ROYAL STATISTICAL SOCIETY
DATA | EVIDENCE | DECISIONS

Royal Statistical Society – Science for Journalists module

Note: excludes instructions on "How to go through this online course", which are specific to the online implementation.

Storyboard of Science for Journalists module, published at http://www.statslife.org.uk/resources/for-journalists
Students should use the interactive course if possible, for the optimum learning experience. This is provided for the benefit of those who require a text-only version of the course.

Section 1: Welcome and introduction

Screen 1: Welcome and introduction

Learning outcomes:

- Users receive a general welcome to the course.
- Outline the Society's commitment to science journalism and health news reporting.
- Give credit to the Department of Business Innovation and Skills for funding.

Screen type:

Text, graphics + audio.

Screen content:

Graphics:

- Royal Statistical Society Logo with strapline of "Data Evidence Decisions" (Hotspot 1).
- Department for Business Innovation and Skills Logo (Hotspot 2).

Audio:

None.

Text:

Welcome to the Science for Journalists e-learning module, which aims to encourage you to think more critically about how you report on science and health stories in the media.

This module will help you to understand how scientists think and work, and will encourage you to think how best to report on stories featuring science and health issues.

Click on the logos to find out more about the module, and the organisations involved.

Text for Hotspot 1:

This module forms part of the Royal Statistical Society's Science Journalism Programme, a programme launched in 2010, as part of the wider RSS GetStats campaign. The Royal Statistical Society is a membership body for anyone with an interest in statistics. One of its core goals is for society to be more statistically literate, so that everyone's understanding of data, risk and probability can inform their daily decision making, leading to better outcomes.

Text for Hotspot 2:

The programme was funded by the Department for Business Innovation and Skills (BIS) from 2010-2014 and aims to improve the scientific and statistical understanding of journalism professionals, and journalism students, through workshops delivered by science and statistics professionals across the UK.

As part of the programme, the RSS have developed e-learning modules to support journalists and journalism students in effective science, data and statistics reporting.

This module, Science for Journalists, is one of two E-learning modules on the RSS Science Journalism Programme.

Resources:

None.

Section 2: Instances of science and health misreporting

Screen 2: Why good science and health reporting matters

Learning outcomes:

Users will be able to:

- Understand the importance of effective reporting on science and health news, and the serious consequences that can result from inaccurate reporting, as it pertains to the MMR scandal

Screen type:

Animated graphics of newspapers, with text.

Screen content:

Graphics:

Animation of images of stories from the following news sources, piling up on top of one another to imitate a stack of stories**:**

- Lancet journal article
- The Independent – MMR and autism story.
- BBC News – MMR and autism story
- BBC News – BSE in cattle story
- The Independent - BSE in cattle story.
- BBC News – ebola virus story.
- Daily Mail – story about eating cake to lose weight
- Sunday Post – story about Alcohol at 14 is a Binge Drinking Risk
- The Guardian – story about diabetes
- NHS Choices – story about diabetes.

Audio:

Every day, newspapers publish and print thousands of words and numbers on the latest findings in science, in articles which are read all over the world. As a journalist, you want to get it right; it is important for your work to be accurate and fair, in order to maintain your own professionalism and integrity, and to best serve your readers and listeners.

Text:

Every day, newspapers carry thousands of words about the latest science findings, and a big result, such as the discovery of the Higgs Boson, can expect to be reported across the globe.

Although there are specialist science journalists, science and health-based stories are present in every journalist's 'beat' – be that local news, business, sport, lifestyle or features.

It is important, professionally and personally, for your work to be accurate and fair. This means both striving to get it right, and avoiding pitfalls. Guarding against vested interests, poor press releases, or being misled by authority, will help you to produce high-quality and responsible journalism that better serves your readers and listeners.

There are wider social issues and ramifications to consider too, which we will explore in the next topic.

Resources

- IFJ Declaration of Principles on the Conduct of Journalists - http://www.ifj.org/about-ifj/ifj-code-of-principles/
- NUJ Code of Conduct - https://www.nuj.org.uk/about/nuj-code/ .

Screen 3: MMR vaccine - The perils of bad science reporting

Learning outcomes:

Users will be able to:

- Understand the importance of effective reporting on science and health news, and the serious consequences that can result from inaccurate reporting, as it pertains to the MMR scandal.

Screen type:

Chart with three years highlighted as hotspots.

Screen content:

Graphics:

- Chart 1 Measles Notifications
- Chart 2 Graph Yearly Measles Cases

Audio:

There are many perils of 'Bad Science Reporting' that you should be aware of. Take a look at this widely publicised example.

Misreporting science stories can have severe consequences - so the potential impact of your reporting should always be considered.

Text:

The potential impact of misreporting science stories can be severe. After the publication of a paper by Dr Andrew Wakefield in *The Lancet*, widespread news reports stated linking the MMR (Measles, Mumps, Rubella) vaccine to cases of autism. Public confidence in the vaccine dropped, and the vaccine was used less, with a correlating subsequent increase in cases of measles. Years later, the effects are still being felt.

Many subsequent studies found no link between MMR and autism. Wakefield was struck off by the General Medical Council, for acting dishonestly, with undeclared conflicts of interests. The paper was retracted. However, widespread panic was not entirely his fault; his public claims went further than what was presented in the scientific paper, and he had actively courted the press. If the journalists at the time had assessed the quality of the evidence and reported accordingly, this event may not have happened.

Text for hot spots

Click on "1968" – Measles vaccine introduced – dramatic reduction in cases of measles begins.

Click on "1988" – Combined MMR Vaccine introduced – further decline in cases of measles.

Click on "1998" – MMR autism link suggested by Wakefield – clear increase in confirmed cases of measles in subsequent years.

Resources:

- Original paper published in the Lancet http://dx.doi.org/10.1016/S0140-6736(97)11096-0
- Public Health England: Measles, mumps, rubella (MMR): use of combined vaccine instead of single vaccines https://www.gov.uk/government/publications/mmr-vaccine-dispelling-myths/measles-mumps-rubella-mmr-maintaining-uptake-of-vaccine
- Public Health England: Measles: guidance, data and analysis https://www.gov.uk/government/collections/measles-guidance-data-and-analysis
- BMJ: Wakefield's article linking MMR vaccine and autism was fraudulent
- http://dx.doi.org/10.1136/bmj.c7452

Section 2: What is science?

Screen 4: Perceptions of science

Learning outcomes:

Users will be able to:

- Consider their perceptions of science and scientists, and understand the common misconceptions of science

Screen type:

Drag and drop – with pop-up responses. Learners drag pieces of paper with text statements into a scientific flask; a pop up window responds with comments.

Screen content:

Graphics:

Photograph of flask (stock image).

Audio:

We've looked at why it is important to take care when reporting on science and health stories. Now, let's look at what makes science, *science*, and think about how scientists work.

What ideas do you have of science and scientists? Select any of the statements that you believe to be true, and test them in the flask.

Text:

What ideas do you have of science and scientists? Drag and drop any of the statements that you believe to be true into the flask.

- Science advances by big breakthroughs.
- Science makes slow steady progress towards discoveries.
- Science proves things.
- Science disproves things.
- Scientists are neutral.
- Scientists are biased.
- The scientist is a lone genius.
- The scientist makes discoveries in collaboration with colleagues and experts.
- Scientists are always truthful.
- Scientists do not always tell the truth.

Feedback for each statement tested:

Science advances by big breakthroughs: If only it were true! Science is a slow, deliberate process, and often "breakthrough" either overstates a finding or ignores the years of incremental successes preceding it.

Science proves things: Science collects and weighs evidence, and makes declarations and predictions based on that – supporting or rejecting ideas. If later evidence is strong enough, then these predictions can be changed. This does not mean that science is unreliable - many scientific ideas are well-supported by evidence so are unlikely to be wrong.

Scientists are neutral: Scientists are human – some are competitive, some have arguments, some have personal bugbears, some have fights, some crave attention… treat them as you would any other interviewee in that respect.

'The Lone Genius': The Lone Genius is a trope that gets aired routinely – it's a fun idea, the man in the shed inventing cold fusion, etc., but in reality science is almost always carried out in collaboration, frequently across different institutions.

Scientists are always truthful: Don't let anyone play the Dr card without giving you evidence to support their claims. Scientists can have opinions, especially informed opinions, but claims should be treated with due scepticism – where's their evidence?

Science makes slow steady progress towards discoveries: Yes. Revolutions are rare. Science is a slow, deliberate process, and often "breakthrough" either overstates a finding or ignores the years of incremental successes preceding it.

Science disproves things: Rejecting hypotheses – showing that an idea is not true – is a common scientific method, but it is not the whole story. Science collects and weighs evidence, and makes declarations and predictions based on that – supporting or rejecting ideas. If later evidence is strong enough, then these predictions can be changed.

Scientists are biased: This bias may not be sinister – unconscious bias affects us all. Techniques such as double-blind trials help to ensure that the researchers' expectations don't affect the results. You should be aware of other potential biases too, eg from funding or publisher.

The scientist makes discoveries in collaboration with colleagues and experts: Yes, most scientists work in collaboration, with other researchers, who may be in different institutions or different countries. These teams may be from a few people to many thousands (eg the CERN particle physics laboratory).

Scientists do not always tell the truth: The lack of truth may be accidental - we all make mistakes. In addition, you may be aware of famous cases of scientific fraud. As a journalist, you're required to distinguish fact from opinion - scientists can have opinions, especially informed opinions, but claims should be treated with due scepticism – where's their evidence?

Resources:

- Understanding science: Misconceptions about science
  http://undsci.berkeley.edu/teaching/misconceptions.php
- International Council for Science: Bias in science publishing
  http://www.icsu.org/publications/cfrs-statements/bias-in-science-publishing
- Retraction Watch http://retractionwatch.com/

Screen 5: The process of science

Learning outcomes:

Users will be able to:

Understand the scientific process and how it differs from other forms of thinking

Screen type:

Five captioned pictures displayed across the screen are hotspots cueing audio tracks.

Screen content:

Graphics:

Five hotspot pictures:

- Aristotle – Photograph of star trails in the sky by James Lee/Flickr Used under CC-BY licence http://www.flickr.com/photos/37176760@N06/5397960367
- Ptolemy – Drawing of Ptolemaic system. Public domain from Wikimedia: http://commons.wikimedia.org/wiki/File:Ptolemaic_system_2_(PSF).png
- [Image] http://commons.wikimedia.org/wiki/File:Copernican_heliocentrism_diagram-2.jpg
- Copernicus – Drawing of Copernican heliocentrism diagram - Public domain from Wikimedia: https://commons.wikimedia.org/wiki/File:Copernican_heliocentrism_diagram-2.jpg
- Galileo – some of Galileo's writing - Galileo manuscript. Public domain from Wikimedia: https://en.wikipedia.org/wiki/File:Galileo_manuscript.png
- Scientific Process: a circle of three words, Observe, Hypothesise and Test. Arrows point from Observe to Hypothesise, from Hypothesise to Test and from Test to Observe.

Audio:

Let's explore how science works, and how scientists think, by looking at how our understanding of the Earth and the stars has changed over time.

Audio for hotspot Aristotle

The ancient Greek philosopher Aristotle believed that the planets, the Moon, the Sun and the stars all orbited Earth. He observed the Sun moving across the sky, and to test whether the Earth was moving, threw a ball straight up in the air.

Audio for hotspot Ptolemy

Though other ideas existed at the time, this concept of the Earth at the centre of the universe took hold in academic discourse and in wider society. The Roman citizen Claudius Ptolemy published a detailed description in 150 A.D, which became the authoritative text on the matter.

Audio for hotspot Copernicus

As observations of the Sun, the planets and the stars improved, this idea started to look weak – more and more modifications were required to take account of the new, more detailed, observations. In the 1500s, the Polish astronomer Nicolaus Copernicus published a theory that the Earth circled the Sun.

Audio for hotspot Galileo

Galileo provided the evidence for Copernicus's idea. Galileo developed a better telescope than had existed previously, and in 1610, saw that moons orbited Jupiter – showing that Aristotle's idea was not right. He also observed the phases of Venus, lending support to Copernicus' idea that planets orbit the Sun.

Audio for hotspot Scientific Process

Further improvements would be made to this idea over time – by Johannes Kepler, Isaac Newton and Albert Einstein, amongst others. For all of these, ideas – or hypotheses – are formulated, and are tested by gathering evidence.

What separates scientific knowledge from speculation, is this scientific process: a cycle of observing the natural world, producing a hypothesis, and then, crucially, finding ways to *test* this idea. This cycle can then repeat, building up hypotheses and evidence, reinforcing ideas or replacing them over time.

If later evidence is strong enough, then a hypothesis can be replaced or changed – as happened with our understanding of the Earth and stars. This does not mean that science is unreliable - many scientific ideas are well-supported by evidence so are unlikely to be wrong.

This scientific process lies at the core of science, and how scientists think and work.

Text:

Let's explore how science works, and how scientists think, by looking at how our understanding of the Earth and the stars has changed over time.

Click on each of the icons to find out more.

Text for hotspot Aristotle

Aristotle believed that the planets, the Moon, the Sun and the stars all orbited Earth, and tried to test whether the Earth was moving.

Text for hotspot Ptolemy

Ptolemy published a detailed description of the concept of Earth at the centre of the universe in 150 A.D, which became the authoritative text on the matter.

Text for hotspot Copernicus

Copernicus published a theory that the Earth circled the Sun in the 1500s, after observations of the planets, the Sun and the stars improved, and previous theories began to look weak.

Text for hotspot Galileo

Galileo provided evidence for Copernicus's idea, after developing a better telescope and observing that Aristotle's idea was not correct.

Text for hotspot Scientific Process

The scientific process – separating scientific knowledge from speculation.

Over time, further improvements were made to Galileo's idea as tests and methods improved, bringing more evidence.

The scientific process is a cycle of observing the natural world, formulating hypotheses, and testing by gathering evidence. A hypothesis can be replaced or changed if later evidence is strong enough. This does not mean that science is unreliable - many scientific ideas are well-supported by evidence so are unlikely to be wrong. This scientific process lies at the core of science, and how scientists think and work.

Resources:

- Understanding science http://undsci.berkeley.edu/
- NASA Earth Observatory: Planetary Motion: The History of an Idea That Launched the Scientific Revolution http://earthobservatory.nasa.gov/Features/OrbitsHistory/
- Universe Today: Why Einstein will never be wrong http://www.universetoday.com/108044/why-einstein-will-never-be-wrong/

Screen 6: The scientific method

Learning outcomes:

Users will be able to:

- Understand the scientific method (empiricism).

Screen type:

Quiz - rank the order of the Scientific Method.

Screen content:

Graphics:

None.

Audio:

Have a go at this exercise. See if you can get the steps of the Scientific Method in the correct order.

If you can understand this process, you'll be better able to understand how scientists think.

Text:

Here's the scientific method broken down a little. Shuffle these steps into the correct order.

- Construct a hypothesis.
- Test your hypothesis by doing an experiment.
- Do background research.
- Analyse your data and draw a conclusion.
- Ask a question.
- Communicate your results.

Correct response:

1. Ask a question.
2. Do background research.
3. Construct a hypothesis.
4. Test your hypothesis by doing an experiment.
5. Analyse your data and draw a conclusion.
6. Communicate your results.

Text displayed in pop-up for correct feedback:

It's important to understand how scientists think. At the heart of everything scientists do is the scientific method. This is the cycle through which we observe nature; we formulate ideas, and - critically – we test those ideas to see whether they are correct, or not.

Text displayed in pop-up for incorrect feedback:

That's not quite right, have another try. Remember, scientists look at the natural world and what is known already, and have ideas that are formulated into a hypothesis, which is then tested.

Resources:

- Steps of the Scientific Method: http://www.sciencebuddies.org/science-fair-projects/project_scientific_method.shtml
- Understanding science http://undsci.berkeley.edu/

Screen 7: Design a good experimental study

Learning outcomes:

Users will be able to:

- understand some of the elements of what constitutes a good scientific study
- have a greater awareness of the scientific process/method.

Screen type:

Tick box quiz – six statements.

Screen content:

Graphics:

None.

Audio:

Introductory audio:

A key part of the scientific method is the testing stage – finding reliable evidence that supports, or rejects the hypothesis.

If we wanted to test the hypothesis that a new vaccine is better than an existing vaccine, how would we design a good experimental study?

Audio played at end of quiz:

To make a fair comparison, we might want to use a technique known as *experimental controls*. Controls enable us to eliminate other external factors as the cause of a phenomenon.

We'd want to study a sufficient number of people - to have a large enough *sample size*.

We'd want to protect against forms of bias - by randomly selecting who should take part in the experiment as test subjects.

We'd want to measure other factors that we think might affect the outcome - a good study will try to detect *confounding factors* that might influence the outcome.
And we'd want to assess whether it is likely that the difference between the groups is real - or if it is just luck - by *statistical analysis*.

Text:

How would we design an experiment to test whether a new vaccine is better than an existing vaccine?

Select each of the tasks you would choose to do.

- Have experimental controls – compare people receiving the new and the existing vaccine
- Randomly select which people get each vaccine
- Choose a very small number of people to take part – a small sample size
- Measure other factors that might affect outcome
- Do not take into account likelihood that results are based on luck
- Tell the doctor and patient which vaccine they are receiving and that you expect the new vaccine to be better.

Correct response:

- Have experimental controls – compare people receiving the new and the existing vaccine
- Randomly select which people get each vaccine
- Measure other factors that might affect outcome

Text displayed in pop-up for correct feedback:

That's correct – well done. Good experimental design will take account of these and other factors.

Text displayed in pop-up for incorrect feedback:

Sorry, that's not correct – see above for the correct answers.

Resources:

- Cancer Research UK: About randomised trials http://www.cancerresearchuk.org/about-cancer/trials/types-of-trials/about-randomised-trials
- NHS Choices glossary http://www.nhs.uk/news/Pages/Newsglossary.aspx

Section 3: Science and stories

Screen 8: From lab bench to front page

Learning outcomes:

Users will be able to:

- Understand the process of scientific research ending up in the newspaper

Screen type:

Five hotspots statements bring up

Screen content:

Graphics:

- Researcher in a lab (Image credit – Thinkstock/Alexander Raths)
- Researcher reviewing a paper (Image credit: public domain via Wikimedia http://commons.wikimedia.org/wiki/File:ScientificReview.jpg)
- Shelves of academic journals in a library (Image credit Thinkstock/ gorsh13)
- Person working at a computer (Image credit: Public domain via Pixabay: http://pixabay.com/p-338561/)
- Reporter with microphone talking to a TV camera (Image credit - Jonut – Flickr via Wikimedia: http://en.wikipedia.org/wiki/Journalist#mediaviewer/File:Reporter.jpg)

Audio:

Introductory audio:

What happens on the journey from lab bench to front page?

Audio played after last hotspot chosen:

Research institutions, publishers of research findings, and scientists themselves are compelled to secure good publicity. This may lead to exaggeration, especially in publicity material or interviews. This was a major part of the MMR-autism story: the original research paper was quite conservative, but the lead author greatly exaggerated the significance of the work in media interviews.

The researcher may only want to talk about their results – but for you to get the bigger picture, and put the work in context, you'll need to get a second, independent, opinion.

Your outlet's editorial line, issues of space, or timing all come into play, too. Also, scientists and journalists use language rather differently – even individual words like **theory**, or **significant**.

It's important to bear these factors in mind, and the challenges that arise, as science hits the headlines.

Text:

Starting from the left, select each section and follow the process through to find out more.

- Scientist makes discovery in research laboratory, university or private institution.
- Research paper submitted for peer review.
- Research published in academic journal.
- Press officer at journal and/or academic institution sends out press release.
- Journalist receives press release and writes article.

Resources:

- Science Media Centre http://www.sciencemediacentre.org/working-with-us/for-journalists/

Screen 9: How science is communicated

Learning outcomes:

Users will be able to:

- Understand two common ways that new research is communicated within the scientific community.
- Gain an awareness and understanding of importance of review articles

Screen type:

Four Hot spot images with pop-up text.

Screen content:

Graphics:

- Hotspot 1 – Conferences – Stock image of microphone.
- Hotspot 2 – Journal articles – Image of start of article on caffeine and sport. Hodgson AB, Randell RK, Jeukendrup AE (2013) The Metabolic and Performance Effects of Caffeine Compared to Coffee during Endurance Exercise. PLoS ONE 8(4): e59561. doi:10.1371/journal.pone.0059561
- Hot spot 3: Review Articles: Image of start of review article on health benefits of wine. Yoo, Y. J., Saliba, A. J. and Prenzler, P. D. (2010), Should Red Wine Be Considered a Functional Food?. Comprehensive Reviews in Food Science and Food Safety, 9: 530–551. doi: 10.1111/j.1541-4337.2010.00125.x
- Hot spot 4: Systematic reviews: Cochrane review of measles, mumps and rubella vaccines. Demicheli V1, Jefferson T, Rivetti A, Price D. Vaccines for measles, mumps and rubella in children. Cochrane Database Syst Rev. 2005 Oct 19;(4):CD004407.

Audio:

As a journalist, you’re likely to hear about scientific news through a press release – many of these press releases are based on one of four common ways for scientists to communicate their work: a conference discussion, a journal article, a review article, or a systematic review. Select each of the images to find out more.

Text:

As a journalist, you’re likely to hear about scientific news through a press release – many of these press releases are based on one of four common ways for scientists to communicate their work: a conference discussion, a journal article, a review article, or a systematic review. Select each of the images to find out more.

Text for Hotspot 1: Conferences:

Conferences are where researchers get together and talk about their work – which may be work in progress, work completed or work yet to be done. Research discussed at conferences may not have been checked by other researchers – if you are reporting on research from a conference, finding out the status of the work, and getting a second or third opinion, are especially important.

Text for Hotspot 2: Journal articles:

This is an example of a journal article, which usually reports on the results of a single experiment or series of experiments by one group of researchers. This is one of the primary ways that research is communicated to other researchers. We will look at this in more detail shortly.

Text for Hotspot 3: Review Articles:

This is an example of a comprehensive review. Reviews are extremely useful summaries of the state of research in a particular field. The authors summarise the findings of a number of research papers on a particular topic that have been published in recent years, and provide a consensus.

Text for Hotspot 4: Systematic reviews:

Systematic reviews use an explicit set of methods to combine the data from all reliable studies in a subject to give a (hopefully) definitive answer on a subject. This is a very involved and complex process, which only takes place in medicine. An organisation called the Cochrane Collaboration is behind most of the activity, and there's a rich resource of peer-reviewed systematic reviews on medical subjects, which have these plain language summaries.

Pictured is the result of a systematic review of the effects of the MMR vaccine. These 139 studies investigated more than 10,000,000 people in total. Compare this to the 12 children studied in the 1998 paper**.**

Resources:

- SciDevNet: Beyond press releases: How to dig up science stories http://www.scidev.net/global/communication/practical-guide/beyond-press-releases-how-to-dig-up-science-stories-1.html
- SciDevNet: Reporting from science conferences http://www.scidev.net/global/communication/practical-guide/reporting-from-science-conferences.html
- Cochrane Reviews http://www.cochrane.org/cochrane-reviews

Screen 10: Assessing quality

Learning outcomes:

Users will be able to:

- Understand the purpose and function of peer review
- Understand how this can aid better science reporting

Screen type:

Three Hotspot images with pop-up text.

Screen content:

Graphics:

Three photographs of individuals, dressed in a professional manner.

Audio:

What is a peer review? - Click on each of the reviewers to find out more about the process, and questions you should ask.

Text:

Publication in scientific journals provides a permanent record of the work. Authors choose where to submit their work for publication. Articles submitted for publication are scrutinised rigorously by experts in the field in a process known as peer review.

Click on each reviewer to find out more about the process, and questions you should ask.

Text for hotspot one:

Peer reviewers assess whether the claims the authors make are backed up by their evidence

Text for hotspot two:

Peer reviewers usually comment on whether the work is important, novel and relevant

Text for hotspot three:

Peer reviewers recommend whether the article should be published, rejected or if more work needs to be done.

Text for display after third hotspot selected:

The peer review process is normally secret – the reviewers' comments are only made known to the authors. One exception is with post-publication peer review, where the article is published, and then commented on publicly.

Peer review is a useful check of quality, but is not designed to prevent fraud, serious errors and plagiarism (copying). Not all journals run a peer review process, and the acceptance threshold varies between journals.

It's a good idea to get a second opinion on a piece of research. Relevant questions include:

- Has the paper been peer reviewed?
- How reliable is the journal?
- How obscure is the journal? (note that research published in high-profile journals is not automatically newsworthy)
- How does this research fit with the wider research literature?
- What has the paper missed out?

Resources:

- Sense about science: Peer review http://www.senseaboutscience.org/pages/peer-review.html I don't know what to believe about peer review
- http://www.senseaboutscience.org/data/files/resources/16/IDontKnowWhatToBelieve_web2011.pdf

Screen 11: How excited should I be?

Learning outcomes:

Users will be able to:

- Gain an awareness and know how to make a good judgement on a press release/scientific study.

Screen type:

Statements shown in a list that can be ranked and checked by the learner.

Screen content:

Graphics:

None.

Audio:

When reporting on a scientific study, how do you decide what to use? Have a go at this exercise.

Text:

Looking more closely at journal articles - what sorts of studies are reported on in journals?

Researchers report on various stages of research. This is especially true in medicine, where journals carry work ranging from reports of instances of disease, to larger studies with control groups, through to the systematic reviews we discussed earlier.

These follow a hierarchy of reliability and importance, which can be difficult to spot from the technical terms used – try ranking them from 1 (highest) to 7 (lowest) and select Submit.

Correct order of statements

- Systematic Review of Randomised Controlled Trials (RCTs)
- Randomised Controlled Trial (RCTs) - subjects allocated (at random) to two or more groups to test treatment or drug
- Cohort study – study a group of people over time to see if a disease occurs
- Case-control study – looking back in time at groups of patients with and without a potential disease
- Case series - descriptive observation of a group of cases with the same disease
- Case report - anecdotal observation of individual case of disease
- Opinion

Text displayed in pop-up for correct feedback:

Recommended hierarchy.

On the right we see a hierarchy for studies of disease. For the development of treatments, there's a similar hierarchy from cells to humans – success of treatments in cells and mice should not be extrapolated to the human population.

Find out the limitations of a study, and what can justifiably be claimed based on it – headlines of a "cure" frequently disappoint current patients. We'll look at ways of finding a second opinion shortly.

Resources:

- NHS Choices:Types of medical research http://www.nhs.uk/Conditions/Clinical-trials/Pages/Healthresearch.aspx
- NHS Choices Glossary http://www.nhs.uk/news/Pages/Newsglossary.aspx

Screen 12: How to read a scientific paper on a deadline

Learning outcomes:

Users will be able to:

- Understand the key features of a scientific paper
- Gain an awareness of best practice tips and techniques for sourcing a study for a news article.

Screen type:

Text with image.

Screen content:

Graphics:

Screenshot of the start of a journal article - Jepsen R, Aadland E, Robertson L, Kristiansen M, Andersen JR, Natvig GK. (2014) Factors and associations for physical activity in severely obese adults during a two-year lifestyle intervention. PeerJ 2:e505 https://dx.doi.org/10.7717/peerj.505

Audio:

If you have the time, checking the original paper can help your story – to help you check out some of the claims, find interesting angles, or to inspire useful questions to ask experts.

To read the paper on a deadline: First, look at the abstract, which tells you briefly what was done and what the principle results were. Do these match those in the press release?

Jump down to the discussion or conclusion; if it's long, look at the last few paragraphs. The important results and implications are found here – does this look like a good story? Note down any speculation to get comment on from an independent expert.

Next, skim the results and the methods sections – does this look consistent with what you've read?

Finally, to dig deeper, and find the context for the story, look at the introduction, where the author will set out what led to the research, why it was done, and why they consider it's important.

Text:

Most papers follow the same layout, so you can check the main parts for interesting questions or obvious oddities without being an expert. Follow this order:

Abstract: a summary of what was done and what was found. Does this match the press release?

Jump to the Discussion or Conclusion, to find the important results, authors' views of what the results mean, and speculation on significance. Does this match?

The results and the methods sections contain the data and a description of the process – does this look consistent and appropriate?

Finally, to dig deeper, find the context for the research in the Introduction or Background section.

Resources:

- ScienceBlogs: How to read a scientific paper
  http://scienceblogs.com/principles/2012/01/10/how-to-read-a-scientific-paper/
- How to Read a Scientific Paper animated tutorial
  https://www.lib.purdue.edu/help/tutorials/scientific-paper

Screen 13: Finding experts – getting a second opinion

Learning outcomes:

Users will be able to:

- Understand the key features of a scientific paper
- Gain an awareness of best practice tips and techniques for sourcing a study for a news article.

Screen type:

Three hotspot graphics with pop-up text.

Screen content:

Graphics:

- Hotspot 1 – photograph of an expert woman (stock image).
- Hotspot 2 – screenshot of Science Media Centre website
- Hotspot 3 – photograph of balance scales (Credit: Thinkstock/Kittisak_Taramas)

Audio:

After you've found a story, you'll most probably have questions that need answering. But how do you find an expert?

Select each of the hotspots to find out more.

Text:

You've looked into the story, and have some questions. Some will be for the researchers and press officers who provided the story. As we've seen, it's also a good idea to get independent expert comment.

Text for hotspot 1:

Finding an expert: You'll want to find one or more experts who are not involved with the research but who are knowledgeable of the area (be sure to ask). A quick route is to look for suitable experts based at respected institutions – most universities have expert directories online, with many university press offices having science specialists. Failing that, searching Pubmed or Google Scholar for similar work may bring up results.

Text for hotspot 2:

The Science Media Centre: An independent charity that helps news journalists to get access to the best science and scientists when science stories are making the headlines. Offer expert comment, briefings and advice.

Text for hotspot 3:

A question of balance? Balance is a strong journalistic tradition, but when this is applied to science stories problems can arise. Think in particular about the publication of a key piece of evidence, or of a comprehensive review, say of MMR or climate change: is equal weighting to opposing views fair or accurate here? Conversely, if you're approached by a researcher claiming a miracle cure, and no other researcher considers it likely, should you exclude these dissenting voices?

Resources:

- Science Media Centre http://www.sciencemediacentre.org
- PubMed http://www.ncbi.nlm.nih.gov/pubmed
- Google Scholar https://scholar.google.co.uk

Section 4: Conclusion

Screen 14: Conclusion

Learning outcomes:

- Summary of the course.

Screen type:

Text and audio.

Screen content:

Graphics:

None.

Audio:

In this module, we have provided a brief overview of how science works, how scientists think, and how scientific knowledge is disseminated.

We hope this has helped you to understand how to approach scientific research and researchers, and given you the key questions to ask, to help you report on stories well. Your high quality, fair and accurate reporting on science issues will be of interest to your audience, and of value to wider society.

You can also go to the Resources section to find a range of organisations and guides to help you further develop your skills and provide resources.

Text:

This module has provided you with a brief overview of how science works, how scientists think, and how scientific knowledge is disseminated.

You can go to the Resources section to find a range of organisations and guides to help you further develop your skills and provide resources.

Thank you for your time.

Resources:

- The Royal Statistical Society – http://www.statslife.org.uk/resources/for-journalists
- The Science Media Centre http://www.sciencemediacentre.org/working-with-us/for-journalists/ including 10 best practice guidelines for science and health reporting

http://www.sciencemediacentre.org/wp-content/uploads/2012/09/10-best-practice-guidelines-for-science-and-health-reporting.pdf

- BBC Academy: Science http://www.bbc.co.uk/academy/journalism/subject-guides/science
- The Guardian: Secrets of good science writing http://www.theguardian.com/science/series/secrets-science-writing+culture/awards-and-prizes
- Science Media Centre New Zealand: Desk Guide for Covering Science http://www.sciencemediacentre.co.nz/deskguide/
- The Association of British Science Writers http://www.absw.org.uk
- Sense about Science: http://www.senseaboutscience.org

Credits

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For further details, see statslife.org.uk/resources/for-journalists or contact Scott Keir, Head of Education and Statistical Literacy, Royal Statistical Society, 12 Errol Street, London, EC1Y 8LX, email: s.keir@rss.org.uk.

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