context how will we make sure the board game represents our context?

3. Focus on the other components

in the game. What else is required? How many players will there be? What will the object of the game be? What other “parts” of the game need to be considered?

4. Focus on the part that encourages environmental learning. How will this aspect of the game work? What will the exact content of the environmental learning be? How will learners integrate what they have learnt with what they understand others still need to learn through playing the game? For example if learners choose to use “Energy Fact and Fortune Cards”, or something similar, they will need to work out exactly what it is they wish to include in these cards and the learning that will occur as a result.

Posing questions to learners as illustrated here will help them focus on what they need to before they can move onto actually creating the game which is covered in the next phase of the project.

The planning phase of the game will be time-consuming and this needs to be considered when planning for lessons.



# PHASE FOUR:

**PAGE 56**



**This part of** the process calls for some creativity in deciding what resources will be necessary to manufacture their game boards and associated game pieces. This should be in line with what your learners are learning about energy and sustainability. The process may also be further impacted upon if learners live in resource-poor contexts where easy access to resources is not the norm.

If you have followed the traditional approach to EnergyWise then let us take a moment to reflect on what some of the requirements for completion of the game are:

- A game board that is painted according to the learners' design
- Playing pieces for each participant
- The game's economy consisting of both paper money and trees as resources
- The houses that the learners may construct during the game

# MAKING OUR GAME

- A timer
- A dice

If your learners have constructed different games with different components to that of EnergyWise then you will see that some of the requirements are similar and some are different. In all cases, however, learners will need to consider their choices for resource use.

If we follow the principles of “reduce, reuse and recycle” what are some of the aspects that learners will need to think about in order to begin accessing resources for their game? If learners live in resource-poor contexts what will some of their strategies be in order to attain the required resources? At this stage each group should have decided exactly what their game will look like and should

have a clear idea of the resource requirements. It should therefore not be difficult to brainstorm some answers to the above questions.

You could facilitate a discussion around this in the learners' small groups so that each group presents a resource inventory. This may look something as follows depending on the process that the learners have chosen to follow:

## RESOURCE INVENTORY

- **Piece of hardboard/ cardboard for the game board**
- **Representations of different trees for playing pieces - these trees are made out of paper**

**but need to stand upright on a base**

- **Enamel paint to paint the board**
- **Trees for economy printed on paper**
- **Paper for the paper money**
- **Dice**
- **Cardboard for the property cards**
- **Something to represent the houses**

**Using the class** to have a large group discussion brainstorm ideas around how the different resources that each group in the class requires could be attained. This way groups are able to access the ideas of others and hear other people's views around how the principle of reduce, reuse and recycle could be put into practice. It is important that learners understand the underlying principle that encourages us to reduce and reuse before we use recycled goods as these goods also have an energy component to their manufacture.

It might be necessary to provide learners with some cues to think about the places that they could attain the resources necessary for their games:

- Waste from their homes
- The rubbish dump
- The local store
- Recycled goods from the local store

Learners will need to consider their choices in light of the fact that they are trying to promote the leading of sustainable livelihoods. They will therefore need to consider which choices will be the best to make in terms of the cost to themselves and their environment.

Once learners have decided what they will use and have accessed the materials for their game you will need to give them time and opportunity to manufacture their game in the group setting. Expert facilitation will be needed in enabling the groups to work together effectively. It may be necessary to help the group(s) to have conversations together as they work through their possibly different approaches to produce the end-product. This will be an important part of the process to reflect on in order to encourage the learners to look at what they have learnt about working together.

# PHASE FIVE.

**PAGE 59**



# PRESENTING OUR GAMES

**Once the groups** of learners in your class have completed their EnergyWise games it will be important for them to have an opportunity to present their game and their learning to the rest of the class. This will provide the opportunity to achieve certain objectives linked to languages in the curriculum. In certain contexts learners have limited opportunity to develop presentation skills that have the potential to assist them in later life. It is thus a privilege to build such an opportunity into “A Blueprint for Becoming Energy Wise.” For learners to use this opportunity effectively it will, in most cases, take some facilitation on your behalf in order to ensure learners are well-prepared.

## Activity idea:

**Begin with a class discussion around what makes a good presentation. Once this is finished give your learners an opportunity to work together in their groups preparing their presentation. You might want to begin with a brainstorm with the class or present them with keywords to stimulate their thinking. These words may include, but are not limited to the following:**

- Communication skills
- Confidence
- Use of visual aids
- Interaction with the audience
- Creativity

## AND OUR LEARNING

Once you have decided on what makes a good presentation it would be a good idea to give the class an opportunity to decide exactly what they would like to include in their presentations. Again you may need to give them some ideas which could include:

- Presenting the game to the class with its rules. If all groups in the class have followed the exact rules they may still each have difference linked to the way the game board has been structured and the kinds of energy fact and fortune cards that were selected if this

was the way they chose to convey environmental learning.

- It would be important for groups to give an idea of why they made certain choices for the rules, if these are different, and for the decisions related to the game board and possibly the energy fact and fortune cards.

- It would be important for learners to highlight their key learning firstly with regard to energy and sustainability, and secondly, in terms of the process of making the game.

**Where you may** have worked only with a small group of learners on your EnergyWise project you can get creative in how you get them to present their project. If they are at school then you may get them to present to some of the other classes in different grades and then to play their game with their audience. This will provide you the opportunity to disseminate knowledge around energy and sustainability issues through playing the game with other children in a way that makes it fun and easy to learn.

However you have produced your EnergyWise games they can become resources for the school and should give credit to the learners who produced them.

**A generic certificate follows on the next page which can be printed out and used to give learners credit for their participation in this project process.**

**PAGE 61**



# **CERTIFICATE OF BECOMING “ENERGY WISE”**

**AWARDED TO**

**SIGNED:**



# LESSON PLANS

**PAGE 62**



**PROMOTING A SUSTAINABLE LIFESTYLE THROUGH THE  
ESKOM ENERGY AND SUSTAINABILITY PROGRAMME**

# **UNIT OF WORK**

**ENERGY,  
ELECTRICITY AND  
THE ENVIRONMENT**

**PAGE 63**



# ALL LEARNING AREAS

THE PROCEDURE FOR THIS THEMATIC UNIT OF WORK:

LESSON 1 – UNDERSTANDING OUR ENVIRONMENT

LESSON 2 – UNDERSTANDING ENERGY

LESSON 3 – UNDERSTANDING ELECTRICITY

LESSON 4 – UNDERSTANDING POLLUTION FROM ELECTRICAL GENERATION

PAGE 64



# Background Information

**The term “environment”** can have many different meanings and understanding. Many people still view the environment as (only) the natural world of bush, plants and animals, and this environment is separate from their everyday lives. In this lesson, we explore the “environment” concept and discover what our learners know about how the environment affects us, and is affected by us, in all aspects of our daily lives. By the end of the lesson, the learners should have a clear understanding of the integration of our natural environment with our social environment, as well as how humans rely on the natural environment to supply our survival needs

**PAGE 65**

# LESSON 1

## UNDERSTANDING OUR ENVIRONMENT

### Learning activities and lesson structure

Photocopy Worksheet 1 at the end of this unit of work and ask learners to fill in their own answers.

When all worksheets have been completed, ask learners to explain some of their answers, and allow the group to debate the answers.

## Background Information

**This lesson gives** the learner basic background on energy in its relation to the dictionary definition “the ability to do work”. It forms the basis to the learner’s core knowledge on energy, and all other lesson plans in this series builds on this basic knowledge. The lesson also assists learners to use dictionary definitions.

# LESSON 2

## UNDERSTANDING ENERGY

### Learning activities and lesson structure

Photocopy Worksheet 2 at the end of the unit of work and ask learners to fill in their own answers.

When all worksheets have been completed, ask learners to explain some of their answers, and allow the group to debate the answers.



## Background Information

**Much of the** later lesson plans in this series will be as a result of electricity generation using coal, which has an impact on global and local environmental processes. It is important that the learners grasp this fact. By working through the worksheet they will begin to gain an understanding of how electricity is generated, and the following worksheet will give some idea of the environmental implications of electricity generation from coal power.

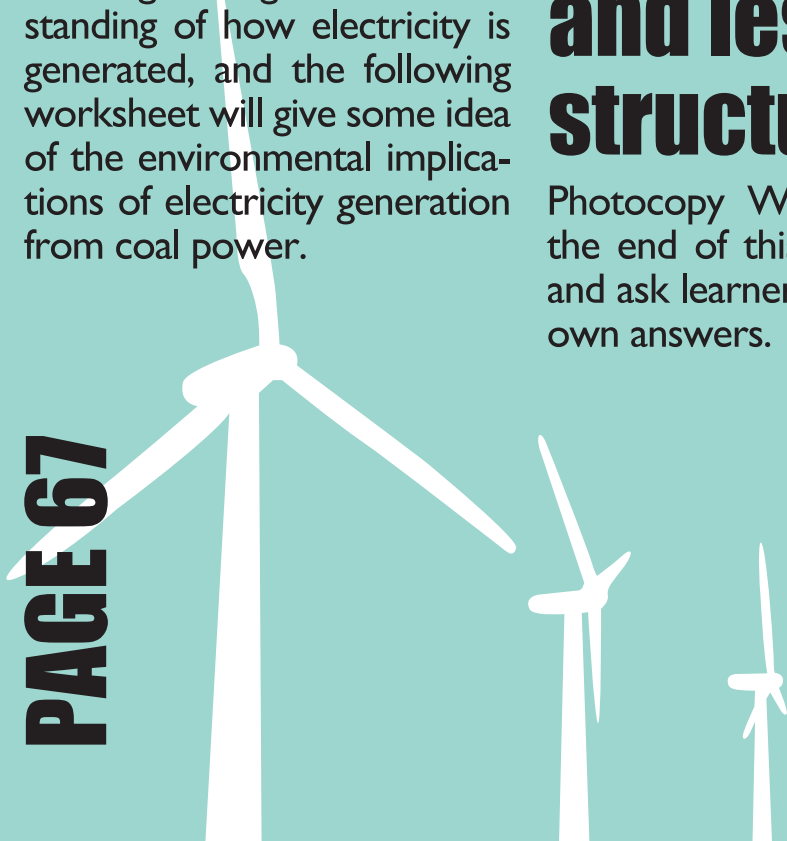
# LESSON 3

## UNDERSTANDING ELECTRICITY

### Learning activities and lesson structure

Photocopy Worksheet 3 at the end of this unit of work and ask learners to fill in their own answers.

PAGE 67



# Background Information

**This lesson** is very important. Make sure your learners grasp the environmental concepts of the greenhouse effect and global warming.

## Greenhouse effect

Atmospheric scientists first used the term 'greenhouse effect' in the early 1800s. At that time, it was used to describe the naturally occurring functions of trace gases in the atmosphere and did not have any negative connotations.

It was not until the mid-1950s that the term greenhouse effect was coupled with concern over climate change. And in recent decades, we often hear about the greenhouse effect in somewhat

## UNDERSTANDING POLLUTION FROM ELECTRICAL GENERATION

negative terms. The negative concerns are related to the possible impacts of an enhanced greenhouse effect. It is important to remember that without the greenhouse effect, life on earth as we know it would not be possible.

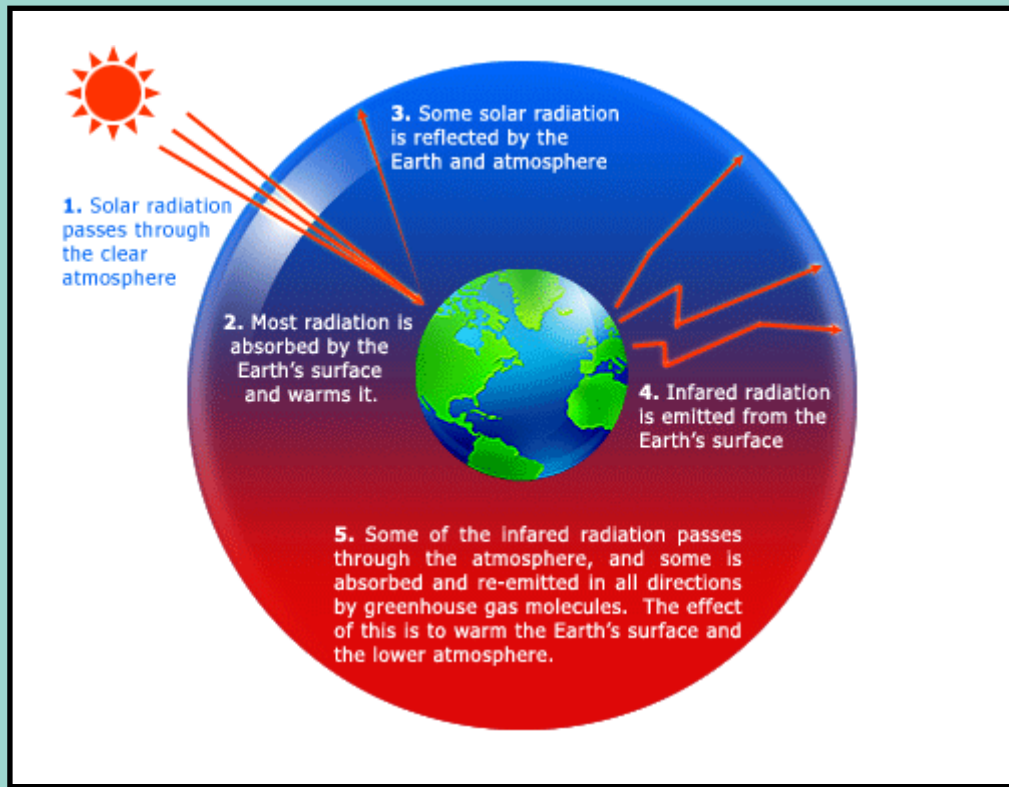
While the earth's temperature is dependent upon the greenhouse-like action of the atmosphere, the amount of heating and cooling are strongly influenced by several factors just as greenhouses are affected by various factors.

In the atmospheric greenhouse effect, the type of surface that sunlight first encounters is the most important factor. Forests, grasslands, ocean surfaces, ice caps, deserts, and cities all absorb, reflect, and radiate radiation differently. Sunlight

# LESSON 4

falling on a white glacier surface strongly reflects back into space, resulting in minimal heating of the surface and lower atmosphere. Sunlight falling on a dark desert soil is strongly absorbed, on the other hand, and contributes to significant heating of the surface and lower atmosphere. Cloud cover also affects greenhouse warming by both reducing the amount of solar radiation reaching the earth's surface and by reducing the amount of radiation energy emitted into space.

Here is a diagram and 5 steps to understanding how the greenhouse effect works. It may be a good idea to explain this to your class in your own words.



the greenhouse effect, is what makes the earth habitable for life. For learners to truly understand the nature and importance of the greenhouse effect, they should understand the answers to these questions:

At the end of the lesson, the questions of what we can observe as directly relating to global warming are important. Allow much time to explore these issues.

1. What is a greenhouse and how does it work?
2. How is the earth's atmosphere similar to a greenhouse?
3. What factors influence the function of a greenhouse?
4. What are the limitations in comparing the earth's atmosphere to a greenhouse?

## Concluding thoughts

**The ability of** solar radiation to be relatively transparent to incoming visible light from the sun (step 1), yet opaque to the energy radiated from the earth (step 5) is one of the best understood processes in the atmospheric sciences. This phenomenon,

## Learning activities and lesson structure

Photocopy Worksheet 4 at the end of this unit of work and ask learners to fill in their own answers.

# **ENERGY, ELECTRICITY AND THE ENVIRONMENT**

# **WORKSHEET 1**

## **WHAT IS THE ENVIRONMENT?**

**PAGES 70 - 72**

**PAGE 70**



**What do you understand by the word environment? Write your answer here:**

**PAGE 71**

**Living environments can take on many different forms.**

A grasshopper's living environment may look like this:



A hippopotamus's living environment may look like this:



As human beings we choose to inhabit a variety of living environments each day of our lives.

**In the two blocks below draw pictures of two of**

**the living environments that you inhabit each day of your life.**



**What type of** resources (materials that come directly from the natural environment) do you need to survive in your environment each day? (hint: think of what you need to live)

Write your answers here:



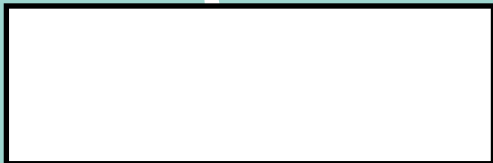
If some of these materials are not in endless supply, what can you do to make them last longer.

Write your answers here



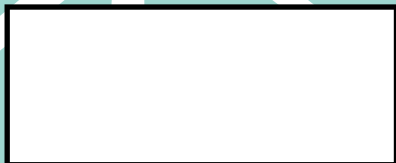
Can you guess how much of these resources you use each day?

Write your answers here:



How many of these resources do you think are in endless supply?

Write your answers here:





# ENERGY, ELECTRICITY AND THE ENVIRONMENT

# WORKSHEET 2

## WHAT IS ENERGY?

PAGE 73

PAGES 73 - 74



**There is a** very important material that is used to produce all the things that you use each day. It also keeps us warm, and it “works” for us. Can you think what this may be? Write your answer here:

## Fact 1

Everything you do requires energy. Reading, running, throwing, climbing and eating activities use energy. Energy is also needed for travel and industry, to warm our homes, school and factories. Energy is used in fridges, lighting and cooking. Energy is the ability to do work. The Sun’s energy is required to provide us with food which enables us to do all these things.

Environment Diary 2005

Can you think of any other words that could be used to describe the term “ENERGY”

## Fact 2

**Light and heat are two forms of energy. Some others are electricity, chemical, nuclear and mechanical energy. Energy can be changed from one form to another. In a light bulb, electric energy is changed to light and heat.**

Environment Diary 2005

From the jumble of letters below, find the following words:

**Environment**  
**Resource**  
**Energy**  
**Power**  
**Sustainability**

(The words can be forwards, backwards, vertical, horizontal, or diagonal)

E	N	V	I	R	O	N	M	E	N	T	A	U	Y
F	Z	R	T	E	I	L	M	X	N	O	P	T	K
G	K	L	A	S	O	U	S	B	T	C	I	L	Z
Y	B	A	M	O	N	A	T	S	R	L	R	E	M
G	H	J	L	U	K	F	R	N	I	M	E	N	T
B	T	X	Z	R	L	G	K	B	A	T	W	R	S
Q	U	N	B	C	R	P	A	X	I	L	O	T	Z
A	O	U	N	E	E	N	E	R	G	Y	P	R	Q
H	I	L	G	Q	I	F	H	M	F	A	L	I	T
N	R	T	L	A	B	A	C	D	F	E	H	G	P
Q	D	E	T	T	L	M	R	S	B	U	Z	X	Y
X	R	S	U	B	L	S	Z	R	D	M	Y	O	P
C	U	T	V	U	R	U	Y	P	E	O	Q	Z	Y

Look up each word from the word search in the dictionary, and write down the definition:

**Power**

**Resource**

**Sustainability**

**Energy**

**Environment**

# ENERGY, ELECTRICITY AND THE ENVIRONMENT

# WORKSHEET 3

## UNDERSTANDING ELECTRICITY

PAGES 75 - 77

PAGE 75



**Think about your** school and your home. What do you use electricity for in each of these environments?



**Home**

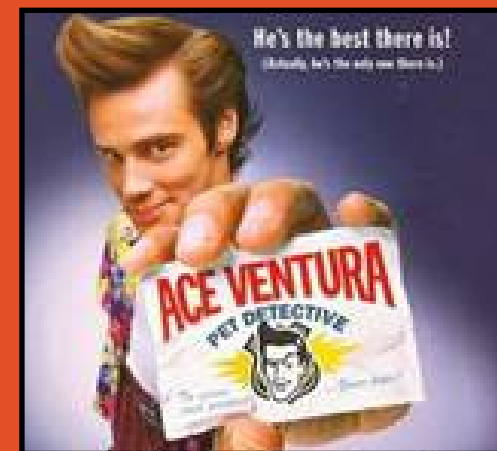


**School**

**Well done! Electricity comes from the burning of COAL. Coal is also known as a fossil fuel and over 90% of South Africa's electricity is produced from coal. Now, imagine you are a famous detective like Ace Ventura!**

What do you think the electricity that you use in each of these environments is made from?

**Clue**  
In South Africa electricity comes from the burning of a very hard, black substance.



# Follow the clues below to find out how electricity is made in South Africa

(Answers are at the bottom of the page - see how many clues you can solve without peeping!)

Did you know?

Electricity cannot be stored. Once it is produced it goes straight onto the power-lines to be used in our factories, our homes and our schools.

PAGE 77

**Clue 1**  
Most of South Africa's coal is mined in a province that lies to the North of Kwa-Zulu Natal and begins with the letter "M".  
**Answer:**

**Clue 3**  
Coal is very heavy and the cost of transporting it is high. Power stations are often built.  
**Answer:**

**Clue 5**  
The steam is then used to turn [an engine whose driving wheel is turned by a current of water or gas.] Find the word which this definition describes.  
**Answer:**

**Clue 2**  
Some coal is also mined in the province that lies right at the Northern point of South Africa and whose first word begins with the letter "N".  
**Answer:**

**Clue 4**  
The coal is burned to heat water to produce a substance that is the same as that which comes out of a kettle when it boils.  
**Answer:**

**Clue 6**  
These engines turn to produce...  
**Answer:**

**Detective's answers:** 1. Mpumalanga; 2. Northern Province; 3. close to; 4. steam; 5. turbines; 6. electricity

# **ENERGY, ELECTRICITY AND THE ENVIRONMENT**

# **WORKSHEET 4**

**POLLUTION FROM ELECTRICAL GENERATION USING COAL**

**PAGE 78**

**PAGES 78 - 80**





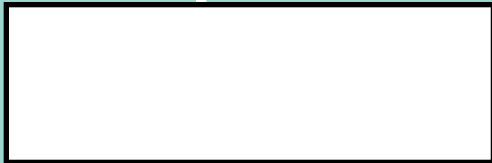
**LOOK UP** the definition for the word “**POLLUTE**” in the dictionary and write it down.

**ANSWER:**



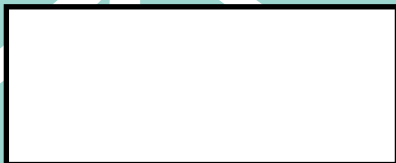
What kinds of pollution do you see in your immediate living environment each day?

**ANSWER:**



Do you think there are any forms of pollution that you cannot see?

**ANSWER:**



If you answered yes, what are these types of pollution?

**ANSWER:**



Unscramble the words below to see the effects this has on the environment.

d i c a      a n i r

(A type of rain)

l g b o l a   r w m a i g n

(This is the term used for an increase in temperatures)

r n g e h e u s o e   f e c f t

(The effect that happens when the earth heats up because of too much carbon dioxide in the atmosphere)

**When coal is burnt to produce electricity carbon dioxide, sulphur dioxide and nitrogen oxides are released into the environment**

# Draw a diagram of global warming and the greenhouse effect...

...to get you started, we have drawn the Sun and the Earth....fill in between how the greenhouse effect works on our planet



What can we do to stop the greenhouse effect and global warming?

Use less electricity?

Become wise consumers?

Any other suggestions?

1. ..

2. ..

3. ..

4. ..

5. ..

# PROMOTING A SUSTAINABLE LIFESTYLE THROUGH THE ESKOM ENERGY AND SUSTAINABILITY PROGRAMME

## NATURAL SCIENCES

A THEMATIC UNIT OF WORK FOR THE PROMOTION OF CURRICULUM LEARNING ON ENERGY AND CLIMATE CHANGE

### LEARNING ABOUT ENERGY AND CLIMATE CHANGE

PAGE 81

#### **The learning outcomes**

for this schedule of activities are:

- LO1: Scientific investigations - the learner will be able to act confidently on curiosity about natural phenomena, and investigate relationships and solve problems in scientific, technological and environmental contexts.
- LO2: Constructing scientific knowledge - the learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

- LO3: Science, Society and the Environment - the learner will be able to demonstrate an understanding of the interrelationships between science and technology, society and the environment.

## The activities in this thematic unit of work are:

### Lesson activity 1

#### **Introduction**

Introduction to global warming, energy conservation and how rising temperatures affect us locally

### Lesson activity 2

#### **The science of global warming**

Learners learn about greenhouse gases and the power of language

### Lesson activity 3

#### **The consequences of global warming**

Learners learn about the potential consequences of global warming

### Lesson activity 4

#### **Learning about ecological footprints**

Learners examine their own energy consumption and conservation

### Lesson activity 5

#### **How energy efficient is our School**

Learners learn how schools can participate in energy conservation

# Lesson plan: energy and climate change

## Duration: 5 lessons

**GRADE: 8**

### LEARNING OUTCOMES AND ASSESSMENT STANDARDS:

LO1: Scientific investigations - the learner will be able to act confidently on curiosity about natural phenomena, and investigate relationships and solve problems in scientific, technological and environmental contexts.

AS: Plan investigations, conduct investigations and collect data, evaluate data and communicate findings

LO2: Constructing scientific knowledge- the learner will know and be able to interpret and apply scientific, technological and environmental knowledge.

AS: Recalls meaningful information, categorizes information, interprets information.

LO3: Science, Society and the Environment - the learner will be able to demonstrate an understanding of the interrelationships between science and technology, society and the environment.

AS: Understand science and technology in the context of history and indigenous knowledge, understand the impact of science and technology - both positive and negative with respect to peoples lives and the environment, Recognizes bias in science and technology.

### LINKS WITH PREVIOUS LESSONS:

Learning opportunities related to Out of the Box / EcoSchools environmental projects

### CORE KNOWLEDGE:

Life processes and healthy living (3rd and 4th bullet)  
Interactions in environments (2nd and 3rd bullet)

**LEARNING AREAS:** Natural Science

### INTEGRATION:

Arts and Culture

LO 1 – Creating, Interpreting and Presenting. The learners will be able to create, interpret and present work in each of the art forms.

Language (English – home language)

LO 1 Listening – the learner will be able to listen for information and enjoyment and respond appropriately and critically in a wide range of situations

LO 2 Speaking – the learner will be able to communicate confidently and effectively in spoken language in a wide range of situations

LO 4 Writing – the learner will be able to write different kinds of factual and imaginative texts for a wide range of purposes

LO 6 Language Structure and Use – the learner will be able to use the sounds, words and grammar of the language to create and interpret texts.

Mathematics

LO 5 Data handling – the learner will be able to collect, summarise, display and critically analyse data in order to draw conclusions and make predictions, and to interpret and determine chance variation.

### LINKS WITH NEXT LESSONS:

Continuing with Learning opportunities related to Eco-Schools environmental projects.

### CONTEXT:

Developing learning opportunities by responding to an Eco-School competition.

# LESSON ACTIVITY 1 - INTRODUCTION

## Lesson procedure

**Begin a discussion** with your learners about global warming by asking learners to describe general trends in the weather over their lifetime. Do they notice changes in temperature since they were small children? Do their parents comment on how the weather has changed? What weather extremes can they remember in their lifetime?

1. Learners now get Worksheet 1 which is a K-W-L chart to fill out about global warming/energy.

2. Provide background information for the learners.

**Although there is great debate about what causes global warming, climate experts agree that the global air temperature has risen 0.3 to 0.6 Celsius over the last 100 years. Factors such as rising sea levels and coral bleaching are indicative of increases in air temperatures. Most specialists predict that if we do not take drastic steps to curb greenhouse gas emissions, global temperature will increase 1 to 3.5 Celsius in the next century. Although the number may sound small, even a 1 Celsius increase can cause significant worldwide change. For example, during a period called the Little Ice Age (1500-1800) where the temperature was only about .5 Celsius cooler than it was in 1900, there were extensive glacial advances in almost all alpine regions. Most scientists argue that global warming in the next century will cause more frequent and intense heat waves, significant ecological disruptions, difficulties with agricultural production in the tropics and subtropics, and rising sea level. All of these will impact life on earth.**

Learners now get Worksheet 2. Look at the pictures of the glaciers. (Make sure your learners understand what a glacier is...)

What do learners notice about the difference in the glaciers over time? Why do they think this is? Introduce learners to general facts about global warming.

Discuss the following question:

How might day to day life be different for you?



# LESSON ACTIVITY 2 - THE SCIENCE OF GLOBAL WARMING

## The learning outcome for this lesson is:

**LO1: Scientific investigations** - the learner will be able to act confidently on curiosity about natural phenomena, and investigate relationships and solve problems in scientific, technological and environmental contexts.

### Materials:

- Plastic wrap
- Polystyrene cups x 2
- Thermometer

### Lesson Procedure:

Give each group of learners two cups and have them fill it with water that is the same temperature. Wrap one of the cups with plastic wrap. Leave both cups

in a sunny place for a few hours. Learners take the temperature of the water in both cups. Learners must predict which one will be warmer? Why? How do they think this experiment relates to global warming?

### Discuss the science behind global warming.

**Sunlight sends energy into the climate, most of which is absorbed by oceans and land. Heat is then radiated outward as infrared energy. Some of this heat is absorbed by what are called greenhouse gases, which exist naturally in the atmosphere. Greenhouse gases include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O). Water vapor is also an important greenhouse gas, but human activity does not change it directly. When energy is absorbed, greenhouse gases transmit energy in all directions. Some of the infrared energy is emitted towards space while some is reabsorbed, further warming the earth. The greenhouse gases are often compared to a blanket around the earth which keeps the earth warm. Increased concentrations of CO<sub>2</sub> and other greenhouse gases cause more infrared energy, in essence creating a thick blanket around the earth that keeps heat inside. This, in turn, causes increases in the temperature of the atmosphere and Earth's surface.**

**Normally, the Earth maintains a balance in the amount of carbon dioxide in the atmosphere. Ocean uptake (dissolving of CO<sub>2</sub> gas into the oceans) and sedimentation (burial of plant and animal matter, which overtime becomes limestone, coal, gas, and oil) are two processes whereby CO<sub>2</sub> is absorbed from the atmosphere. This naturally occurring system readjusts to return the balance to normal states. However, the system is slow-moving and cannot keep up with the pace at which humans are burning fossil fuel, and thereby releasing carbon dioxide into the atmosphere. Furthermore, the clearing and burning of forests transform organic carbon into gas, which contributes to an increase in carbon dioxide in the atmosphere. The constant need for energy causes a reliance on fossil fuels, which, in turn, means more and more CO<sub>2</sub> being released into the atmosphere.**

**In groups, learners** develop a chart that explains their understanding of the science of global warming (see Worksheet 3) .



# LESSON ACTIVITY 3 - CONSEQUENCES OF GLOBAL WARMING

## Lesson procedure

- **Learners investigate the** effects and consequences of global warming Discuss all of these with your learners. Go to Worksheet 4 and learners discuss in groups before completing and reporting.

PAGE 88



# LESSON ACTIVITY 4 - LEARNING ABOUT ECOLOGICAL FOOTPRINTS

## Lesson procedure

**Begin a discussion** by asking learners to contemplate their own energy use? Have them think of their morning and list all the energy they used. For example, do they have an alarm clock? Which lights did they turn on? How long was their shower? Did they take food from the refrigerator? Did they drive to school?

### **Provide Background:**

**Begin by describing the concept of an ecological footprint. Explain to learners that ecological footprints have been done on a global, national and individual level. A nation's footprint is calculated using its population, the amount consumed by the average resident, and the amount of resources used in providing goods and services required to meet people's consumption. Also included is the area required to absorb the CO<sub>2</sub> that is released due to fossil fuel burning.**

Hand out Worksheet 5 and learners complete the questionnaire before educator writes the calculator (under) on the board in order for learners to calculate their score:

For every section give yourself

- 1 mark if you ticked the top line.
- 2 if you ticked the second line
- 3 if you ticked the third line
- 4 if you ticked the fourth line
- 5 if you ticked the fifth line

Discuss with class:

The lower the percentage the better their ecological footprint is... that means they are living sustainably.

What are some things they do that increased their score? (Living unsustainably...)

What are some things they do that decreased it? (Living sustainably...)

Calculate the overall score of the class.

To end the lesson, learners personally arrange what they would be most willing to do/change in their life to what they would be least willing to do.

# LESSON ACTIVITY 5 - HOW ENERGY EFFICIENT IS OUR SCHOOL

## Lesson procedure

### Use Worksheet six

Learners look around the classroom and list everything they see in the classroom that uses energy.

After listing these items, they discuss how energy efficient they think those item are. In the right column, they write ways in which electricity can be used more efficiently.

Learners develop their own plan for a "Green School". They can draw out the plans and write a brief explanation of their ideas for their green school.

Learners return to Worksheet 1 – the KWL chart and fill in the third column (What I learned)

# THEMATIC UNIT OF WORK

## ENERGY AND CLIMATE CHANGE THE K-W-L (KNOW, WONDER, LEARN) CHART

**A Know-Wonder-Learn** (K-W-L) chart is one of the most commonly used graphic organizers to tap learners' prior knowledge. This simple chart activates learners' prior knowledge by asking them what they already know about a particular subject. This allows the learners to make personal connections before the content is deeply explored.

The learners first brainstorm their ideas on the Know section of the chart.

Then the students independently or collaboratively brainstorm questions they have about the content in the Want to Learn section.

Once learners begin to answer these questions during a lesson or unit of work, they record

this information on the Learn section of the chart.

By using this chart, students are constructing meaning from what they've been learning, comparing their new knowledge to what they already know, and are able to clarify their ideas. This also keeps learners' focused and interested in the content and is a way to keep track of what they are learning.

Ultimately, the chart could be used as a document for an assessment portfolio to show what the student has learned.

# WORKSHEET 1

## Group \_\_\_\_\_ global warming and climate change

**Write about what you know about global warming. Then write questions about what you want to know. When we have finished all your lessons, you can write about what you've learned.**

**What I know:**

**What I want to know:**

**What I learnt:**



# **THEMATIC UNIT OF WORK**

## **ENERGY AND CLIMATE CHANGE**

### **IS THIS GLOBAL WARMING?**

# **WORKSHEET 2**

**PAGE 93**



**The general retreat** of mountain glaciers during the past century is one example of evidence that the climate is changing.



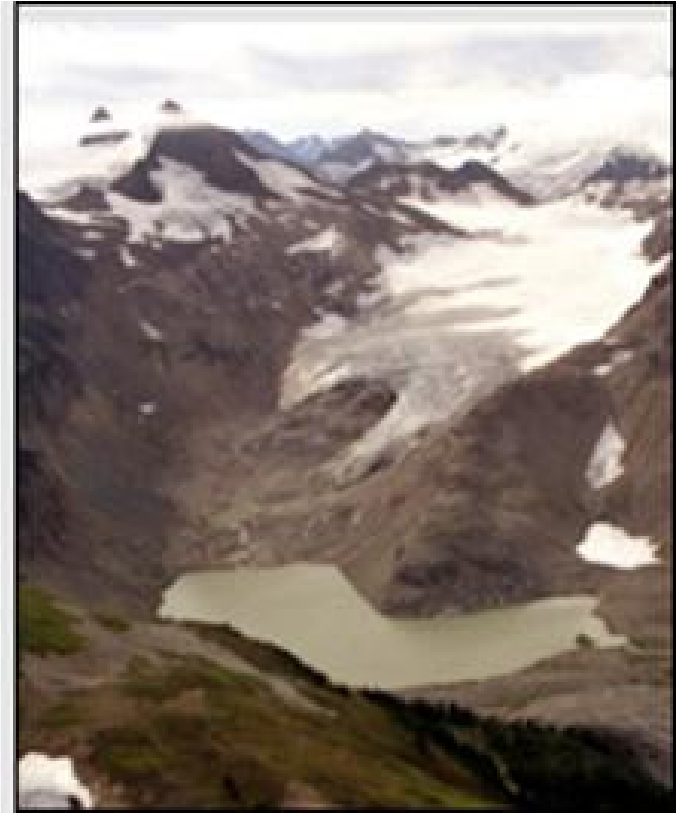
**1928**

South Cascade Glacier,  
Washington



**1979**

South Cascade Glacier,  
Washington



**2003**

South Cascade Glacier,  
Washington

# THEMATIC UNIT OF WORK

## ENERGY AND CLIMATE CHANGE

### UNDERSTANDING THE SCIENCE OF GLOBAL WARMING

# WORKSHEET 3

**PAGE 95**



# Draw a diagram of global warming and the greenhouse effect..

...to get you started, we have drawn the Sun and the Earth....



**PAGE 96**

# THEMATIC UNIT OF WORK

Here are some of the consequences that scientists say could happen as a result of global warming:

## Impact of land

- Range of arable land expands south and north
- Soil drier due to higher evaporation rates
- Increased CO<sub>2</sub> aids some plant growth
- Habitats for some animals shrink
- Range of insects likely to expand

## ENERGY AND CLIMATE CHANGE CONSEQUENCES OF GLOBAL WARMING

## Impact of water

- Sea level rises due to melting ice caps, warming water
- High water eats away at, or submerges, coastal land
- Sea water contaminates some drinking water supplies
- Water levels drop in some rivers, streams

## WORKSHEET 4

## Impact of air

- Cloud cover increases
- Levels of the greenhouse gas methane may increase
- Hurricanes range farther north, south on warmer water

Think about these and circle the impacts that you think may happen in your area. You must have a reason for your choices.

# THEMATIC UNIT OF WORK

## ENERGY AND CLIMATE CHANGE

### YOUR ECOLOGICAL FOOTPRINT

# WORKSHEET 5

**PAGE 98**



# Tick next to the sentence that applies to you

## How often do you eat animal based products? (beef, pork, chicken, fish, eggs, dairy products)

- Never (vegan)
- Infrequently (no meat, and eggs/dairy a few times a week) (strict vegetarian)
- Occasionally (no meat or occasional meat, but eggs/dairy almost daily)
- Often (meat once or twice a week)
- Very often (meat daily)
- Almost always (meat and eggs/dairy in almost every meal)

## How much of the food that you eat is processed, packaged and imported?

- Most of the food I eat is unprocessed, unpackaged and locally grown.
- Very little.
- One quarter
- Half
- Three quarters
- Most of the food I eat is processed, packaged, and from far away

## Compared to people in your neighborhood, how much waste do you generate?

- Much less
- About the same
- Much more

## How many people live in your household?

- 7 or more people
- 6 people
- 5 people
- 4 people
- 3 people
- 2 people
- 1 person

## What is the size of your home?

- 20 square metres or smaller
- 20-40 square metres
- 40-60 square metres
- 60-90 square metres
- 90-120 square metres
- 120 square metres or larger

## Which housing type best describes your home?

- Green-design residence
- Row house or building with 2-4 housing units
- Multi-story apartment building
- Free standing house without running water
- Free standing house with running water

## Do you have electricity in your home?

- No
- Yes, with energy conservation and efficiency
- Yes

## On average, how far do you travel on public transportation each week

- 0 km
- 5-50 km
- 50-150 km
- 150-300 km
- 300 km or more

## On average, how far do you go by car each week (as a driver or passenger)?

- 0 km
- 10-50 km
- 50-100 km
- 100-300 km
- 300-500 km
- 500 km or more

## Do you bicycle, walk, or use animal power to get around?

- Most of the time
- Sometimes
- Seldom

## Approximately how many hours do you spend flying each year?

- Never fly
- 3 hours
- 10 hours
- 25 hours
- 100 hours

## How often do you drive in a car with someone else, rather than alone?

- Almost always
- Very often (about 75%)
- Often (about 50%)
- Occasionally (about 25%)
- Almost never

My score is:

\_\_\_\_\_ out of 59

Percentage \_\_\_\_\_



# THEMATIC UNIT OF WORK

## ENERGY AND CLIMATE CHANGE

### HOW ENERGY EFFICIENT IS OUR SCHOOL?

# WORKSHEET 6

**PAGE 100**



## Things that use electricity in our classroom


## Ways that we can use electricity efficiently


**My plan to make our school “green” is:**

**PAGE 102**

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# QUESTIONS FOR MY FRIENDS

**Choose 3 friends in the same grade and ask them these questions.  
You must write each friend's answer down separately on a new page.**

1. **Where does coal come from?**
2. **Where does electricity come from?**
3. **How is electricity produced?**
4. **What is “energy”?**
5. **Where do we get energy from?**
6. **What are some other methods of energy production? Give 2 examples.**
7. **How can we sustain (keep going) our energy resources on Earth?**
8. **What is “acid rain” and “global warming”?**
9. **What is the importance of the ozone layer?**
10. **How can the ozone layer be destroyed?**

