A lesson plan used by Tamara Ingamells, Cheney School, Oxford, to help teenagers understand the importance of biases and the way they led to Dr. Andrew Wakefield's assertion that inoculation against mumps, measles and rubella predisposed to autism.

Context of lesson/reflections on previous learning: Students should be investigating source evidence and looking at bias – how can they feel confident in relying on the evidence that they have been given?

Lesson Title: "The Man Who Swallowed The Pea, and Other Tall Tales".	Duration 1 hr
Learning Intentions: (*What I want students to learn*) What is bias? How do I know that the source in front of me is suitable? How can I spot "bad science"? What is the impact of scientific research on public health? How does the media influence impact on scientific research in positive and negative ways?	Success Criteria: (*Evidence of successful learning*) Pupils can explain they think a resource is good/bad, using both literacy skills and scientific thinking. Pupils can identify success criteria for planning and running of clinical trials/spotting 'bad science'. Pupils can analyse data to show the impact of scientific research on public health
Differentiation Some pupils may need reading strategies, e.g. TA support, reading aloud, keyword lists, dictionary support. Writing frames, sentence starters and vocabulary help may be needed for written activity. Tasks may need scaffolding, e.g. by breaking into smaller chunks or by separating into groups to focus on one resource, then coming back and sharing information.	Literacy /Numeracy skills Literacy – use of newspaper articles, journal articles and assessment of key terms especially 'buzzwords' Numeracy – use of data on MMR uptake and subsequent measles outbreaks in UK

Learning plan (*activities, resources, use of support staff,*):		Strategies for checking learning
Teachers will:	Learners will:	
Introduce the two articles to pupils. *It may be useful to set up 'control' groups – some groups to be given articles with nothing identifying which news body they are from. Do pupils still come to same conclusions?*	Read through the BBC and Daily Mail articles on "the man who swallowed the pea". Discuss in small groups – which article do they believe? Why do they believe that one?	Circulate around class. Encourage students to compare and contrast both language of article and type/relevance of scientific evidence available.
Bring whole class back – which article seems more likely to be true? Why? *If control group given, get pupils to compare results – did the pupils who did not know which source they had come to same conclusions about validity of article?*	Pupils to explain to class why they supported that particular article as more likely to be real. Pupils who are aware of the sources of article are often more likely to choose BBC as 'better' – can they justify why they think that?	
Show BBC April Fool's Spaghetti on Trees video. Give information about how many people subsequently called in to the BBC asking how they could get a spaghetti plant!	Pupils to evaluate the evidence provided in each article. Which article provides more supportive scientific evidence? Which provides more sources/citations? How does that influence their feelings about how true this story is?	
Discuss Andrew Wakefield and the MMR vaccination. *Statistics showing numbers of babies getting vaccinations vs. number of reported cases of measles are very useful here!*	*At this stage, pupils could either be taught directly by teacher, read web cartoon on MMR, or do independent guided research to find out about Andrew Wakefield, MMR and media responses.*	
Important points to be covered: Sample size: Wakefield's trial used only 12 children, of which only 8 showed onset of behavioural issues. Self-reporting: The behavioural issues were linked to the vaccination by the parents of the child or their physician. There was no direct clinical evidence for this. Correlation vs causation. (Ice cream analogy: Ice cream sales and suntan lotion sales both increase at the same time. Does that mean we get sunburn from eating ice cream?)	Pupils could identify success criteria for planning and running medical trials, as well as "how to spot a rubbish trial" (TV beauty adverts are very good at this; look at the small print on screen!) – in doing this they should cover many of the important points (left) Pupils to use internet research to find and evaluate the following: (some links at bottom of lesson plan). Literacy strategy – pupils should be thinking about 'buzzwords' identified earlier; how did media use influence the public response? The original Wakefield paper Media articles from the time (1998-2003)	Depending on literacy ability of pupils they may need reading strategies, e.g. using Andrew Wakefield Cartoon (link below), or differentiated group work: handing out one resources per group

Diagnosis of behavioural issues: Autism diagnosis was becoming more accurate and the vaccination occurs shortly before children first display autistic spectrum traits. Does this mean that the vaccination caused the behavioural changes? Self-interest: Wakefield had financial interest in single vaccinations for Measles/Mumps/Rubella Reproducibility: Further attempts (including by members of the original research team) to reproduce the results of Wakefield's original trial have not done so. Ethics: Wakefield was struck off by the General Medical Council in 2010 for a number of infractions, including but not limited to receiving funding for his research from a legal aid board who wanted to sue the manufacturers of combined MMR vaccinations.	Subsequent media articles exposing the malpractice (2004 onwards) Evidence of medical impact	and asking them to focus on that then present findings back to the class.

Homework:

Essay title:" Andrew Wakefield: How one man (and the media fall-out) changed the course of vaccination history."

Support: The essay should cover the following. Pupils could in lesson time work together to decide on these criteria, or they could be given to pupils as questions to answer directly.

What do pupils feel about the quality of Wakefield's Lancet report, in terms of how well the evidence actually supported his conclusion?

How did the media response make the story much more widespread?

What impact did that have on public opinion about the safety of the MMR vaccine?

What were the consequences in terms of the amount of children getting vaccinations?

How did that further impact on public health, in terms of frequency of measles outbreaks?

Useful Links:

Pea Plant Grows Inside Man's Lung: BBC http://www.bbc.co.uk/news/world-us-canada-10945050

You cannot Pea Serious! Doctors amazed to find vegetable growing in pensioner's lung http://www.dailymail.co.uk/health/article-1302142/Pea-sprouts-mans-lung-Doctors-vegetable-growing-pensioner.html

Spaghetti Trees: http://news.bbc.co.uk/onthisday/hi/dates/stories/april/1/newsid_2819000/2819261.stm

The Facts In The Case of Dr. Andrew Wakefield by Daryl Cunningham http://darryl-cunningham.blogspot.co.uk/2010/05/facts-in-case-of-dr-andrew-wakefield.html

A version of the original Lancet paper, via Brian Deer: http://briandeer.com/mmr/lancet-paper.htm full pdf http://briandeer.com/mmr/lancet-paper.pdf

Brian Deer's expose on the Andrew Wakefield: http://briandeer.com/mmr/lancet-summary.htm

http://www.badscience.net/2008/08/the-medias-mmr-hoax/

European Centre for Disease Control: Measles endemic in UK again http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=18919

Andrew Wakefield found "irresponsible" by GMC over MMR vaccine scare: http://www.theguardian.com/society/2010/jan/28/andrew-wakefield-mmr-vaccine