Climategate, A Cautionary Tale: Rigour, Ethics and Logic in EFL Research

Ross Taylor

Abstract

Whether or not investigations into the "Climategate" affair at East Anglia University and other academic institutions prove the beginning of the end of CO2 driven Anthropogenic Global Warming (AGW) theory, there are a number of lessons and warnings that all academics engaged in research, including EFL research, would do well to take note of. The author discusses briefly some of the main allegations made and major issues raised for academic research, including: the cherry picking of data; the distortion of data by statistical adjustments to support a hypothesis; the misleading presentation of data; the refusal to disclose data for replication; and the destruction of information subject to Freedom of Information Act requirements. The author revisits the logic of falsification demonstrated by Karl Popper and argues that this extraordinary incident at the interface between the academic world and policy implications reminds us that in EFL research we should be extremely careful in treating our data objectively, conducting research rigorously, and making claims based on such research.

Climategate, A Cautionary Tale[1]: Rigour, Ethics and Logic in EFL Research

Ross Taylor

In our EFL research, do we consider ourselves as "scientists"? I think not. However, in fact we are Social Scientists, as Education is a Social Science. It is (or should be) the scientific method that underpins all of our research, and our training of undergraduates and postgraduates in research methods. In this sense then, we wear two hats. We are teachers and educators, but in research, we are also scientists.

On November 19th, 2009, a file appeared on the internet. It contained thousands of e-mails and documents from the Climate Research Unit of East Anglia University, U.K. (CRU). Allegations and counter-allegations about the contents of the file literally exploded across the internet, triggering further scrutiny of world temperature records and the "consensus" on climate science as presented by the UN body, the Intergovernmental Panel on Climate Change (IPCC).

Recent revelations that have resulted from this renewed scrutiny have been nothing if not dramatic. Perhaps the most extraordinary came only last week, when the IPCC were obliged to retract as unsubstantiated a claim that there was a greater than 90% probability that the Himalayan Glaciers

[1] A traditional story with a moral message warning of the consequences of certain actions or defects of character.

would melt in only 25 years from now, by the year 2035 (Leake & Hastings, 2010, p. 1). Interestingly, by the time the claim was published by the National Aeronautics and Space Administration (NASA) in the US on its web page "Climate Change- How do we know?", the time for glacial meltdown had been reduced to 2030. The reason for the retraction was that this claim was based on a comment, not based on any research whatsoever, made by a single scientist reported in non-peer reviewed and non-research based World Wildlife Fund (WWF) literature, which was then cited as evidence.

It is only now emerging that a number of other dramatic "scientific" claims made by the IPCC were not based on research-based peer-reviewed publications, but on WWF reports by non specialists and activist journalists, for example relating to a predicted reduction of 40% in Amazonian Rain Forest and other dire predictions of the consequences of AGW (Watts, 2010).

Of course, the Climategate scientists and the IPCC have been subjected to a seemingly unprecedented level of scrutiny. Deservedly so, given that they advocate a doomsday scenario and carbon-trading system that would revolutionise the already fragile global economy. However, in our own work and research, it is worth asking ourselves the question, wearing our social scientist hats-would our work (and ethical conduct) stand up to a similar level of scrutiny?[2].

[2] Of course, there are those who will argue (1) that Climate Science has nothing to do with EFL teaching and learning; and (2) that EFL research methods are already extremely rigorous and therefore any "lessons" *(cont.)*

All research has implications, whether these are largely small and incremental, as in our own field, or have vast implications for the management of resources and economies, as in the field of Climate Science. To emphasize the importance of rigour in our own research, let us make a small analogy. Suppose there is some EFL research that "proves" that Computer Assisted Language Learning (CALL) is far more effective in learning outcomes than using live teachers in the classroom in every EFL skill. The logical consequence of this is to abandon classroom teaching altogether. The implications of such research are potentially enormous for the EFL profession. Suppose then, after all this expense and thousands of students being subjected to this new and "better" teaching and learning system, further research eventually revealed that learning outcomes are in fact worse using CALL than with the traditional teaching and learning methods, that those who published the CALL research drew erroneous conclusions from their data, or knowingly or unwittingly cherry-picked the data in support of their research. This is the story of Climategate as applied to EFL.[3]

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are unnecessary and obvious. Argument (1) misses the whole point of my argument and is a superficial response. What we have here is a whole branch of science that is in a current state of crisis (See Evers et. al. 2010), so of course there are lessons to be drawn from how that came about. Argument (2) is surprising in its level of complacency, that I might add exhibits a similar level of complacency that was exhibited by many Climate Scientists and the IPCC prior to Climategate. Complacency is anathema to the scientific method.

[3] I do not wish to give the impression that I question research in CALL. I use CALL merely for the purpose of analogy, and intend to make no comment one way or another on CALL.

So having hopefully made the point of the relevance of my cautionary tale to our own academic lives, let us return to it, with a few caveats. Firstly, the scope of this article cannot possibly review all the allegations of academic misconduct that are related to Climategate and the IPCC. Secondly, I cannot hope to rehearse all of the arguments both for and against AGW. That is neither necessary or appropriate here. For those interested in exploring these arguments, I provide at the end of this paper numerous references and weblinks to sites that provide argument and information both for and against. Finally, I do not claim that the e-mails disprove AGW. Other scientific work is needed and the best thing I believe we can do is to be open-minded, rational and sceptical.

The Scientific Method and EFL Research

> *If I have seen farther, it is by standing on the shoulders of giants (Newton, in Hawkins p.1)*

There is an element of a paradox here. Most EFL researchers have an "arts" background. However in their research, through the production, development and testing of hypotheses, and drawing logical conclusions from data thus obtained, they are applying the scientific method. In the training in research methodology that we receive, this is implicit, but needs to be made more explicit[4]. We need to

[4] This is not a research paper on the defects of teaching research methods at postgraduate level, but seeking to draw lessons and provoke thought based on a recent crisis. If your experience has been different to mine, so be it. This does not mean that we should not constantly remind ourselves of the roots of and reasons for this method of investigation.

remind ourselves, both in the context of our own research and in the context of the training and supervision of postgraduate students in the conduct of their research, of the scientific method and its principles.

So where does the scientific method originate? It is not clear. Certainly it draws on the work of many, including Euclid, Aristotle, Copernicus, Newton and Einstein. It was a major part of the Scientific Revolution:

> *Method was also an aspect of the Scientific Revolution, which increasingly built itself on experimental procedure…. [although]…experiment was not new in the seventeenth century…Experiment had not yet been considered the distinctive procedure of natural philosophy… [the author discusses the work of Galileo as an example]…In the science of optics, Newton's investigation of the heterogeneity of light and the production of colored phenomena assumed from the beginning that experimentation was the only possible mode….There had never before been an investigation like either of these or many others; in the future there would be little, and increasingly less, in science that was unlike them. (Westfall, R.S. in Osler p.49)*

In its most straightforward form the scientific method can be outlined as follows:

1. Define the question
2. Gather information and resources (observe)
3. Form hypothesis
4. Perform experiment and collect data
5. Analyze data

6. Interpret data and draw conclusions that serve as a starting point for new hypothesis
7. Publish results
8. Retest (frequently done by other scientists) [Replication] (Crawford & Stucki, 1990 p. 223)

These are the fundamental principles. Of course, in real life and in real research we all know how principles can become blurred, how sometimes lines can be crossed without realizing it.[5] However, it is important to remind ourselves of such principles, however innovative and creative our research may become.

Popper, the Hypothesis, Falsification and EFL Research

To understand hypothesis testing we need to understand why the concept of falsification is so important. Popper's

[5] It is sometimes observed that human beings are infinitely complex, and that therefore there are characteristics of research in the Social Sciences that mean it is far more difficult to apply the scientific method (and therefore, by implication, that there can be some undefined greater "flexibility" in its application), e.g. " Huge problems are faced by the researcher in education and behavioural science since human beings are far more complex than the inert matter that is studied in physical sciences. This arises because humans are not only acted on by a plethora of environmental forces, but can interpret and respond to these forces in an active way. A classroom may seem in all respects to be a standard context for all who are there, yet some students may react differently from others to the teacher, to the content of the lesson, and to many other subtle elements impinging on them." (Burns, 2000, pp. 9-10). I dispute this as an arrogant claim of researchers in Social Sciences. I do not agree that research into classroom learning is in some way more complex than for example nuclear physics or climate science. It is all complex, there are merely different issues involved. Whilst human beings are certainly complex, there is a real danger that this kind of argument can be used to justify non-rigorous research methods.

idea was that:

> *It is easy, he argues, to obtain evidence in favor of virtually any theory, and he consequently holds that such 'corroboration', as he terms it, should count scientifically only if it is the positive result of a genuinely 'risky' prediction, which might conceivably have been false. For Popper, a theory is scientific only if it is refutable by a conceivable event. (Stanford Encyclopedia of Philosophy)*

A useful analogy is taken from the field of engineering as to why Popper's ideas remain important:

> *"One possible line of reasoning behind these strategies comes from engineering: To test the robustness of some device one subjects it to stresses that will make it most likely to fail, even though those stresses do not normally occur in the use of the device. If it survives those stresses, we should have more confidence in it in normal circumstances than we would otherwise have" (Kleiner, 1993, p.12).*

Of course, this is what might be termed applied philosophy. In real life, things are infinitely more complex, as Popper himself was well aware. A hypothesis may appear to have been falsified, whereas in reality other factors that are unaccounted for may explain the apparent outcome. Let us return to CALL as an example. Our very simple hypothesis was that CALL is far more effective in learning outcomes than using live teachers in the classroom in every EFL skill. Is this hypothesis valid, i.e. is it falsifiable? Well, the null hypothesis would be that CALL is no more effective than live

teachers in the classroom. This can be tested and therefore the hypothesis is a valid one, worthy of investigation. Suppose we design an experiment that uses a less than rigorous test of learning outcomes- perhaps one that uses a questionnaire to ask students whether they felt they had learned more using CALL. All the students provide a negative response. Does this mean that the hypothesis is falsified? No, because the research tools were defective.

However, let us suppose that the tools used are more rigorous and the results therefore more reliable, that CALL does not improve learning outcomes. Does this mean that the hypothesis is falsified? Even then, this may not be so, because unknown factors may have affected the outcome. However, it may be concluded that the hypothesis may need to be amended and in its current form and at the current stage of research knowledge, appears not to be true.

> *Every genuine scientific theory then, in Popper's view, is* **prohibitive***, in the sense that it forbids, by implication, particular events or occurrences. As such it can be tested and falsified, but never logically verified. Thus Popper stresses that it should not be inferred from the fact that a theory has withstood the most rigorous testing, for however long a period of time, that it has been verified; rather we should recognise that such a theory has received a high measure of corroboration. and may be provisionally retained as the best available theory until it is finally falsified (if indeed it is ever falsified), and/or is superseded by a better theory. (Stanford Encyclopedia of Philosophy)*

To return to our CALL example, it is a genuine scientific theory (hypothesis) because it prohibits the same success in learning outcomes using teachers in the classroom. The theory is genuine because we can eventually disprove it through research that shows that learning outcomes are either equal to or better than CALL by using teachers in the classroom.

It follows therefore, any valid hypothesis must be able to predict the future, and if that prediction turns out not to be correct, it is, at least to some extent, falsified. This may mean it may need to be refined, major adjustments made, or ultimately scrapped. This is one of the fundamental issues that underlies some of the exchanges that we see in the Climategate e-mails. Externally, the public mantra being promoted was that the science was settled, that increases in CO_2 caused increases in temperature. Internally, however, everyone knew that there was a serious problem, for the obvious reason that CO_2 levels were increasing but temperatures were flat. The consequence of this is quite simple. If my hypothesis is that increases in CO_2 produce increases in temperature, I conduct an experiment and there are increases in CO_2 but no increases in temperature, this is a major step towards hypothesis falsification. It certainly indicates that the computer models predicting dramatic temperature increases for this century are unreliable. This the significance of this e-mail:

> *The fact is that we can't account for the lack of warming at the moment and it is a travesty that we can't. (Trenberth, e-mail 14/10/2009, Costella, 2010, p. 145).*

In our analogy, the equivalent would be that after many years of CALL teaching, there was no improvement in learning, despite the enormous investment. Privately, teachers were aware of this and arguing about it. Publicly, however, they were calling for dramatically increased investment in CALL.

Data Analysis: The Temptation to Cherry-Pick

Truth is sought for its own sake. And those who are engaged upon the quest for anything for its own sake are not interested in other things. Finding the truth is difficult, and the road to it is rough (Alhazen, 1974).

Anyone who conducts research in testing a hypothesis needs to be alert to the temptation of cherry picking data. Essentially, this means the selection and presentation of data that support a hypothesis and ignoring data that tend towards its falsification.

There are some excellent examples of this in our cautionary tale: (1) The apparent selection of only warmer temperature sites in Russia to create an illusion of increasing temperatures; (2) The apparent selection of only warmer temperature sites in the rest of the world to create the same illusion; and (3) the deletion of data which appears to falsify a hypothesis.

It is easy to dismiss these examples as applying to a field of high pressure science and unconnected with our own research world. However, cherry-picking can take many subtle

forms. If we are looking for evidence of improved learning as a result of our teaching hypothesis, is there not a strong temptation to highlight cases of improved learning (whilst ignoring other factors that might account for the learning) and to minimize or ignore cases where learning does not seem to have taken place? I am not accusing EFL researchers of overt dishonesty. However, we are human beings, and may believe, to varying degrees of intensity, in our hypothesis. We may believe that we are being objective about the data selection and presentation, but are we, even subconsciously, ignoring data that tends to falsify our hypothesis? I will come back to the issue of the passionate beliefs of those in charge of data collection when we have briefly looked at the three examples I have mentioned.

(1) Allegations Relating to Russia

Russian scientists have alleged that the scientists at CRU have cherry-picked the temperature data which is then fed into their computer models to predict future warming. Recent cooler temperatures have been excluded, whereas recent temperatures corrupted by the well documented Urban Heat Island effect (UHI) have been included, resulting in a recent warm bias[6].

[6] As the report from the research institute is in Russian, this is a newspaper excerpt in relation to this allegation:

"Climategate has already affected Russia. On Tuesday, the Moscow-based Institute of Economic Analysis (IEA) issued a report claiming that the Hadley Center for Climate Change based at the headquarters of the British Meteorological Office in Exeter (Devon, England) had probably tampered with Russian-climate data….Analysts say Russian meteorological stations cover most of the country's territory, and that the Hadley Center had used data submitted by only 25% of such stations in its reports. *(cont.)*

(2) Allegations relating to the rest of the world

There are many allegations of the same process of data selection and consequent artificial warming bias happening in many other countries around the world, and there is no need to study them in detail here[7].

(3) The "Hide the decline" allegation

I've just completed Mike's Nature trick of adding in the real temperatures to each series for the last 20 years (i.e. from 1981 onwards) and from 1961 for Keith's to hide the decline. (Jones, e-mail 16/11/99, in Costella, 2010, p. 19)

There are two serious allegations that arise from this e-mail, and it is more than the decline that was being hidden, it was the significance and implications of the decline. The

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Over 40% of Russian territory was not included in global-temperature calculations for some other reasons, rather than the lack of meteorological stations and observations. The data of stations located in areas not listed in the Hadley Climate Research Unit Temperature UK (HadCRUT) survey often does not show any substantial warming in the late 20th century and the early 21st century. The HadCRUT database includes specific stations providing incomplete data and highlighting the global-warming process, rather than stations facilitating uninterrupted observations. …IEA analysts say climatologists use the data of stations located in large populated centers that are influenced by the urban-warming effect more frequently than the correct data of remote stations." (Rianovosti, 2010)

[7] Any interested reader can study the D'Aleo & Watts (2010) paper. "Perhaps one of the biggest issues with the global data is the disappearance of temperature monitoring stations from the networks after 1990. More than 6000 stations were active in the mid-1970s. 1500 or less are in use today. The stations that dropped out were mainly rural, at higher latitudes and altitudes. This tended to make them cooler stations, introducing a warming bias and making any accurate assessment of warming impossible" (D'Aleo & Watts, 2010, p.10).

problem faced by the scientists was again a fundamental issue that goes back to falsification. The long recognized Medieval Warm Period (MWP) occurred before the Industrial Revolution, and therefore before the extensive burning of fossil fuels by man. Evidence that temperatures in the MWP were the same or higher than they are now, was again strong evidence tending to falsify the hypothesis that fossil fuels being burned by man were causing warming. As there were no thermometers then, temperatures had to be estimated, by using proxies. One such proxy were tree rings, because there was a relationship between tree growth and temperature. I will leave aside all the arguments about the reliability of tree rings as a temperature proxy, as they are not relevant here. I am only concerned with the scientific method, falsification and data manipulation.

The temperatures derived from the tree ring samples were extremely useful for the CRU and the IPCC, because they appeared to show that the MWP did not exist, therefore they got rid of the apparent falsification that I have discussed above. However there was a major problem. From 1961 the temperatures plotted from the tree rings went drastically in the opposite direction to temperatures that were actually observed from thermometers. The consequences of this are obvious. The tree rings were not a reliable source of temperature information, and therefore they could not be used to argue that the MWP did not exist. This was the decline that was being referred to.

What happened as a result, will I believe go down in history as one of the most shameful episodes of data manipulation.

In the IPCC graph which the CRU scientists were preparing and on which the world's politicians would rely, tree ring proxy data that declined, showing that tree rings were therefore not reliable proxies, was cut out. Instead, real temperatures were substituted after 1961 to give the appearance that the record was reliable. This was the trick. This is what was hidden. And in their e-mails these academics bragged to each other about it.

Allowing personal Beliefs, Biases and Opinions to Influence Data Selection and Conclusions

One of the dangers that we face as researchers as I have observed above is that our attachment to our own research, our belief in the correctness of our hypotheses, can blind us to evidence of falsification. That is why Popper is so important in my view. If we honestly look for evidence that tends to falsify our research, and cannot find it, that is far better verification than the selection of evidence that supports it. So as researchers, we need to cultivate a detachment from our own passions and beliefs in our research.

The examples I have chosen from the Climategate affair also provide interesting insight into this particular problem of the risk of personal or political beliefs influencing research outcomes. Examples (1) and (3) above related to the CRU at East Anglia. The head of this department, Professor Phil Jones, is currently suspended pending inquiry. It should be pointed out that it is possible that this inquiry may exonerate him, I do not know. This does not affect the lessons to be learned, however.

It appears that the passionate belief in AGW that was obviously held by Professor Jones may have led him and his team into the apparent misconduct alleged in examples (1) and (3) and that should be a lesson to us all. The feelings of Professor Jones on the issue of AGW are made very clear in this e-mail, where he declares that he would actually like to see climate change happening (with all the tragic consequences for humanity that this implies) in order to be proved correct:

> *As you know, I'm not political. If anything, I would like to see the climate change happen, so the science could be proved right, regardless of the consequences. This isn't being political, it is being selfish. (Jones, 5/7/2005, in Costella, 2010, p.68)*

The second example of apparent wrongdoing that I have highlighted above also provides us with another lesson in detachment from our research. Allegations about global temperature manipulation relate to the CRU, true, but also to another global temperature record being kept by NASA. The head of the division dealing with temperatures is a Dr. James Hansen. In other words, the allegations of temperature manipulation to provide a false case for AGW happened under his watch, so in exploring the risk of personal beliefs interfering with the application of the scientific method in our research it may be helpful if we can find any evidence of this man's personal beliefs. We do not need to look far.

Recently, a book has been published that is essentially an attack on modern civilization and the consequences of the Industrial Revolution. This is an extract from the book

> *Unloading essentially means the removal of an existing burden: for instance, removing grazing domesticated animals, razing cities to the ground, blowing up dams and switching off the greenhouse gas emissions machine. The process of ecological unloading is an accumulation of many of the things I have already explained in this chapter, along with an (almost certainly necessary) elment of sabotage. (Farnish, 2009)*

The same Dr. James Hansen early this year wrote the following comments in reviewing the book:

> *Keith Farnish has it right: time has practically run out, and the 'system' is the problem. Governments are under the thumb of fossil fuel special interests – they will not look after our and the planet's well-being until we force them to do so, and that is going to require enormous effort. (Hansen, J, quoted in Delingpole, 2010, p. 1)*

As I have observed, deception and self-deception can sometimes be very difficult to distinguish, and as researchers we need to be aware of such dangers. In this context, I am reminded of the famous 1974 "Cargocult Science" Caltech commencement address of the Physicist, Richard Feynman:

> *We have learned a lot from experience about how to handle some of the ways we fool ourselves. One example: Millikan measured the charge on an electron by an experiment with falling oil drops, and got an answer which we now know not to be quite right. It's a little bit off, because he had the incorrect value for the viscosity of air. It's interesting to look at the history of measurements of the charge of the electron, after Millikan. If you plot them as a function of time, you find that*

one is a little bigger than Millikan's, and the next one's a little bit bigger than that, and the next one's a little bit bigger than that, until finally they settle down to a number which is higher.

Why didn't they discover that the new number was higher right away? It's a thing that scientists are ashamed of--this history—because it's apparent that people did things like this: When they got a number that was too high above Millikan's, they thought something must be wrong--and they would look for and find a reason why something might be wrong. When they got a number closer to Millikan's value they didn't look so hard. And so they eliminated the numbers that were too far off, and did other things like that. We've learned those tricks nowadays, and now we don't have that kind of a disease.

But this long history of learning how not to fool ourselves—of having utter scientific integrity--is, I'm sorry to say, something that we haven't specifically included in any particular course that I know of. We just hope you've caught on by osmosis.

The first principle is that you must not fool yourself--and you are the easiest person to fool. So you have to be very careful about that. After you've not fooled yourself, it's easy not to fool other scientists. You just have to be honest in a conventional way after that. (Feynman, 1974)

Replication

Replication, Point 8 in the scientific method list I have referred to, may be last, but is of central importance. Replication is at the heart of the scientific method and it is also a central issue in the Climategate affair. In our own field

of research, this means that another teacher must be able to produce the same or very similar results in the classroom as revealed in our research, using the same methods. If your research cannot be replicated, in the absence of other factors explaining this, this would tend to show that your hypothesis is not correct, or the conclusions you draw from your research unjustified.

> *To be replicable, the data obtained in an experiment must be reliable; that is, the same result must be found if the study is repeated. That science has such a requirement is quite obvious, since it is attempting to obtain knowledge about the world. If observations are not repeatable, our descriptions and explanations are likewise unreliable and therefore useless (Burns, 2000, p.6).*

Perhaps the most notorious case in modern history (up until Climategate) that re-emphasises the importance of replication was the case of two scientists Stanley Pons and Martin Fleischmann who claimed to have discovered a method for producing cold fusion, therefore releasing the potential for unlimited power supplies (Fleischmann & Pons, 1989). Many attempts were made and literally millions of dollars spent in an attempt to replicate the experiment to produce cold fusion, but failed.[8]

[8] "Using equipment far more sensitive than any available to the Utah group, Caltech failed to find any symptoms of fusion. The scientists found no emitted neutrons, gamma rays, tritium or helium, although the Utah group reported all these emissions at high levels. And all the cells consumed energy rather than produced it, the Caltech team said." (Browne, 1989)

Of course, we live in a world where much research and data analysis is conducted using computers. Computers certainly produce impressively displayed results, but the outcomes of computer processing need to be treated with as much caution as manual or mental deductions. There is an old adage amongst computer analysts: garbage in = garbage out. This means that however good the computer program is, if the data introduced into the computer for processing is faulty or biased (as is alleged in Climategate), the results will be equally faulty and biased. There is also the issue of the coding of the computer program, particularly if that has been specially designed for your research. To allow for replication by another, that also needs to be made available. "In the modern era this means the data, computer codes, adjustments to data and similar matters that are necessary for the reproduction of the results" (Buckheit & Donoho, 1995).

Major scientific journals follow this policy, take for example, the case of *Nature*:

> *An inherent principle of publication is that others should be able to replicate and build upon the authors' published claims. Therefore, a condition of publication in a Nature journal is that authors are required to make materials, data and associated protocols promptly available to readers without preconditions. (Nature)*

However, in the Climategate case, this simply was not done. Claims after apocalyptic claim were made whilst simultaneously refusing to disclose the data and computer code required for replication. Not only that, but the disclosed

e-mails show that publicly funded data was intentionally not disclosed to avoid giving ammunition to sceptics (see my comments on scepticism below). It is not my intention to discuss the detail of the e-mails. However a few extracts should give you an understanding that this was an obstruction of one of the basic tenets of the scientific method:

> *Just sent loads of station data to Scott. Make sure he documents everything betterthis time ! And don't leave stuff lying around on ftp sites - you never know who istrawling them. The two MMs [McIntyre and McKitrick] have been after the CRU station data for years. If they ever hear there is a Freedom of Information Act now in the UK, I think I'll delete the file rather than send to anyone. (Dr. Phil Jones, Feb 2, 2005, in Costella, 2010)*

And in this e-mail:

> *…The IPCC comes in for a lot of stick. Leave it to you to delete as appropriate !*
>
> *Cheers*
>
> *Phil*
>
> *PS I'm getting hassled by a couple of people to release the CRU station temperature data. Don't any of you three tell anybody that the UK has a Freedom of Information Act ! (Dr. Phil Jones, Feb 2, 2005, in Costella, 2010)*

I have chosen merely two examples in many e-mails. I am not here concerned with either proving or disproving any of the many arguments that have been raised for or against the disclosure of data in these circumstances (which incidentally

do not seem to have impressed the British police, see below), but am here concerned with an attitude, here made explicit, by leading scientists in the field of climatology that is directly contrary to the principle of replication that is so central to the scientific method. As I write this, the Chief Scientific Adviser to the British Government has criticized these actions:

> *He said that it was wrong for scientists to refuse to disclose their data to their critics: "I think, wherever possible, we should try to ensure there is openness and that source material is available for the whole scientific community. (Webster, 2010, p.1)*

In case anyone has any remaining doubts as to the seriousness of this matter, in January 2010 a police investigation concluded that the University of East Anglia had not properly complied with the UK Freedom of Information Act. However, because it was now more than six-months since the request for data disclosure, individuals could not be prosecuted. The police are seeking a change in the law to allow prosecution over a longer timescale in the future (Corbyn, 2010, p.1).

Openness in research is therefore not merely an issue of professional courtesy or transparency, it goes right to the heart of the scientific method: replication. If research cannot be replicated it is valueless. If data and computer code used to interpret such data is not disclosed to allow for such replication then the conclusions drawn from that research are equally valueless.

Errors in Reasoning and EFL Research

I have already discussed the dangers of conscious and subconscious cherry-picking of data. However similar problems arise in drawing conclusions for the data that are collected. One of the most common errors that I come across in reviewing the research work of students and others are versions of the classical error, post hoc ergo propter hoc, meaning "after this, therefore because of this".

Excellent examples from the AGW debate also illustrate this logical error. Man is increasing the level of carbon dioxide in the atmosphere. That is true. The average global temperature increased in the latter part of the 20th century. That also appears to be true (subject to concerns about data manipulation). Does this therefore prove that AGW is true? No it doesn't. There may be many other reasons for the increase in temperature in the last part of the 20th century, solar activity, ocean activity and El nino as obvious examples. So what we have is merely a hypothesis that may or may not be true, and may be falsified in the application of the scientific method, as I have already discussed.

Now let us apply this lesson to EFL research. A teacher introduces a new method of teaching. Learning outcomes improve, when compared to previous classes. Does it follow that the hypothesis that the new method of teaching improves learning is true? No it doesn't. All it shows is that there was no evidence that appeared to falsify the hypothesis. There could be many reasons for the apparent success of the experiment. All teachers know that sometimes, a class just "takes off" due

to the various personalities in the class and the interaction with the teacher's personality. This could explain the outcome. Or perhaps the students were stimulated because they were aware that they were taking part in research. Or perhaps the teacher had just got married, or had a baby, or won the lottery, so they were friendlier and happier to students in class. This could also explain the outcome. Or perhaps the class was just after lunch and the students were feeling happy and well-fed, instead of being a class at 8 in the morning when the students were feeling tired and resentful. There are many, many reasons that can account for learning outcomes and great caution is needed to avoid being misled led by this human but fallacious line of reasoning.

Scepticism as a Virtue in EFL Research

I now come to deal with what appears to have become an unfashionable word, particularly at East Anglia University. Scepticism. The parallel with the AGW argument is again illustrative. The labels "sceptic" and "denier" have in ad hominem fashion been attached to many scientists and non-scientists who remain unconvinced by AGW theory. I do not think I need to discuss the label "denier". The label has obvious allusion to the label "holocaust denier" and is clearly offensive, both to Jews and to those who have carefully considered the science and arrived at a different conclusion to AGW proponents. However, the use of the term "sceptic" as a pejorative term is troubling. This is because scepticism, like replication, is at the heart of the scientific method. All research should be sceptical in the true sense of the word.

These were the views expressed recently in an Australian National newspaper on the subject:

> *The hacked emails from the Climatic Research Unit at the University of East Anglia show how far the rot has spread within the scientific community. I doubt the researchers involved view the issues in Hamilton's moralising terms. What is clear, however, is that these researchers regard scepticism as a dirty word.*
>
> *Yet scepticism is the price knowledge pays for truth. We question our theories because that questioning is the means by which they will be displaced by better theories in future. The moment scepticism is abandoned for orthodoxy, scientific inquiry degenerates into pseudo-science, as with genetics in Trofim Lysenko's Soviet Union. (Ergas, 2009)*

The word, sceptic, comes from the Greek word "skeptomai", which means "to look carefully, to reflect". Perhaps this is why it is at the heart of the argument I am making in this paper. It is in fact healthy to treat our data with suspicion. Why? Because if we do this we are far less likely to be drawn into unintended errors, or drawing unsupportable conclusions from our research. What is the concept of falsification other than an advanced application of scepticism? I am going to look hard at any evidence that shows that my hypothesis is not correct. Only when I have done that can I be confident that my hypothesis is valid and not disproved (not falsified).

All academics need to be sceptical, to avoid falling victim to the latest fashion in their fields or accepting without

question, the current prevailing paradigm. Paradigms change, and always will. This does not mean that prevailing paradigms are always wrong, merely that it is healthy to question them, and if, when tested in this way, they hold up, they are the stronger for it.

On the day that I am writing this, the chief scientific advisor to the British Government, Professor Beddington, in commenting on the Climategate affair had this to say on the issue of scepticism:

> *I don't think it's healthy to dismiss proper scepticism. Science grows and improves in the light of criticism. There is a fundamental uncertainty about climate change prediction that can't be changed. (Webster, 2010, p.1)*

I am reminded in this discussion of the words of that intellectual giant Pierre Abelard, writing in his book explaining his theories of logic, Sic et Non (Yes and No). I will therefore leave the last words on the virtue of scepticism to him:

> *The beginning of wisdom is found in doubting; by doubting we come to the question, and by seeking we may come upon the truth. (Abelard, c. 1120)*

Suggested Questions to Ask Ourselves as EFL Researchers

I hope that I have shown that the Climategate affair raises some important and serious questions about all research, including our own in the EFL world. Perhaps it

would be helpful to EFL researchers to reduce the lessons I have described that can be drawn from the cautionary tale of climategate to a checklist of questions that I believe we should ask ourselves in relation to our own research, and should include in our teaching of research methods and techniques:

(1) Have you reminded yourself of the scientific method and considered how it applies to your research?
(2) Have you developed a falsifiable hypothesis or do you just have a vague idea that you are going to charge ahead with because you think it is a good one?
(3) Do you have confidence in the replicability of your research? If not, what possible value can your research have?
(4) Have you avoided the temptation to cherry-pick your data? Is it possible that you have unconsciously been selecting data that supports your hypothesis and ignored or minimized data that tends to falsify your hypothesis?
(5) Are you willing to be open with your research methods and data, even to those who might disagree with you?
(6) Are you personally or politically involved in your research or are you able to be professionally and intellectually detached from the outcome?
(7) Are you sceptical about your own research, results and conclusions?

Concluding Remarks

I will leave you with some final thoughts, returning to a hero of mine, Kenneth Clarke, who I have already referred

to. Forty years ago, in the final episode of his documentary series, *Civilization*, "Heroic Materialism", he reviews the turbulent history of the 20th century and the development of atomic weapons with some sadness:

> *And one must concede that the future of civilization doesn't look very bright. And yet, when I look at the world about me in the light of these programmes, I don't feel at all that we are entering on a new period of barbarism…I'm at one of our new universities….Well, these inheritors of all our capacities look cheerful enough…In fact, I should doubt if so many people have ever been as well fed, as well read, as bright minded, as curious and as critical as the young are today. (Clarke, 1969)*

The new university that Kenneth Clarke was referring to as a source of optimism for the future of Western civilisation in this last episode was the University of East Anglia. Three years later, the CRU was established there.

> *Those who have taken upon them to lay down the law of nature as a thing already searched out and understood, whether they have spoken in simple assurance or professional affectation, have therein done philosophy and the sciences great injury. For as they have been successful in inducing belief, so they have been effective in quenching and stopping inquiry; and have done more harm by spoiling and putting an end to other men's efforts than good by their own (Bacon, 1620).*

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For those interested in following the AGW debate, here are some websites that are both for and against. As the argument can get quite heated, I suggest you approach them all with a healthy scepticism:

Pro AGW:
http://atmoz.org/blog/
http://www.realclimate.org/
http://scienceblogs.com/stoat/

Skeptical on AGW:
http://wattsupwiththat.com/
http://climateaudit.org/
http://www.icecap.us/

Further Reading

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