INSTITUTE OF EDUCATION

MA MODULE: INVESTIGATING RESEARCH

ASSESSMENT – CRITICAL REVIEW #2:

RESEARCH ARTICLE:
"Primary science teacher confidence revisited: ten years on"
(by Colette Murphy, Peter Neil and Jim Beggs)

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Murphy, Neil and Beggs' (2007) study is premised on the purported lack of confidence in primary science teachers in the United Kingdom (UK) to teach the subject, the lack of opportunities for children to explore, question, investigate, and understand science, and the low priority science appears to have in many primary schools. Their research therefore seeks to accomplish three objectives, namely to 'provide a clear, evidence-based analysis of the current issues facing primary science in the UK, [to] explore primary teachers' attitudes to science' (p. 418), and to review the nature and impact of initiatives taking place in primary schools. The authors used research methods that were both qualitative, comprising focus group discussions and proceedings from a science workshop, and quantitative, comprising telephone and email surveys. Also, the authors surveyed the landscape of science initiatives offered by higher education institutions to better understand the type of opportunities available to primary science teachers for professional development. The results revealed that teacher confidence and expertise were the two main factors of concern to teachers. This research was positioned as a follow-up to Harlen et al.'s (1995) paper on the same topic, and given that a decade has lapsed with no other study carried out on primary science teacher confidence in the UK, Murphy et al.'s study does have a timely rationale. Given its sound justification, this critical review will next focus on the methodology and sampling, followed by the analysis and discussion of the findings.

Firstly, although the methodology appears comprehensive, the sampling strategy, and subsequently the findings, may be problematic. While the sampling for the focus group discussion was largely sound, with one participant representing each school so as to reflect the diverse school profiles, a point of caution would be that the

teachers participating in the discussions might be among the more confident science teachers in their school. This is largely a conjecture on the basis that teachers nominated for a more intense focus group discussion would be those comfortable with discussing the subject at length. However, what is of greater concern would be the sampling strategy for the telephone surveys. Information regarding the sampling strategy of this study is lacking, and there is a very real possibility that inexact sampling might render the results skewed and the validity of this study suspect. The only information provided of the sample is the number of teachers per country, with no further information on the selection process. It would be a concern if this were not a random sample. Given the extensive data to be collected for 300 respondents, participants could have possibly self-selected, or opted-in, to this study, hence skewing the results (Dowling & Brown, 2010; Lavrakas, 2008). Self-selected participants could possibly and reasonably tend towards certain behaviours and attitudes in a systematic fashion, such as a more favourable attitude towards science especially since they are willing participants of the study. Thus, this study would start with a sample *already* more confident of teaching science. This would throw doubt upon the 'improvement' in the teacher confidence ranking between the 1995 and 2007 studies, and the correlation between teacher confidence and professional development. For the former, as discussed, self-selected participants might naturally be more confident of teaching science, and hence skew the rankings. For the latter, if there exists a self-selection bias, participants who start off being more confident about teaching science would tend to be predisposed and open to developing professionally in the teaching of the subject.

Next, in respect to the analysis of the findings, there may be erroneous comparisons made with Harlen et al.'s study, thus compounding the earlier problem of ambiguous sampling. This adds to the compromise on the validity of this report. While the comparison is seemingly justifiable given the almost identical research focus of both studies, there are grave inconsistencies upon a more considered analysis. Ostensibly, both papers are situated in identical contexts, with research focusing on the confidence of science teachers in primary schools in the United Kingdom. However, delving deeper, there appears to be doubtful comparisons made. In ranking the confidence of teaching different subjects, Murphy et al. asserted that their results indicate that 'teacher confidence in science teaching relative to other subjects has *improved* [italics added] since Harlen et al.'s study in which science was rated the eighth most difficult subject to teach out of 11 subjects' (p. 421-422). This assertion was based on their results indicating that teachers now rank science third, instead of eighth as indicated in the 1995 study (Tables 1 and 2, Appendix 1).

However, this finding is debatable, given firstly, the different backgrounds of the respective samples, and secondly, the flawed comparisons between the respective rankings of teacher confidence. The first is that a simple comparison cannot take place between the 1995 and 2007 study because the 1995 study focused only on teachers in Scotland, while the 2007 study drew a sample from all other countries in the United Kingdom: Scotland, England, Wales, and Northern Ireland. Also, the sample was heavily skewed towards England, with 150 participants from England, and 50 each from the other countries. Hence, it would be specious for Murphy et al. to argue for the said 'improvement' in teacher confidence. The second

problematic factor would be the flawed comparisons between the respective rankings of teacher confidence. In absolute terms, it appears that teacher confidence in teaching science has increased by five places. However, this is not necessarily true. Firstly, Harlen et al.'s ranking was one based on *eleven* subjects, while this paper's ranking was based on only *six* subjects. Secondly, there is essentially no significant difference in the confidence level of science comparatively if similar subjects were to be used for a more valid comparison: it would have only moved up *one* rank from the fourth to the third (Table 3, Appendix 1). It is thus not defensible, especially considering the focus and topic of this paper, for the authors to categorically conclude that 'there has been some progress in developing teacher confidence in primary science over the past 10 years' (p. 428).

Lastly, the final section discussing the findings of the email surveys to higher education institutions was ample but could have been put to better use, and might also possibly be suffering from the same sampling issues as that discussed earlier. Firstly, while the information provided revealed an impressive amount and range of projects directed at improving teacher confidence, it is largely descriptive in nature, and could be better utilised and more impactful if the authors made more overt efforts to triangulate this data with that from the surveys of teachers. For example, both surveys reveal similar data (though, as espoused above, there is scepticism regarding the veracity of the findings) that teachers lack confidence in teaching (p. 425), and triangulation would have better reinforced this point. Another issue with the email surveys was that the scope of the projects and the profile of the participants remained unclear. As with the sampling issue, the same reasoning stands that teachers who were willing and confident enough to work on extensive projects with

higher education institutions would potentially be teachers who were already somewhat confident in science to start with. These projects may actually not be reaching the teachers who need the extra development the most. The research issue here could thus be either one due to the poor analysis of survey responses, or more fundamentally, one due to poor research or survey design.

In conclusion, although the theoretical background of this research may be sound, the methodology comprehensive, and the findings sufficiently convincing at face value, it flounders in terms of sampling issues, and issues with the discussion of its findings such as suspect comparisons with the Harlen et al. paper and a lack of in-depth inquiry into the survey responses from the higher education institutions. Additionally, while this study utilises what seems like sound statistical methods, the insufficient and imprecise analysis might actually be reflecting inaccurate findings. This leads to the question of the validity of its key finding – that professional development is the strongest indicator for improving teacher confidence.

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Appendix 1

Table 1

Harlen et al.'s (1995) Ranking of Primary Science Teachers' Confidence in Teaching Different Subjects (p. 35)

Subject	Ranking	Effective ranking in comparison with Murphy et al.'s (2007) study
English	=1	=1
Mathematics	=1	=1
*Health education	3	
Social subjects: history and geography	4	3
*Religious education	5	
*Physical education	6	
*Art	7	
Science	8	4
*Music	9	
Information technology	10	5
*Technology	11	

Note. Asterisks preceding subjects (e.g. *Health education) indicate these subjects were absent from Murphy et al.'s 2007 study.

Table 2

Murphy et al.'s (2007) Ranking of Primary Science Teachers' Confidence in Teaching Different Subjects (p. 422)

Subject	Ranking	Effective ranking in comparison with Harlen et al.'s (1995) study
Mathematics	1	1
English	2	2
Science	3	3
Social subject: history	4	4[a]
Social subject: geography	5	
Information technology	6	5

[a]Refers to the ranking given to history and geography as one entity, in correspondence to Harlen et al.'s (2005) study.

Table 3

Comparisons between Harlen et al.'s (1995) and Murphy et al.'s (2007) Effective Ranking of Primary Science Teachers' Confidence in Teaching Different Subjects

Subject	Harlen et al's (1995) ranking	Murphy et al's (2007) ranking
Mathematics	=1	1
English	=1	2
Social subjects (history and geography)	3	4
Science	**4**	**3**
Information and communication technology	5	5