Teacher Notes

Your zone is:

ACTIVATE YOUR TEACHER ACCOUNT

1. Go to www.imascientist.org.au
2. On first visit, enter this ACCESS CODE:
3. Click 'Register'
4. Choose a username and password, you can write them here so you don't forget them:

Username:

Password:

CHECKLIST

The things you need to do BEFORE the event are:-

1. **Activate Your Account** (as above) so you can book live chats and access further teaching materials.
2. **IT Checks:** Get your IT person to make the checks we recommend at www.imascientist.org.au/IT. School firewalls can block parts of the site. This can usually be fixed, but not in the middle of a lesson.
3. **Book Live Chats** with scientists, if desired. Please give at least 48 hours notice, but the earlier the better. Log in and go to www.imascientist.org.au/live-chat to choose your desired start and finish time, date, zone, school and class. See page 3 for more details.
4. **Students Register On Site:** Hand students their individual Access Code cards from the teacher pack and get them to register at www.imascientist.org.au. They should go to the website, type in their access code in the space provided, click 'Register' and choose and write down a username and password to use when they next log in. Advisable to do before, but can be done during the event. See page 2 for more details.

Timetable

4 - 8 Mar	**Site online.** You can do background work and preparation with your students.
11 - 15 Mar	**Week 1: Getting to know you.** Students can ask questions & chat to scientists.
18 - 22 Mar	**Week 2: Evictions.** Students can still ask questions, chat and vote for their favourite scientist. Evictions happen every day from Tuesday and the winner is announced on Friday.
25 - 29 Mar	**Feedback.** Evaluations and wrap up

If you need any help please email admin@imascientist.org.au or call 0410 442 629

For further information please visit: www.imascientist.org.au/teachers

	Lesson	Learning Outcomes
1	***You're the Judges!*** Introduce I'm a Scientist then choose and rank criteria by which to judge the scientists.	• Introduction of science as human endeavour. • Develop critical thinking skills. • Consider ethical, social and practical aspects of science.
2	***Meet the Scientists*** Get to know the scientists in your zone through scientific speed-dating, or an alternative version of Lesson 2 that doesn't involve student movement around the classroom.	• Realise that scientists are 'real people' they can relate to. • Find out about up-to-date science.
3	***Live chat*** 'Chat' to real scientists online in real time.	• Feel a personal connection to scientists. • Have fun! • Sustain and develop their enjoyment of, and interest in, science.
4	***Science In The Media Case Study: Nanotechnology (A)*** Consider how members of the public receive scientific information from the media.	***Science as human endeavour*** • Developing an argument. • Societal aspects of scientific evidence. • Using data to draw conclusions. • Develop debate and discussion skills. ***Substantive*** • To evaluate the benefits of, and the problems that may arise from, the use of nanotechnology.
5	***Science In The Media Case Study: Nanotechnology (B)*** Review Lesson 4 and and consider further examples of how nanotechnology is presented to the public.	
6	***Project analysis*** Look back on the project and analyse their learning in a structured way.	• Society and individuals make decisions on issues relating to science and technology. • Different issues need to be weighed up and this can be difficult.

After the event – prizes and certificates

- Please do fill in the teacher survey at www.imascientist.org.au/feedback.You are the expert on what happened in your classroom. Your feedback will help us to continuously improve the event.
- Please also encourage your students to fill in the student survey too, at www.imascientist.org.au/feedback.
- In each zone the scientists pick a student winner (who they think has asked good questions and really engaged with the event). The moderators also pick a winning student, selected at random from the completed student surveys. Winning students get a certificate and a $50 iTunes voucher. We'll let you know if this is one of your students.
- To thank the students for their important contribution, we have created student participation certificates. Individual ones can be downloaded from the students' profile pages.

Contact

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For further information please visit: www.imascientist.org.au/teachers

Teacher Notes

Instructions for Students

What is 'I'm a Scientist'?

You can read this to your students to brief them about the event. It may help to have the website (www.imascientist.org.au) up on a projector or interactive whiteboard whilst you describe the event.

I'm a Scientist, Get me out of Here! is an online event where you get to meet and interact with real scientists. It's in the form of an Australian Idol-meets-Masterchef-style competition between the scientists. You submit questions which the scientists will try to answer by the next day. These stay on the site so you can read the questions other students have already asked, and the scientists' answers. You can have live online MSN-style chats with scientists where you get to ask the scientists questions and learn more about them.

You get to vote for the scientist that you think should win a prize of $1000 to promote their work. A student from each zone will win a gift voucher prize for asking the best questions and engaging with the scientists.

Each of you will get an Access Code card which you'll use to register on the site. You'll be asked to choose a username and password. Use a username that does not indentify you by name or age. Write them on the Access Code card and don't lose it. You'll need it to log onto the site. You'll also be asked for an email address and your school's name. Giving your email address will mean you'll be kept up to date with answers to your questions and evictions of scientists.

Once you're on the site you'll be able to do the following:

Fill in Your Profile – You can answer questions on your favourite and least favourite things about science. (*You may cover this as a class in Lesson 1: You're the Judges!*)

Meet the Scientists – There are five scientists competing for your votes. They have each posted a profile and answered some set questions. (*You will hopefully cover this in more detail in Lesson 2: Meet the Scientists.)*

ASK - You have the chance to ask the scientists whatever question you like. They'll try to answer by the next day and you'll get an email to let you know it has been answered. Questions and answers remain on the site so have a look around and see what others have asked before you pose your own question. *(Lesson 2: Meet the Scientists will help prepare.)*

CHAT - Live chats are your chance to ask questions and let scientists know your opinions. *(Lesson 3: Live Chat has more details on this.)*

VOTE - You vote for the scientist you think should win a prize of $1000 to promote their work. You can vote at any time and your final vote in each of the four rounds is the one that counts. In the second week the scientists are evicted day by day until the winner is announced on the Friday.

Feedback – This event is relevant to the the curriculum topic of Science as Human Endeavour. It is important to reflect on your learning, and the organisers will also appreciate any feedback you can give them, at www.imascientist.org.au/feedback

How long will it take/How much time should you spend on it?

Awesome: 12 hours
Including interacting with scientists on the website, all lesson plans and information sheets there is enough material for about 12 hours of lessons.

Average: 3-5 hours
Most teachers will do at least Lessons 1-3. Many will have more than one live chat.

Minimum: 2 hours
This will usually be 1 introductory lesson, 1 homework of reading more about the scientists and submitting questions and 1 lesson of live chat with scientists.

Be warned:
Most teachers, when asked what they would do differently next time said, *'spend more time on I'm a Scientist'*.

Eviction update:
In the second week of the event, evictions take place daily from Tuesday. During this week, even in lessons not on I'm a Scientist, take five minutes at the start or end of the lesson to check the website (www.imascientist.org.au) to see who has been evicted.

Teacher tips – learn from other people's experiences

In every event we ask teachers in the feedback survey what they would do differently if they ran the event again. Here are the most common answers, in order of popularity:-

1. Spend more time on the event

2. Involve more students

3. More preparation time – especially before live chats

> *"Prepare the class more, carry out the discussions first. Get them thinking about what scientists do, and the decisions they have to make."*

> *"I'd spend more time working with the group looking at the sort of questions they might like to ask. I did some of this but a number of students persisted in asking 'trivial pursuit' type science questions"*

There are better ways to use the event than to have scientists as Googlers. If students get stuck, encourage them to ask questions that follow-up the information provided in the scientists' profiles, questions that relate to their own interests, questions that explore what they've been studying in more detail or questions that explore their curiosity using 'why' and 'how'?

4. Use smaller groups or pair up students in live chats

> *"I would book more chunks of online chat but split the group so there were fewer students on at a time to give more chance of dialogue."*

> *"I would pair up weaker members of the group during live chat so they could work as a team to read/assimilate information/type responses."*

5. Use the provided resources more

And remember if you have questions, the Staffroom (www.imascientist.org.au/staffroom) is open every day from 9am – 5:30pm AEST during the event and we can also answer questions through Twitter @IASAus or email at admin@imascientist.org.au.

Live chats

"We are live chatting with scientists right now! The girls are excited and this is total engagement, thanks so much."
Tracey Warzecha, Riverside Girls High School, New South Wales

Before live chat lesson

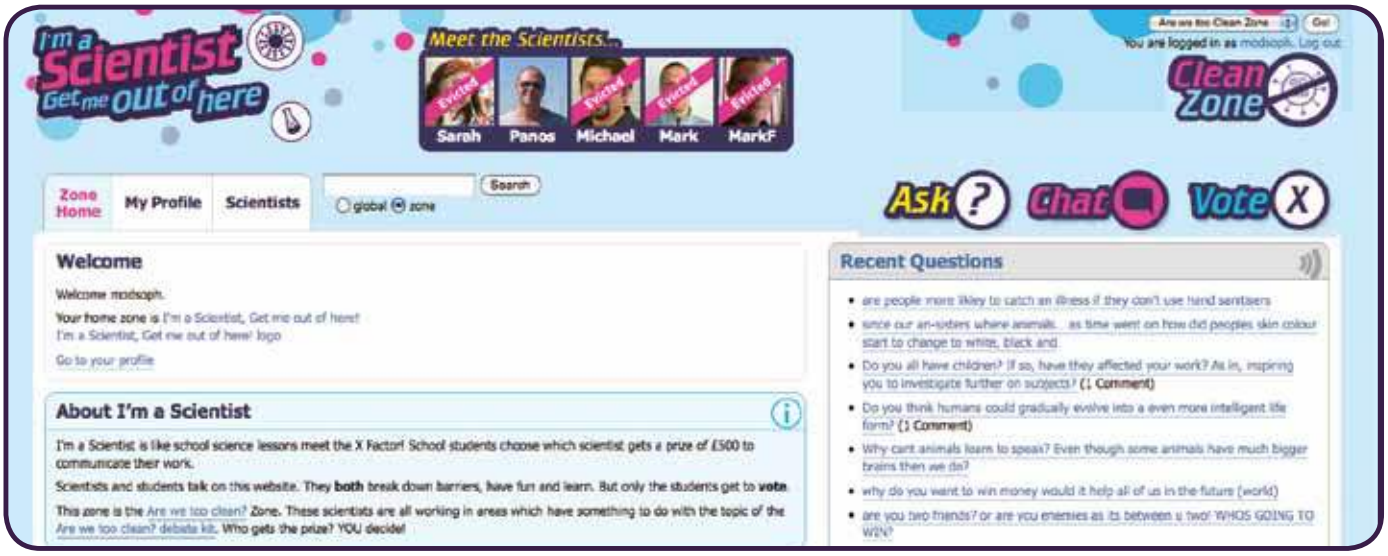
- Book IT suite/provide internet access for students
- Book live chat – Log in and choose your desired start and finish time, date, zone, school and class at www.imascientist.org.au/live-chat.
- Do some preparation with your class (we suggest Lesson 1: You're the Judges! and Lesson 2: Meet the Scientists).

During lesson

Explain to your students that they are going to have an MSN-style chat with some real scientists. Please encourage them to interact with the scientists, and not just amongst themselves. Encourage students to express their opinions on the work that the scientists do. Tell them there will be a moderator in the chatroom who will help keep the conversation on track and will block disruptive pupils.

- Live chats are consistently the most popular part of the event – for students, for scientists, and even for teachers!
- They are fun and give immediate contact between scientists and students. Students realise scientists are 'real people' and feel connected to them.
- Many teachers tell us that quieter students are more active in live chats than face to face and it can be an interesting change to class dynamics.
- Don't be embarrassed if your class is boisterous or mess about. The moderators will deal with this.

Please prepare your students before the live chat. Prepared students get the most educational benefit out of the live chats. Lesson 1: You're the Judges! and Lesson 2: Meet the Scientists are ideal preparation.



How do the lesson plans and the activities work together?

1. "You're the Judges!" Coming to it cold, students may just vote for the scientist with the nicest photo, or the best joke. This lesson plan gets students thinking about some of the deeper issues, while still giving them ownership of the criteria they come up with (rather than telling them what to consider). There's no right or wrong answer, but all students should have thought about how we judge scientists a little by taking part.

2. Interaction with scientists and voting gives students practice at using these skills and giving them a real say about something gives them a reason to engage.

3. "Media views of nanotechnology" assists with the analysis and synthesis of public information related to sciences and builds discussion skills.

4. Other accompanying resources extend this further, raise different science as a human endeavour issues, and give more opportunities for practice.

> *"It seems to me this is a really good match with the Science as a Human Endeavour aspect of the new curriculum in science"*
> Helen Marussinszky, Mitcham Girls High School, South Australia

Lesson Plans

There are many ways to use the I'm a Scientist event. We've put together six lesson plans and we recommend that you use at least Lessons 1, 2 and 3. These lesson plans were developed in consultation with teachers and have been extensively tested. Most have found them extremely helpful.

Format: Starter/activity/plenary

Suggested adaptations: For lower and higher ability groups

Timings: Designed for 50 mins

Purpose: Develop science as a human endeavour skills and deepen learning (see back page for more details)

Further resources:
Online at www.imascientist.org.au/teachers

There is a summary of all six lessons plans on the back page.

Lesson 1: You're the Judges!

Lesson	Format
Lesson 1 – You're the Judges! Introduce I'm a Scientist. Choose and rank criteria by which to judge the scientists.	***Starter: 5 minutes*** Explain the I'm a Scientist event briefly (show the site on a projector or interactive whiteboard if possible). They have the power to decide who wins. What ideas do they have about science at the moment? Will they change? ***Activity 1: up to 10 minutes*** 1) This activity can be done as a class or as individuals. 2) Ask students what occurs to them when they think about science – these should be off the top of their heads, and can include anything. 3) Ask students what their favourite and their least favourite things are about science. 4) Get the students to log in to the site and fill in their profiles. 5) You may want to keep a copy of the class's ideas as this activity is helpful for students to reflect on their own learning ***Activity 2: 25 minutes*** 1) Display the criteria list. 2) Get students to discuss each one and vote whether the criteria are IMPORTANT or NOT IMPORTANT when choosing which scientists to vote for. Aim to choose about 10-15 important criteria. 3) Get the class to whittle the important criteria down to the five most important criteria. Write these five criteria on the board. 4) Get the class to rank the five most important criteria. ***Plenary: 10 minutes*** • Brainstorm any other criteria that aren't on the list, that students might consider important when judging scientists. • Overall message: This will help you judge the scientists as a scientist. ***Suggested Homework:*** Look at the website and see how each scientist in your zone performs on the five most important criteria your class selected. Watch the critical thinking animations (see extension below).
Learning objective: • Consider a range of criteria and understand that different (important) values may need to be weighed against each other. • Prepare students to think critically about the responses scientists offer.	
Other learning outcomes: • Encourages students to consider criteria to use in deciding which scientist to vote for and how to judge their work. • Promotes use of sophisticated criteria, not trivial issues. • Gives students ownership of criteria.	
Curriculum links: • Science as human endeavour • Consider ethical, social and practical aspects of science.	
Resources: List of criteria on page 6 and in the 'Lesson 1 – You're the judges' Access to I'm a Scientist website (www.imascientist.org.au)	

Suggested adaptations

Support:
Less justification necessary. Lead students into the rationale behind their decisions.

Extension:

TechNyou SCIENCE EDUCATION RESOURCES

Teachers wishing to undertake a more detailed consideration of critical thinking may chose to explore the DIISRTE resource at TechNyou (http://education.technyou.edu.au/critical-thinking) and its accompanying animations (compiled at http://bridge8.wordpress.com/2012/01/30/critical-thinking-animations for your convenience).

Lesson 1: You're the Judges!

Criteria list

- My work makes people laugh
- I go to events, like lectures, to tell people about my work
- My work will save some lives, but not many people have the disease I study
- My work won't save any lives, but will seriously improve lots of lives (e.g. helping people to walk again)
- My conclusions are based on lots of accurate data
- My work will improve the field of cosmetic plastic surgery
- My work could make me a lot of money
- I am married
- My work could help me to get a Nobel Prize
- I'm very good-looking
- My work will help us to protect the environment
- My work will help make cars that go faster
- My work will help us create replacements for plastics that we currently make out of oil
- Lots of other scientists think my work is wrong
- I give lots of money to charity
- I don't harm any animals in my work
- I use instruments we have had in our lab for years. I know there's newer ones on the market but I'd rather spend the money on other things.
- I drive a sports car
- My work will help us understand in more detail how animals that live in the desert adapt to their surroundings
- I believe in God
- I don't believe in God
- My work will help us to understand how our brains work
- My work will help us explore space
- I'm wearing really cool trainers
- My work will help companies make more money
- My work will mean more people can have access to safe drinking water
- My work will create new knowledge
- My work will help people around the world to communicate faster
- I'm an orphan
- Lots of other scientists think my work is right
- I have tested my theory in lots of ways and haven't been able to disprove it

Lesson 2: Meet the Scientists

Lesson

Lesson 2 - Meet the Scientists
Scientific speed-dating, a fun, exciting way to 'meet' the scientists.

Learning objective:
- Get to know the scientists in-depth in a structured way.

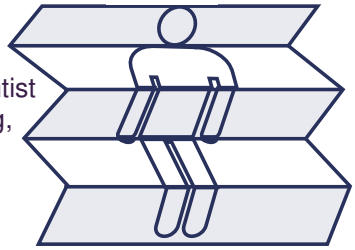
Other learning outcomes:
- Stimulate interest and raise questions they may want to ask.

Curriculum points covered:
- Select, organise and present scientific information.
- Evaluate scientific information and make informed judgements from it.

Resources:
- List of the top five criteria decided on in Lesson 1: You're the Judges!
- Five copies of the Assigned Questions in Lesson 2.
- Printed downloads of each of the scientists' profiles in your zone.
- Paper and pens for drawing a scientist.

Format

Starter: 10 minutes
1) Tell students they will be getting to know the scientists. Split students into five groups and number them 1-5.
2) Ask them to think about what they imagine scientists are like. Draw a scientist as a group. Starting at the top, each person in the group draws a different part of the scientist (head, shoulders, etc) without others seeing, folds over what they have done and passes it on (like a game of consequences).



3) Unfold and look at the pictures – any common themes? Do they think scientists are really like that?
4) Assign each group a scientist from your zone and hand them a print out of the scientist profile from the I'm a Scientist website. Get each group to read out their scientist name and job role.
5) Remind the students of the five most important criteria they chose in Lesson 1: Your the Judges! for rating scientists.

Activity: 30 minutes
1) Get the students to read through their scientist profile as a group.
2) Split each group in half, into A's and B's, to end up with ten groups for scientific speed-dating. Those in Group A are students who will go around and question the scientists. Group B are the scientists who will use the printed scientist profile pages on which to base their answers.
3) Hand the Group A students the list of Assigned Questions to ask the Group B scientists. They can also ask questions of their own. If the answer is not available on the scientist profile the group can speculate as to what their answers could be.
4) The Group B scientists will stay seated and the Group A students will rotate between each scientist, asking questions. Ring a bell every 3 minutes to move the students on to new scientists.

Plenary: 10 minutes
All the students discuss the scientists as a class. Go over the questions for each scientist to make sure they got the right answers. Did they like the questions? Did they feel they got to know the scientists? Would they ask similar questions or others?

Suggested Homework:
Bearing in mind the five most important criteria decided on in Lesson 1: You're the Judges! think of three questions to ask the scientists. Research how a famous scientist (e.g. Stephen Hawking, Isaac Newton, Marie Curie, Dorothy Hodgkin) would answer your three questions.

Suggested adaptations

Support:
Do the activity as a class with the five scientists at the front. 2 or 3 play each scientist.

Extension:
Concentrate more on their own questions rather than assigned questions.
Go back onto the site and submit some questions for scientists.

Lesson 2: Meet the Scientists *(alternative version)*

Lesson	Format
Lesson 2 – Meet the Scientists (alternative version) This is an alternative version of Lesson 2 that does not involve scientific speed-dating and student movement around the classroom.	***Starter: 10 minutes*** Recap the event, and what can be done on the site. Can also use 'fold game' starter from the scientific speed-dating version of Lesson 2. ***Activity: 35 minutes*** 1) As a class brainstorm suitable questions that they want to ask to get to know the scientist. Get students to write them all down. Appoint a question to each pair to ask when they use the site. 2) Take students online, (in pairs or threes in ICT suite or all look at site together on projector) and read the profiles of all the five scientists in your zone and the information on the site. See if the impression they get of them is different from what they expected. Decide which scientist they like the best. 3) Write down three interesting things they find out on the site. 4) Ask a brainstormed question, and one of their own for the scientists to answer when they use the site. 5) Present their three interesting things to the class, and for which scientist they intend on voting, or for which they would not vote. ***Plenary: 5 minutes*** Discuss what they found out – did anything surprise them? ***Suggested Homework:*** Pick one of the scientists. Find out about their area of science and write about it, including: – What they study – Where they do their research – A famous scientist from the area they study.
Learning objective: • Get to know scientists and realise they are normal people!	
Other learning outcomes: • Stimulate interest and raise questions they may want to ask. • Opportunity to interact with real scientists.	
Curriculum points covered: • Select, organise and present scientific information. • Evaluate scientific information and make informed judgements from it.	
Resources: • Pupils' own pen and exercise book. • ICT suite or a computer and projector in the classroom so students can work together with the teacher leading.	

Suggested adaptations

Support:
Give more assistance in brainstorming questions. Use the criteria from Lesson 1: You're the Judges! and suggested Lesson 2: Meet the Scientists questions as a basis.

Extension:
Allow more freedom when looking at the site. Write a short paragraph about what they find on the site to present back to the class. Justify more clearly which scientist they like best.

Assigned Questions

1. What kind of place do you work?
2. What do you do?
3. What's your favourite band?
4. Do you work alone or as part of a team?
5. How long have you done your job?
6. What is your research trying to find out?
7. Will your research affect people? If so, how many people and in what way?

Lesson 3: Live chat

Lesson	Format
Lesson 3 - Live chat 'Chat' to real scientists MSN-style online in real time.	***Starter: 5 minutes*** Go over the important criteria from Lesson 1: You're the Judges!, Assigned Questions from Lesson 2: Meet the Scientists and/or brainstormed questions from the alternative Lesson 2. In this live chat lesson the students can get to know the scientists better, in real time. Remind them that they have a big responsibility because each student gets a vote to decide which scientist wins $1000. Note – Scientists are busy and working full time. It's likely that not all the scientists will be able to make every live chat booked so try to manage the classes' expectations. The important thing is that they get to 'meet' real scientists and find out they are human too. ***Activity: 35 minutes*** 1) Log on to the website (www.imascientist.org.au) with chosen username and password noted on Access Code cards, either individually as students or as the teacher if the whole class are doing it together via projector screen. 2) Live chat with the scientists, as individuals, pairs or small groups. 3) In groups of four get students to write a summary of what they have learnt, and present this to the whole class. ***Plenary: 10 minutes*** • Sum up what they have learnt about the scientists. • Are there any other questions they didn't get to ask? • Did they learn anything that surprised them? • Remind students that they can use the site to ask questions at home if they have access to the internet. ***Suggested Homework:*** Pick one of the scientists' areas of work. Find out more about an issue facing that area. Either research an issue that came up in the live chat, or if none arose write about the biggest issue facing that area of work.
Learning outcomes: • Broaden the students perceptions of scientists and science. • Increase the relevance of science to everyday life.	
Other learning outcomes: • Get to know the scientists. • Prompt more thoughtful questions. • Opportunity to interact with real scientists.	
Curriculum points covered: • Apply principles and concepts to unfamiliar situations. • Make informed judgements about science.	
Resources: • Live chat booking (important). • ICT suite (or whole class do it together via projector screen).	

Suggested adaptations

Support:
Ask scientists brainstormed questions from Lesson 2: Meet the Scientists and write down the answers the scientists give to them.

Extension:
Less reliance on Assigned Questions from Lesson 2: Meet the Scientists.

Lesson 4: Science In The Media Case Study: Nanotechnology (A)

Lesson	Format
Lesson 4 – Science In The Media Case Study: Nanotechnology (A) By now the students will have interacted directly with the scientists. In this lesson, students will consider how they and other members of the public may receive scientific information in their daily lives: indirectly via the media. Nanotechnology is used as the example.	***Starter: 25 minutes (or more if required)*** What is nanotechnology? Review previous learning on nanotechnology, or watch the You Tube clip (see Resources) as an introduction to nanotechnology. Please note it is not critical for students (or teachers) to have a detailed understanding of nanotechnology in order for lessons 4 and 5 to be of value. Key concepts that may be considered include: 1. Nanotechnology involves controlling the shape and size of materials at a very small scale: the nanometre scale (which includes the atomic, molecular and macromolecular scales); 2. The properties of materials are different at the nanoscale as compared to larger scales; and 3. Nanotechnology is a relatively new area of science, and as a consequence is still being characterized in terms of implications for regulation and control. ***Main Activity: up to 25 minutes*** Split the class into groups. Consider the 4 articles provided, and select some or all of the articles for your students. Ask the groups to read the article(s) provided, and perform the following tasks as time allows: • Summarise in 1-2 sentences what is being said in each article. Is the person being quoted for/against nanotechnology? • Make a list of which points in the articles are FACTS and which are OPINIONS. Is it difficult to tell the difference between the two? • Decide who would benefit the most if the points of view/opinions put forward in the article were accepted by the reader or the public. Does that mean that the person(s) quoted would also benefit? • Decide whether you think the people being quoted in the article have been able to tell the whole story or whether the journalist/reporter has edited out information to suit a particular angle for the news story. For example, is the person being quoted telling the whole story, part of the story or putting forward a point of view? How can you tell what is missing? ***Suggested Homework:*** Complete the tasks above relating to the news articles. Prepare to discuss your conclusions with the class at the next lesson.
Learning Objectives: Assist students to critically analyse and assess scientific information in the media. Encourage students to develop skills in critical thinking.	
Curriculum points covered: This lesson links with a consideration of the treatment of science in the media, as well as encouraging the development of information literacy i.e analysing and synthesising information relating to the sciences.	
Resources: YouTube clip: What's the big deal about nanotechnology? It's all about being really small. Big things are coming from the tiny world of nanotechnology. See the YouTube link 'Introduction to Nanotechnology' uploaded by OMSIVideo on 27 August 2009 (timed at 3:10): http://www.youtube.com/watch?v=8BTGzVScBso 4 articles written for this exercise (pages 11-14 of this booklet and via download on the I'm a Scientist website).	

Suggested adaptations

Support:
Ask the scientists how they feel about their research being presented in the media.

Alternative:
Lessons 4 and 5 can be substituted by the Debate Kit on Drugs in Sport included in the teacher materials and available online.

Lesson 4: Science In The Media
Case Study: Nanotechnology (A)

Article 1

Nanotechnology and sunscreen

Headline: Is sunscreen safe for you or not?

Sunscreen is essential to prevent sunburn, but does it cause problems for users later on?

Sunscreens help to filter out ultra violet (UV) radiation by using a combination of two types of active ingredients. Inorganic particles, such as zinc oxide or titanium dioxide, form a barrier which reflects UV waves. Meanwhile organic components absorb UV rays and release their energy as heat. Early sunscreens containing light-reflecting inorganic compounds looked almost like white paint.

Nanotechnology has made it possible to produce clear sunscreens (translucent) which cannot be seen when applied. Many modern sunscreens contain nanoparticles that make the sunscreen undetectable; it impossible to tell if a person is wearing any sunscreen. The nanoparticles in the sunscreen make the lotion invisible to the eye, which can be attractive for the consumer.

But according to the group Friends of the Earth, wearing translucent sunscreen is a poor consumer choice to make. The organisation says that the nanoparticles contained within the sunscreen might enter a person's blood stream by being absorbed through the layers of skin, and translucent nano-based sunscreens should not be sold.

However, a spokesperson for the regulatory body, the Therapeutic Goods Administration (TGA) says that all sunscreen ingredients used in Australia meet the regulatory standards for use. Jane Dodds, a scientist from the CSIRO, says that sunscreen users can safely use translucent sunscreens. She says the most recent clinical tests conducted in Australia into nanoparticles and sunscreens do not prove that nanoparticles enter the blood stream by being applied in a cosmetic sunscreen. "These sunscreens with nanoparticles for translucent properties are safe to use," she said.

Lesson 4: Science In The Media
Case Study: Nanotechnology (A)

Article 2

Nanoparticles to deliver drugs

Headline: Blood bubbles fizz up to deliver drugs

Scientists have discovered that nanoparticles and tiny bubbles can be used to more effectively deliver drugs into the blood stream. The effect of the drugs in the blood can be enhanced by adding magnetic nanosized particles to micro bubbles as part of a medical therapy.

This is a potent discovery that could lead to new treatments for diseases of the body or the brain. It also silences the critics of nanotechnology that nanoparticles are something unsafe to use on humans.

According to Eleanor AlterStride at Kings College at the University of London in the United Kingdom, the principle of bubbles to the body or the brain using nanotechnology is relatively simple. "An ultrasound is applied to the body to create micro bubbles in the blood causing them to oscillate, which boosts the uptake of drugs into nearby cells," she says.

"The bubbles created by the ultrasound are stimulating natural uptake mechanisms in the body which improves the efficacy of the drugs." Dr AlterStride says that magnetic nanoparticles help to further the effect of the drug by extending the life of the micro bubbles.

"Micro bubbles which oscillate can also be useful in drug administration for stroke therapy," said Dr Christina Slade at the University of Toronto. Dr Slade and her colleagues have developed different types of bubbles to treat stroke in rats. In the laboratory, they use nanoparticles and bubbles as part of their scientific research process on various diseases in rodents.

Dr Slade said: "Most importantly, the bubbles can be useful in cases where destruction is the goal. By turning up the intensity of the ultrasound energy, with the nanoparticles, the bubbles oscillate much more energetically and for longer, and can break down blood clots, tumours and kidney stones."

Dr Slade says that three days after an experiment to kill certain cancer cells, those rats that had received drugs via micro bubbles enhanced with nanoparticles had responded far better to the therapy than those without the nano-enhanced micro bubble therapy.

"The nanoparticles working with the micro bubbles have the potential to transform medical applications in a cost effective way with maximum impact on patients," Dr Slade said.

Lesson 4: Science In The Media
Case Study: Nanotechnology (A)

Article 3

Nanotechnology, regulation and the environment

Headline: UK report raises nanotechnology concerns

Australian regulators are being urged to investigate concerns about the use of nanomaterials in clothes and cosmetics after a British review claimed that the tiny particles had the potential to be as dangerous as asbestos particles.

A two-year study by the Royal Commission on Environmental Pollution (RCEP) in the United Kingdom has called for immediate testing to see if a range of household products such as cosmetics and deodorised socks which contain nanoparticles are safe.

The RCEP report claims that these items have similar properties to asbestos which can cause cancer. "While there was no direct evidence that the products were dangerous, there were major gaps between their increasing use and the reliable data available on their safety," the report said.

In Australia, the organisation Friends of the Earth (FOE) has said the British findings reinforced FOE concerns that some products sold in supermarkets had not been tested properly. According to FOE the British report alerts the public to the potential toxic risks of carbon fullerenes or 'bucky balls', which the FOE identified in several cosmetics on sale in Australia.

FOE has said that it is not just in Britain but also in Australia that we need to worry about nanoparticles and their effects on our health and environment. They have also said that the Royal Commission has warned that carbon fullerenes, which are tiny, soccer ball-shaped nanoparticles, pose high toxic risks, and their use in shaving cream, cosmetics and face creams is concerning.

The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) said that all products used in Australia must first meet the regulatory standards for use before becoming available in the market.

A NICNAS spokesperson said yesterday: "It's not true what the critics say about the use of nanotechnology in products. If we thought there was a problem with these items, then they would be recalled from the shops immediately. Product recalls are not that common with items containing nanoparticles or nanomaterials. We carefully check all items before releasing them into the market place. What the British Commission's report and the Friends of the Earth say is just wrong," the NICNAS spokesperson said.

Lesson 4: Science In The Media
Case Study: Nanotechnology (A)

Article 4

Nanotechnology and the health of the market

Headline: Is the nanotech boom at a risk to worker health?

The global nanotechnology market is growing rapidly with estimates that it will be worth $US27 billion by 2013. The Australian Business Council has said that the nanotechnology market in Australia has grown at a compound annual growth rate of 10 per cent each year for the past seven years. It is expected to continue to grow at this annual rate for the foreseeable future.

Some commentators in Australia claim that the speed at which nanotechnology markets are developing globally requires the Government to provide more details on its response the regulation of nanoscience. Of primary concern to them is whether the speed of development and economic benefits of nanotechnology are at odds with Australian health and safety policies and practices. Similar questions were raised at the annual international nanotechnology conference, held in Sydney earlier this year, which relate to the growth and impact of nanotechnology. The questions raised were: "Do the public understand the risks and rewards of nano materials?" and "Who should be regulating nanotechnology in Australia?"

The 2010 report The Government's approach to the Responsible Management of Nanotechnology has made a number of recommendations in relation to addressing human health and safety and environment risks with nanotechnology. One of the Report recommendations concerned the regulation of nanotechnology. This recommendation is linked with the public's expectation of the Government to regulate the health and safety effects of working with nanotechnology.

Consulting toxicologist Dr Tony Bruschi says, "The current global push appears to be to commercialize as quickly as possible. Unfortunately, the industry's approach to the 'precautionary principle' for hazard and exposure reduction appears to be lip service only" he said. Dr Bruschi said he thinks most Australians are considerate of the health, safety and environmental impacts of new technologies and concerned about these technologies' effect on worker health. He said he supported the Government's initiatives to implement measures to regulate nanotechnology because of the need to balance the risks of nanotechnology with any potential rewards.

A Victorian Trades Council representative said most people know little about nanotechnology but are generally supportive of it. "They trust scientists and expect that the Government will look after regulatory matters. However, if there is a problem, the public expects the Government will provide them with the necessary information to make a proper assessment of their own situation," she said.

Lesson 5: Science In The Media
Case Study: Nanotechnology (B)

Lesson	Format
Lesson 5 – Science In The Media Case Study: Nanotechnology (B) In this lesson students will review their work in lesson 4, and consider further examples of how nanotechnology is presented to the general public. ***Learning objective:*** Assist students to critically analyse and assess scientific information in the media. Encourage students to develop skills in critical thinking. ***Curriculum points covered:*** This lesson links with a consideration of the treatment of science in the media, as well as encouraging the development of information literacy i.e analysing and synthesizing information relating to the sciences. ***Resources:*** Links to YouTube clips: • *Nanotechnology - age of convergence*: http://www.youtube.com/watch?v=uf6EGvl7nJo • *Nanotechnology - the next BIG thing*: http://www.youtube.com/watch?v=gyHV_2QqPdA • *Be amazing!: A step-by-step guide to destroying civilization with nanotechnology*: http://www.youtube.com/watch?v=_0dYPnui3rM • *Nanotechnology nanorobots*: http://www.youtube.com/watch?v=h8NU5DbDDQk (Full description on page 16)	***Activity 1: up to 25 minutes*** Groups should reconvene, discuss and formulate conclusions relating to their consideration of the news articles and tasks from lesson 4. Groups may be invited to present their conclusions to the class. Students may then be encouraged to decide on a personal conclusion in answer to the question "Would I use nanotechnology?" (please note there is no right or wrong answer to this question). Their answers may be presented to the class, or comprise a written activity: students should be encouraged to provide supporting arguments for their conclusion. ***Activity 2: up to 25 minutes*** View one or some of the YouTube Clips referred to in the resources section. Invite the students to analyse the clip(s) to decide whether the information provided is balanced or if you think there is a vested interest behind opinions included in the articles. Look for facts (especially verifiable ones), opinions and quotations that indicate that the reporter is providing a balanced viewpoint or only part of the story. Write a report on the story detailing how you know when a story is balanced – what evidence have you found to indicate that the clip is balanced or only partially telling a bigger story. ***Suggested Homework:*** Look in newspapers, magazines, television news reports and websites for additional articles relating to nanotechnology, and critically analyse.

Suggested adaptations

Support:
Ask the scientists how they feel about their research being presented in the media.

Extension:

TechNyou SCIENCE EDUCATION RESOURCES

Teachers wishing to undertake a more detailed consideration of nanotechnology, biotechnology and other emerging technologies with their students may chose to explore the DIISR resource TechNyou (http://technyou.edu.au), which provides news and views, resources and fun tools to use in the classroom.

Lesson 5: Science In The Media
Case Study: Nanotechnology (B)

Nanotechnology - age of convergence

The author/YouTube creator suggests that humanity is approaching an evolutionary event horizon, where the organic and the synthetic, the virtual and the 'real', are merging into an operational ecology. The YouTube derails this operational ecology as an existence morphology for which there is no precedent in the history of which we are currently aware, catalysed by nanotechnology.

See the following YouTube link uploaded by Charles Ostman on 21 June 2006 (timed at 4:34): Nanotechnology - age of convergence http://www.youtube.com/watch?v=uf6EGvl7nJo

Nanotechnology - the next BIG thing.

Mathias Kolle, a PH.D. student in Physics at Cambridge University, United Kingdom reveals how technology will help change our lives in the future. He discusses the use of microscopes and laboratory experiments, cancer, the environment, and science and technology.

Uploaded to YouTube by truetubevideos on 15 August 2008 (timed at 4:27): Nanotechnology - the next BIG thing http://www.youtube.com/watch?v=gyHV_2QqPdA

Be amazing!: A step-by-step guide to destroying civilization with nanotechnology

This YouTube clip by Ransom Riggs and friends uses 3D animation created with motion capture technology to show how to live inside a whale, fight a zombie, attempt to destroy civilization by infiltrating an advanced research facility, and use nanotechnologies as a catalyst for disasters.

See the YouTube link uploaded by ransriggs on 08 March 2009 (timed at 6:15): Be amazing! http://www.youtube.com/watch?v=_0dYPnui3rM

Nanotechnology nanorobots

Nanorobotics is the technology of creating machines or robots at or close to the microscopic scale of a nanometre (10-9 metres). The author/YouTube creator suggests that nanorobotics is a still largely hypothetical nanotechnology engineering discipline of designing and building nanorobots. He details that nanorobots (nanobots, nanoids, nanites or nanonites) would be typically devices ranging in size from 0.1-10 micrometers and constructed of nanoscale or molecular components. He says that as no artificial non-biological nanorobots have yet been created, they remain a hypothetical concept.

See the YouTube link uploaded by 4DaBigTime on 28 June 2009 (timed at 2:15): Nanotechnology nanorobots http://www.youtube.com/watch?v=h8NU5DbDDQk

Lesson 6: Project analysis

Lesson	Format
Lesson 6 – Project analysis A structured way to look back on the project and analyse it.	***Starter: 5 minutes*** Show of hands, did they enjoy it? Initial thoughts on why/why not? What do they think about science now? ***Activity 1: 10 minutes*** Reflection questions for discussion 1. How did having the judging criteria affect their decision making? 2. Have they changed the information in their student profiles about their favourite and least favourite things about science? Why? What information prompted those changes? ***Activity 2: Evaluate (10 minutes)*** Fill in the student evaluation form available at www.imascientist.org.au/feedback ***Plenary: 5 minutes*** Quick show of hands and discussion. Would they want to do it again? Would they want to change the event?
Learning objective: To reflect on and consolidate own learning during the project.	
Other learning outcomes: • To consider the benefits of the project and highlight problems or difficulties. • Empower students (it's not perfect, their opinion is useful). • Consider purpose – does it matter if their favourite didn't win if they learnt things and enjoyed it?	
Curriculum points covered: • Society and individuals make decisions on issues relating to science and technology. • Different issues need to be weighed up and this can be difficult.	
Resources: • Access to the I'm a Scientist website. • ICT suite if possible.	

Evaluation

Any:
Teachers and students should also fill in a feedback survey online to let us know what they think of the event and if/how they think we should change it. This is found at www.imascientist.org.au/feedback

Notes