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THE ELEPHANT IN THE ROOM: IRISH SCIENCE TEACHERS' PERCEPTION OF THE PROBLEMS CAUSED BY THE LANGUAGE OF SCIENCE

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The language of science is a problem that students face in both second and third-level education. Wellington and Osborne (2001) claimed that "language is a major barrier (if not the major barrier) to most pupils in learning science" (p. 2). Science has its own language and difficulties presented in acquiring and understanding this language, act as barriers for many pupils. However, to-date in Ireland, little research has been conducted into the problems caused by language in the teaching and learning of science in second-level schools.

This study is a part of a larger project on the issue of language in science teaching. The purpose of this study is to examine the level of awareness of Irish science teachers of the problems which the language of science poses to their pupils. This preliminary work also identifies whether teachers have experienced any of these problems and assesses, if and how, they respond to the problem(s) created by the complex and multi-faceted nature of the language of science.

Improving the quality of second level science education is vital to producing Ireland's 'knowledge economy' and scientifically-literate citizens. The old proverb says that given a fish, one can eat for a day; taught to fish, one can eat for a lifetime. We cannot improve second-level science education without addressing the underlying problem of scientific language, as language is a major barrier for many pupils in understanding and enjoying science in the Junior Cycle. Helping pupils to master the language of science enables them to become fishers themselves, with a lifetime thirst for knowledge and the skills to seek and learn on their own (Staver, 2007).

Research Design and Methodology:

The sampling instrument used at this stage of the project was a semi-structured questionnaire. According to Borg and Gall (1983, p.241), the first stage in sampling is to define the target audience. The overall aim of the questionnaires was to ascertain if teachers are aware and/or have experienced any of the problems which the language of science poses to pupils. Therefore, practising teachers were labelled as the target audience in this phase of the research. However, "the cost of sampling an entire population to answer a specific question is usually prohibitive in terms of time, money and resources" (Lunsford &Lunsford, 1995). Therefore, it was essential to select a subset of subjects which are representative of the target population (Lunsford &Lunsford, 1995). The first step in choosing the sample was to access if the school types in Munster provided a representative sample of all school in Ireland.

Table 1 and 2 below show that this was the case.

In Ireland				
Secondary Schools	**Vocational Schools**	**Community and Comprehensive Schools**	**Total**	**DEIS***
403	247	91	742	202
54%	33%	13%	100%	27%

Table 1: Breakdown of Post-primary Schools in Ireland according to School type

In Munster				
Secondary Schools	**Vocational Schools**	**Community and Comprehensive Schools**	**Total**	**DEIS***
122	70	24	212	47
57%	33%	11%	100% in Munster, 29% of total schools in Ireland	22%

Table 2: Breakdown of Post-primary Schools in Munster according to School type

Once it was established that the schools in Munster were representative, the researcher was satisfied to concentrate the distribution of questionnaires to 100 schools in this area. In order to achieve an accurate and representative range of school types, a systematic stratified sampling approach was employed.

Table 2 shows that 57% of schools in Munster are Secondary Schools, 33% are Vocational Schools and 11% are Community and Comprehensive Schools, thus to provide an proportionally representative sample of these schools in a school cohort of 100; 57 Secondary Schools, 33 Vocational Schools and 11 Community and Comprehensive Schools were choosen. The 212 schools, excluding the four schools used in the pilot study, were then divided into strata according to school type and each were assigned a number which was recorded. The appropriate number of schools were then randomly selected using the online research tool of Research Randomizer accessed via ***http://www.randomizer.org*** .Once the schools had been randomly selected, the researcher then established how many science teachers were in each of the target schools including the name of the teachers (accessed from rate my teacher.ie). In total 400 questionnaires were sent to the 100 target schools. There were **86 (21.5%) respondents** to this questionnaire from **29 (29%) schools** as seen in Table 3. The collected data was recorded and analysed using the Statistical Package for Social Sciences, SPSS Version 19.

School Type	No. of Schools who received the questionnaires (n=100)	No. of Schools who returned questionnaires (n=29)	% of Schools who returned questionnaires	% of School type in study (ideal)	% of School type in study (actual)
Secondary School	57	16	28%	57%	55%
Vocational School	33	9	27%	33%	31%
Community and Comprehensive School	11	4	36.4%	11%	14%

Table 3: Summary of the number of Schools that received and returned Questionnaires

Results:

In the following preliminary results, the strongly agreed and agreed and the strongly disagreed and disagreed categories have been combined and are reported as **'agreed'** and **'disagreed'.**

The following are the key findings from this study:

•While 100% of teachers recognise that the language of science is a barrier to pupils acquisition of knowledge and understanding, **48% of these teachers perceive it to be a major problem** and **64% of teachers 'agreed' that the language of science is the main stumbing block for pupils in understanding and learning science.**

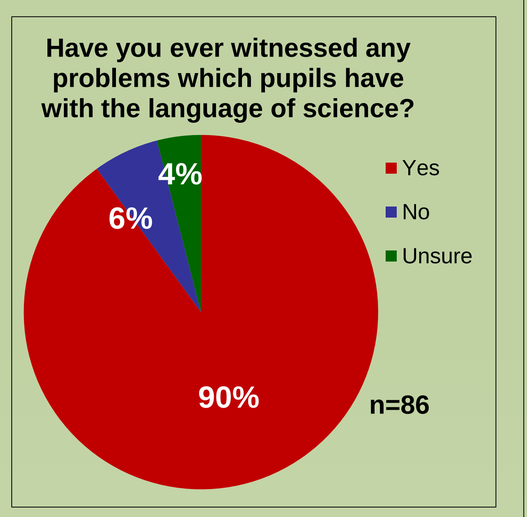
•**90% of teachers 'agreed' that they have witnessed problems** which pupils have with the language of science in their own teaching.

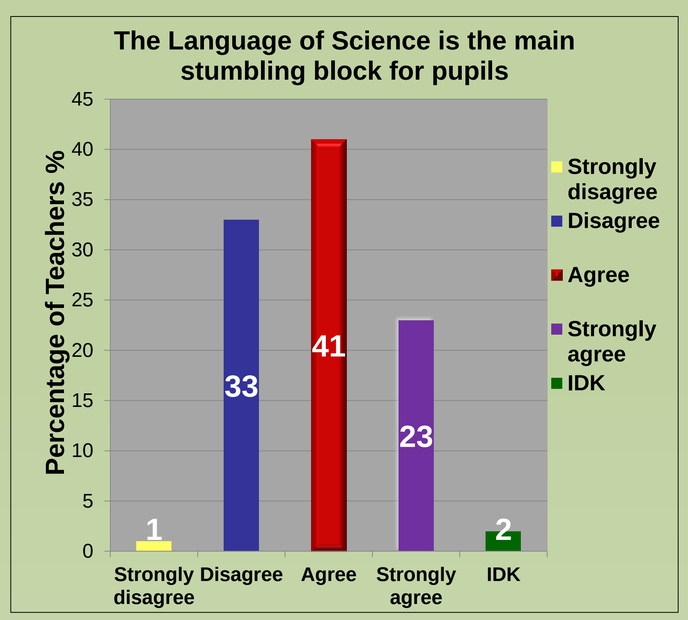
•**66% of teachers 'agreed' that the language used in written materials including examination papers is often too complicated for pupils to understand.**

•As previously stated, while teachers recognise that the language of science is a barrier to pupils' acquisition of knowledge and understanding, **85% of teachers 'agreed' that pupils for whom English is not their first language and also pupils with a low literacy level, are presented with a dual barrier with regard to understanding and learning science**. **66% of teachers also 'agreed' that they more more cognisant of the problems posed by the language of science to the latter cohorts of pupils**, although they are aware that it is a whole school problem.

•Although **83% 'agreed' that they have done something to address the problem**, **67% of teachers 'disagreed'** with the statement that they feel **adequalely equipped with teaching strategies** to deal with the problems posed by the language of science.

•56% of teachers stated that the language of science was not highlighted to them as a problem during the course of their teacher education, while 10% of teachers were unsure.





Discussion and Conclusions:

It is clear from this preliminary work that teachers are aware that the language of science is a barrier to their pupils' acquisition of scientific knowledge and understanding. The majority of teachers have witnessed this problem in their own teaching and have identified it as a problem, which is intensified for non-native speakers of English and pupils with low literacy levels. However, teachers recognise that this problem is not exclusive to these cohorts of pupils, but is rather a whole school problem. While it is apparent that a high proportion of teachers have made an attempt to address this problem, the majority of teachers feel that they are not adequately equipped with teaching methodologies and strategies to deal with the problem (s) posed by the language of science.

This problem is clearly synonymous with the idiomatic expression of the 'elephant in the room' as the majority of teachers stated that the language of science was never highighted as a problem to them in their teacher education. It is clear from these preliminary findings that the language of science is a problem in the teaching of science in Irish Post-Primary schools, one which needs to be addressed at once. As previously stated , we cannot improve second-level science education without addressing the underlying problem of scientific language. The time to voice this problem and bring the 'elephant' to the fore of educational discusion and debate is now. Science educators need to be well informed about this problem and accordingly need to be equipped with teaching strategies and metholodologies to make the teaching and learning of science more effective and accessible for all learners. Failure to respond to the 'elephant in the room of science education' inhibits pupils from becoming fishers of knowledge and understanding themselves (Staver, 2007).

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***DEIS= Delivering Equality of Opportunity in Schools**