English for Science

Unit 2: Links in Science

Revised Edition 1999

Education Department
Hong Kong

Aims

- Warmer - icebreaker
- To practise reading skills - using science-based texts to practise reading
- To practise the grammar of science. Passives and Processes
- To carry out error correction
- To annotate a diagram - a listening-based activity which involves diagrams
- To discuss Science - for or against - building up a case and presentation

Materials

EFS2.1 Student's File – Which Subject

EFS2.2 Student's File – Passives and Processes

EFS2.3 Student's File – Annotating Diagrams

EFS2.4 Student's File – Pronunciation Spot

Procedure

1 To begin with a little vocabulary warmer. Write the following words on the board

Cell Nucleus Electron Radio activity Energetics

Ideal gas

Ask the students which subject, Biology, Chemistry or Physics they belong to. They all belong to more than one discipline according to the Advanced Level Examination Regulations and Syllabuses 1996.

2 Feedback to the board. According to the Syllabuses document:

Cell - Biology and Physics
Nucleus - Biology, Chemistry and Physics
Electron - Chemistry and Physics
Radio activity - Chemistry and Physics
Energetics - Biology and Chemistry
Ideal gas - Chemistry and Physics

Ask the students if there are any other terms they know which cross the boundaries of their science subjects.

3 This unit is going to look at other common links between the three sciences. And we will be looking at common areas of grammar later in the unit. First, begin with some reading.

4 In the Student's File there are the "AIMS AND OBJECTIVES" for the three subjects **(EFS2.1)**. In each case the subject name has been removed. The first thing to do is get the students to skim through each article and decide which subject the texts refer to.

Key EFS 2.1

Text One is Biology, Text Two is Chemistry, and Text Three is Physics.

5 Next get the students to read the texts more slowly looking for similarities. Although many of the aims and objectives are written in slightly different ways, similar vocabulary is used and similar skills are described.

Each subject asks for an ability to make observations, record observed phenomena, experiment, relate what they are studying to the real world and develop an ability to understand basic scientific principles. The Physics and Biology Syllabuses aim to "prepare students to become responsible citizens in a changing world."

Get the students to tell you the similarities they have found. Suggest to them that if there are so many similarities between the disciplines, then the language that they need to use will be similar too.

Before we leave the exam syllabuses' ask the students to create one for another subject. The obvious choice would be English. Tell them to use the three syllabuses they have as examples and to think about what they already do in English. They should work in pairs or small groups for this. Tell them that they should include between six and ten points in their syllabuses.

Below is a copy of the HK A-level Exam Syllabus for English. There is also a copy of this in the resource kit which you can copy for students if you want.

AIMS AND OBJECTIVES

(Use of English)

This syllabus aims to foster the development of students' English language skills in order to equip them for tertiary education and/or employment.

The examination will test the ability of candidates to understand and use English as might be required in tertiary education and/or future employment. It will test the ability of candidates to:

(i) understand and interpret spoken English as it might be encountered in academic or vocational situations;

(ii) write clear, concise and grammatical English in an appropriate style;

(iii) demonstrate both global and detailed understanding of a variety of written texts;

(iv) understand and use spoken English for practical communication;

(v) integrate reading, writing and study skills in the pursuance of task-based/problem-solving activities.

6 Grammar Attack. Another similarity between the sciences is the need to write up experimental reports. Unlike the "hard boiled" style seen in "Language Arts", it is very unusual to write a report like this in the first person. "I applied heat to the solution. I timed the swing of the pendulum." The most common style to use in this case would be the passive. "Heat was applied to the solution." "The swing of the pendulum was timed."

Write "PASSIVE" and "ACTIVE" on the board. Ask the students what they know about these terms related to grammar. Write up whatever the students give you that is related to these terms. If you don't get anything, write up the following sentences.

"I observed a rise in temperature in the solution."

Ask the students whether this is active or passive. Ask them to make a passive sentence out of it.

"A rise in temperature in the solution was observed."

The next section looks at simple transformations - it might be necessary to give a quick revision of how to form the passive. **Worksheet 2.2** gives a list of the different tense formations in the passive followed by a short transformation exercise.

(Key ESF 2.2)

Active to Passive 1

2 *The solution was poured into the glass measuring cylinder.*

3 *The apparatus was set up as shown in the diagram.*

4 *The same experiment was carried out by the whole class. (Here the people doing the action are important, but not as important as the action).*

5 *The solution was left to cool while the experimental procedure was written up.*

Active to Passive 2

1 *The crystals are added to the supersaturated solution. Temperature readings are taken for five minutes. Then the solution is diluted with pure water until a change in colour is noticed. Once a change has been seen, the temperature is measured. After five minutes the temperature is measured again and 20ccs of the solution is removed. The solution is tested for acidity using some litmus paper. If the pH of the solution is below 4, then the temperature is taken again. If the solution is not that acidic, then it is left for another five minutes and the test is repeated.*

2 *The lens holder is set in place on the light bench. The light source is turned on. The screen is placed at the end of the bench. The first convex lens is placed in the lens holder and is moved along the bench until the image is focussed on the screen. The distance from the holder to the screen is measured and recorded. The procedure is repeated for all five lenses. All the measurements are recorded and each lens is marked with the focal length that was observed.*

Passive Correction

It can seen that the passive voice is very useful when an experimental procedure being written up. It makes the report sound more objective and the reader understand that the experiment has been carry out by the person writing the report. The passive voice is also used in a lot of academic writing. For example which of the following do you think sounds more official: I asked 20 people what they liked about Hong Kong, or 20 people was asked what they liked about Hong Kong.

1 *can be seen*
2 *is being written*
3 _____
4 *carried*
5 _____
6 _____
7 _____
8 _____
9 *were*
10 _____

It can seen that the second one seems more official; it	11 *can be seen*
could have been write for a newspaper or magazine.	12 *written*
That is another area of writing that uses the passive	13
voice. Journalism. Examples of the passive can seen	14 *can be seen*
on the pages of the English language newspapers	15
every day, eg. "A taxi driver and two passengers were	16
slightly injury when falling masonry..."	17 *injured*
So for your report writing to be improve it is a good	18 *be improved*
idea to practise using the passive.	19

7 Annotation of Diagrams. This is a very important skill for students of science subjects. However, it is not just scientists who need to annotate diagrams. Any members of different disciplines require this skill. The activities require the students to listen to the descriptions of the diagrams and make appropriate annotations. The terminology involved in this task may not be familiar to the students. You may refer them to Student's File **EFS2.4** before listening.

Announcer: You are going to hear two diagrams described to you. These diagrams can be found in your notes. As you listen to the description, annotate the diagrams in the appropriate places.

Voice 1: You have in front of you a diagram of a Fluid Cushion Transport Vehicle.

The Fluid Cushion Transport Vehicle or FCTV for short is a workhorse transport device for use in very wet areas or areas where the surface is very changeable. There are several features of the FCTV which make it quite exceptional. I want to concentrate on eight of those features now.

The first of these features is the modular propulsion unit. This is an interchangeable unit which can be removed and replaced within half an hour. It is situated at the front of the vehicle. The modular design of the whole vehicle makes it extremely adaptable. So just below the modular propulsion unit is the highly durable skirt or HDS. It is similar to the traditional skirt that is utilised by hovercraft, but it is much more durable and has an expected life of up to ten years. The third feature is the polymer-toughened visi-shield. This provides ultra-clear visibility and with the new polymer-bonded toughened glass the shield is virtually unbreakable. Number four is the side-access port. This is sealable which means that the vehicle can be used in environmentally dangerous areas. In fact the whole vehicle can be sealed off from the outside environment allowing complete protection of passengers and internally stored cargo.

On top of the vehicle are two features. The first I want to mention is the telescopic fuel intake system. This allows the vehicle to be refuelled on the move from a helicopter or low, slow flying plane. The second feature on the top of the vehicle is the communication's cluster. This allows for satellite links from anywhere on the surface.

At the rear of the vehicle is the load pad access ramp. This facilitates loading of heavy cargo and self-powered cargo. Finally there is the universal coupling which joins the load pad to the vehicle. There are four different load pad modules all easily coupled and uncoupled using the universal.
So there you have the Fluid Cushion Transport Vehicle.

Voice 2: I am going to describe the new generation of integrated communications terminals to you. This particular one is a Scientific Integrated Terminal or SIT. There are a number of features that you will need to know about. The SIT is a fully integrated modular design machine. The modular technology used in SIT is exactly the same as that used in the new generation of shuttle craft. The first feature that will look familiar, but is in fact quite revolutionary, is the full fuzzy keyboard. This keyboard has been ergonomically designed and is adaptable to your hand span. Below the full fuzzy is the central nervous system of the SIT, the CNS. This contains quadruple processors with dual backup systems. This allows for partial shut down of the central nervous system without loss of function. This unit contains four key slots which allow for easy up-grades and use of peripherals. At the front of the CNS are two slots for portable storage disks. The one on the left is an optical storage disk drive. The one on the right is an ordinary 2.88 megabyte floppy drive. On the side of the CNS are two more slots, the lower one being a fluid-drive CD ROM drive and the upper one a plug-in slot for voice activated peripherals.

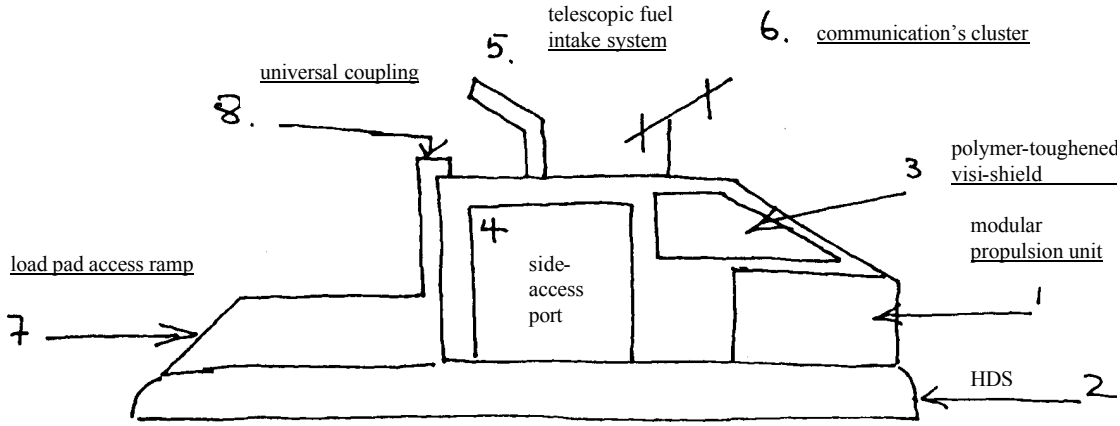
Between the CNS and the screen is the Coms Neck. The Coms Neck is hinged in three places which allows for easy packing of the SIT. The screen itself is a touch-sensitive, fully interactive monitor. The surrounding of the screen is also touch-sensitive for all the controls such as brightness, contrast and so on.

On either side of the screen is an import/export module. Each of these modules has two ports, the upper port on each side being the import, the lower being the export.

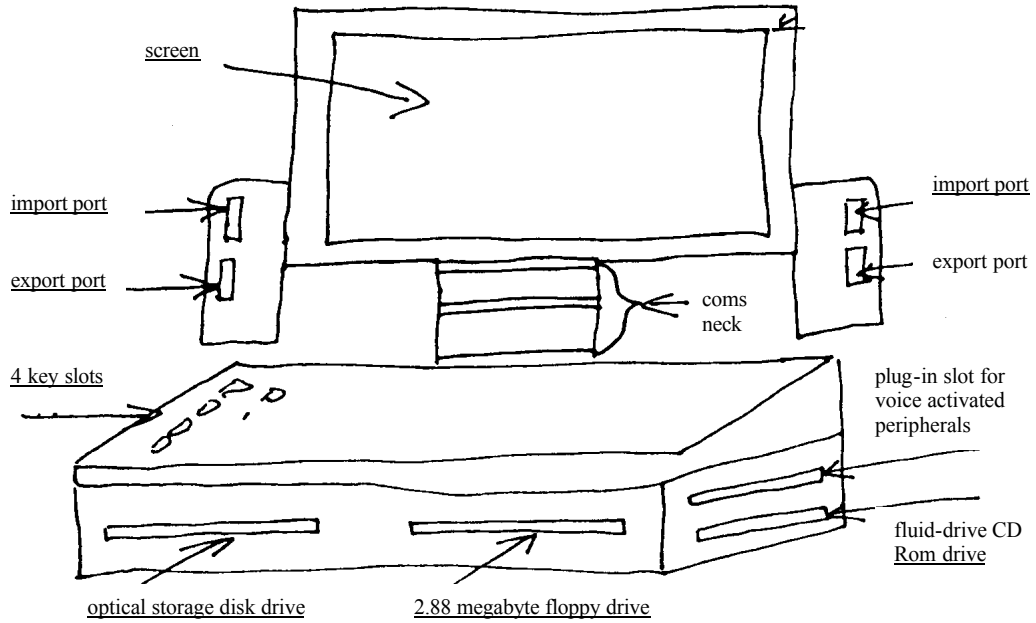
The SIT is fully portable and weighs only 3.1kg with the 8-hour battery onboard.

Key ESF 2.3

A: Annotated Diagram of Fluid Cushion Transport Vehicle (FCTV)



B: Annotated Diagram of Scientific Integrated Terminal (SIT)



8 The students should check with each other before you ask for feedback. Although these diagrams may seem simple, it is important that the students are accurate with the annotation and that they get the important information. Note-taking is about accuracy, not the specific nature of the content.

9 As an optional activity, students could draw their own diagrams and describe them to their classmates so that the latter can annotate them.

10 Pronunciation Attack. In the listening there are a number of words and phrases that might cause difficulty. It would be a good idea to do a mini-pron attack to change the focus. This can be done as a listen-and-repeat activity using the tape, or students can read through the tapescript and note the words or phrases they have found difficult. The words and phrases chosen for the taped version appear below.

Fluid Cushion
Vehicle
modular propulsion
interchangeable
durable
polymer-toughened
telescopic
communication's cluster
facilitate
universal

integrated modular design
revolutionary
ergonomically designed
quadruple processors
partial
peripherals
voice activated
hinged

11 The focus will now turn to students producing their own work. Begin this section by putting up the word SCIENCE on the board. Tell the students you want them to think about all the good things that science contributes to our lives. After a few minutes, tell them to concentrate on the bad things that science brings to our lives.

I'm sure you can think of many different examples, but here are one or two to get you going.

Good	Bad
– Advances in medical science – New safer materials – Safer pesticides and fertilizers – Genetic engineering of better crops – Possibilities of new and safe forms of fuel – Products that do least harm to the environment – Research into the effects of global warming and the greenhouse effect and alerting governments to the dangers	– Weapons of mass destruction – Toxic waste – Playing with genetics

In groups students should start to build a case for or against science. You should encourage them to be as lateral in their thinking as possible.

Get feedback from the groups on this and then tell them you want them to create a case either for or against science. You should tell them that this is the basis of an argumentative essay, i.e. looking at both sides and coming down in favour of one.

In their groups ask them to produce an overview with specific examples - basically this includes an introduction, specific paragraphs and a conclusion. Tell them that they will present their case to the class and that they will have only five or ten minutes to do so. Also tell them that each member of the group will have to speak, either individually or as a group - e.g. chanting a slogan.

Set them to work giving them 20-30 minutes to produce the work and then present it.

12 Finally, as with Unit One you should look back at what the students have practised in this Unit and see how it fits in with the UE exam.