Masters of the universe

Level: Intermediate upwards

Timing: Approx. 90 minutes

Material needed: One copy of the student worksheets and Vocabulary record per student

Group size: Any

Overview

This lesson plan, which is based around an article first published in *Business Spotlight* Issue 1/2012, is suitable for both pre-experience and in-work students and learners of Business English. In this article, the author talks about how everybody is able to participate in scientific research and contribute valuable information and time to help provide information required for the advancement of scientific, environmental and humanitarian projects.

The tasks in the student worksheets encourage the students to learn and use new business vocabulary and functional language, and to develop and practise skills that could be useful in business situations.

The teacher's notes provide suggestions for teaching and learning strategies, as well as ideas on how to present the tasks in the classroom, any necessary answer keys and extension tasks (for in class or as homework).

Warmer

The warmer questions are intended to introduce the topic and provide you with an idea of how much pre-knowledge about the topic the students are able to bring to the lesson. Ask the students to describe what a scientist does, what his/her qualifications might be, what field he/she might work in, etc., then ask the same questions about a *citizen scientist*. Explain that the word *citizen* normally means *someone who lives in a particular town, city or country* but that here it is used to describe a lay person or non-scientist.

Key words

Looking at these key words prior to reading will help introduce the students to the topic of the article. Getting them to guess what the article is about via the key words will encourage them to think about the content and the words.

Finding the words in context (i.e. within the article in a sentence) will help them to understand the way in which the words are used. The words are numbered in the order that they appear in the article.

Key:
1. citizen scientist; 2. volunteers; 3. patterns;
4. extraterrestrial; 5. humanitarian; 6. data crunching;
7. transcribe; 8. decipher; 9. protein strands; 10. web portal

After reading

This task requires the students to look more closely at the content of the article and to be able to understand it enough to answer the questions.

Key:
1. They are both projects in which citizen scientists can participate. See paragraphs 2 and 4.
2. Computers aren't very good at comparing images. The human eye is much better at 'spot-the-difference' tasks. See paragraph 6.
3. See paragraphs 10 and 11.
4. Some of the projects use the creativity of a great number of people to solve scientific problems. See paragraph 10.
5. In September 2011, players produced a model of an AIDS-related enzyme that biochemists had been trying to decipher for ten years. See paragraph 12.
6. People have a tremendous desire to do something useful, to contribute to scientific understanding and to help explore the universe. See paragraph 8. Some people are drawn to citizen science because it connects them to – and helps protect – nature. See paragraph 13.

Fact-finding

Ask students to find information in the article that will help them fill in the table. Tell them not to worry if they can't complete every cell in the table at this stage.

Web research

The websites given will allow the students to find further information about the projects mentioned in the article. They will also be able to complete the table in task 4.

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Key:

name or type of project or URL	*run by ...*	*tasks for citizens*	*benefits for science and humans*
The Christmas Bird Count	*Audubon Society*	*to count birds*	*to monitor changes in the bird population*
Evolution Megalab	*Open University*	*to observe patterns on snail shells*	*to follow evolution*
SETI	*University of California, Berkley*	*The project uses the volunteers' computers to analyze data received from radio telescopes.*	*to help search for life in space*
World Community Grid	*World Community Grid / Oxford University*	*Nothing. The project just uses the volunteers' spare computer capacity.*	*to aid many humanitarian aims, e.g. comparing medical treatments or measuring water flow through various materials*
LHC@home	*LHC@home / CERN*	*By contributing spare processing capacity on their home and laptop computers, volunteers may run simulations of beam dynamics and particle collisions in the LHC's giant detectors.*	*Volunteers help physicists develop and exploit particle accelerators, like CERN's Large Hadron Collider, and compare theory with experiment in the search for new fundamental particles.*
Galaxy Zoo	*Zooniverse*	*to classify photos of galaxies*	*to understand how galaxies form*
Phylo	*Supported by: Natural Sciences and Engineering Research Council of Canada, Nokia, McGill School of Computer Science*	*to play a computer game*	*to aid scientists solving common problems - every puzzle completed contributes to mapping diseases within human DNA*
Foldit	*University of Washington*	*to play a computer game in which gamers fold protein strands which create new structures*	*Players can design brand-new proteins that could help prevent or treat important diseases.*

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Teaching tip: Alternatives to web research in class

A great deal of teaching material these days includes tasks that require access to the internet. Of course, this is not always practical or possible. You may not have the hardware, the access or the time! But exercise titles such as *Web research* need not lead to frustration or simply skipping the task. If you don't have internet access in the classroom, there are many alternative ways these tasks can be carried out, as well as variations on the tasks themselves.

For example, if students have **internet access at home**, the task can be set as homework. Students can be asked to do any necessary research and preparation that will allow them to present their findings for the next lesson. If they have **free study periods**, they can work in pairs or groups to make the homework more collaborative.

You could do some **pre-research** and print out information onto paper that can be distributed to the students during class time as additional reading material. Students can pass on this information by means of information exchange tasks or via presentations.

If your school or institution has a **library**, you could send the students off to find information and ask them to report back to the class after having done so.

Another way that involves no preparation is for you to **dictate the information** from the answer key in a random order and the students decide where to write it into the table.

Vocabulary record

Here, students should be encouraged to record all the new and useful vocabulary they have learned during the lesson, not only in the form presented in the article but also in related forms.

Related topics on onestopenglish

For follow-up lessons on the same or related topics, go to the following lesson plans on onestopenglish:

ESP: Science
http://www.onestopenglish.com/esp/other-professions/science/

Business Spotlight: Specialist or generalist?
http://www.onestopenglish.com/business/business-spotlight/specialist-or-generalist/550367.article

You may also find topical and relevant *Guardian* news lessons here on onestopenglish:
http://www.onestopenglish.com/skills/news-lessons

Discussion

These questions aim to personalize the topic of the citizen scientists. Developing the topic beyond what has been read in the article, students are encouraged to talk about what they think about the idea of citizens helping out with scientific projects, which projects they would be interested in finding out more about, as well as how technology has made participation in science projects possible for everybody.

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Worksheet

1 Warmer

Answer the questions below.

1. What is a scientist?
2. What is a citizen scientist?

1 Key words

Match these key words and expressions from the article with their definitions.
What do you think the article is about? Find the words in the article to read them in context.

humanitarian	transcribe	patterns	
volunteers	web portal	protein strands	decipher
citizen scientist	extraterrestrial	data crunching	

1. a lay person (someone without special qualifications) who provides information that can help with scientific research _____
2. people who are not paid for the work that they do _____
3. sets of lines, shapes or colours that are repeated regularly _____
4. relating to things that exist on planets other than Earth _____
5. relating to efforts to help people who are living in very bad conditions _____
6. calculating and evaluating information _____
7. to write, type or record something exactly as it was originally said or written _____
8. to succeed in understanding the meaning of something written _____
9. single pieces of a biochemical compound _____
10. an internet site that has links to other places _____

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by Carol Scheunemann

People occupy their free time by doing the craziest things; things that can also be undertaken to aid scientific research.

1 What do you enjoy doing in your free time? Birdwatching? Stargazing? Solving word puzzles? Playing computer games? With hobbies such as these, you can contribute to scientific understanding. By taking a look at the world around you, the sky above you, the civilizations that have gone before you, or the molecules inside you, you can become a "citizen scientist".

2 The work of scientists involves analyzing and interpreting data. But collecting the data often requires hundreds of hours. In what is regarded as the first "citizen-science" project, ornithologist Frank Chapman from the Audubon Society, a group formed for the protection of birds, asked volunteers to count the birds they saw on December 25, 1900. Chapman received reports of 18,500 birds from 27 people across North America. The "Christmas Bird Count" is still held every year for the purpose of identifying birds in various regions. It now provides information on more than 61 million birds from some 60,000 birdwatchers.

3 Jonathan Silvertown, professor of ecology at the UK's Open University, says that volunteers have contributed to research at his institute for at least 30 years. "Citizen science is not new at all," he says. "What is new is how easy it is to set up new projects and to participate in them." People can quickly find and join projects on the internet. Thanks to smartphones, they can upload and send data (such as photos or videos) almost effortlessly. "Without any doubt, citizen science is growing," Silvertown adds. One of the Open University's current projects for the public is Evolution MegaLab, in which people throughout Europe can follow evolution by observing the patterns on snail shells.

4 Researchers have also begun to delegate the digital side of their work through "distributed computing," which uses the processing capacity of home computers – for example, at night. Started at the University of California, Berkeley, the first such project went online in 1999 – the Search for Extraterrestrial Intelligence (SETI). More than six million people have downloaded a free piece of software, Seti@home, which allows their computers to analyze data received from radio telescopes, and help scientists search for life in space.

5 Now, citizen scientists can choose from a number of "at home" software programs to assist in research – including one that processes climate and weather models for Oxford University. World Community Grid, sponsored by IBM, uses distributed computing for humanitarian aims, such as comparing medical treatments or measuring water flow through various materials. And researchers at CERN, in Switzerland, recently introduced LHC@home, a simulation of the Large Hadron Collider for people interested in smashing atoms.

Image: Corbis

6 Scientific discovery needs more than observation and data crunching, however, and a number of projects depend on talents that only humans have. Satellites and space telescopes, such as Hubble, have collected millions of pictures of stars. One would think that computers could quickly sort digitized information, but computers aren't very good at comparing images. The human eye is much better at "spot-the-difference" tasks.

7 Begun in 2007, Galaxy Zoo invites volunteers to classify photos of galaxies. "Humans evolved to be good at pattern recognition — the same skills that were once used to spot predators now allow us to classify galaxies, or discover planets," says Dr. Chris Lintott, an astrophysicist and researcher at the University of Oxford and co-founder of Galaxy Zoo. Galaxy Zoo belongs to the web portal Zooniverse, which now has around 500,000 members.

8 "People have a tremendous desire to do something useful, to contribute to scientific understanding, and to help explore the universe," says Lintott.

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9 Zooniverse also offers projects that will help us to better understand our history on earth – transcribing centuries-old ships' logbooks for weather data, for example, or deciphering Greek texts that were written about 2,000 years ago. Lintott says the work of citizen scientists is taken seriously. "We produce data that scientists actually want," he explains.

10 Some projects deal with things too small for humans to see. By turning research into a game, scientists make complex concepts seem simpler. Such computer games make use of "distributed thinking". In other words, they depend on the creativity of a great number of people to solve scientific problems.

11 Players of the game Phylo move simple patterns of small, coloured squares to find matching genome sequences (think of Tetris). Created by the structural biology group at McGill University in Montreal, Canada, the game compares genomes of different animals, and the coloured blocks represent the nucleotides in DNA. But you don't have to understand genetics to win points and contribute to the fight against diseases.

12 Another simulation is Foldit, from the University of Washington, which asks its 60,000 users to "solve puzzles for science." It encourages gamers to fold protein strands, helping scientists to create new protein structures that could be used when developing medicines. In September 2011, players produced a model of an AIDS-related enzyme that biochemists had been trying to decipher for ten years.

13 Besides folding proteins, hunting galaxies or watching snails, thousands of other activities for citizen scientists attract huge numbers of volunteers worldwide, says "science cheerleader" and blogger Darlene Cavalier from Philadelphia, co-founder of the web portal Science for Citizens. The portal offers a central listing where citizens and projects can find each other. People can search in various categories, such as time, costs or skills needed, and by specialty or geographic area. Cavalier says that while some people want to contribute to research, others "are drawn to citizen science because it connects them to – and helps protect – nature."

14 When she's not busy working on her websites, speaking at conferences, or writing for Discover, a US popular-science magazine, you might find Cavalier and her four children adding to scientific understanding by digging in a bag of dirt from the Museum of the Earth in Ithaca, NY, looking for bits of mastodon fossils.

CAROL SCHEUNEMANN is an editor at *Business Spotlight* with responsibility for language tests and the Technology section. She also coordinates *Business Spotlight Audio*.

3 After reading

Answer the questions according to the information in the article.

1. What's the connection between counting birds and looking for life on other planets?
2. Why can't these tasks be carried out just by computers; why are humans still needed?
3. How can playing computer games aid scientific research?
4. Why are many minds better than one?
5. Give an example of a scientific breakthrough that has been accomplished by citizen scientists.
6. What motivates people to become citizen scientists?

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4 Fact-finding

Complete the table as far as possible with facts from the article.

name or type of project or URL	run by ...	tasks for citizens	benefits for science and humans
	Audubon Society		
Evolution Megalab			
SETI			
World Community Grid			
			Volunteers help physicists develop and exploit particle accelerators, like CERN's Large Hadron Collider, and compare theory with experiment in the search for new fundamental particles.
		to classify photos of galaxies	
		to play a computer game	
	University of Washington		

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5 Web research

Go to these websites and fill in any information that is still missing from the table in task 4.

- birds.audubon.org
- www.evolutionmegalab.org
- www.worldcommunitygrid.org
- lhcathome.web.cern.ch/LHCathome/
- www.galaxyzoo.org
- phylo.cs.mcgill.ca/eng/
- fold.it/portal/info/science

Read more about citizen science by typing *citizen science* or *citizen scientist* into a search engine.

6 Discussion

Discuss the following points and questions in small groups.

- Talk about any scientific projects, large or small, global or local, that you have taken part in or volunteered for.
- Which of the projects would you like to find out more about and possibly participate in?
- How has technology changed the way people are able to engage with science?
- Are universities and scientific organizations taking advantage of people's natural curiosity?
- Why do you think the author has chosen *Masters of the universe* as the title for the article?

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Vocabulary record: Masters of the universe

verb	noun	adjective (+ opposite)	adverb (+ opposite)
master			
	analysis		
		various	
			creatively