This is the published version of a paper presented at ESERA Conference 2013, 2-7 Sept, Cyprus.

Citation for the original published paper:


N.B. When citing this work, cite the original published paper.

Permanent link to this version:
http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-87578
PROFILING IN-SERVICE TEACHERS ACROSS EUROPE TO DETERMINE THEIR ATTITUDE TO IBSE.

Laura Barron¹, Odilla Finlayson¹, Deirdre McCabe¹, Claudio Fazio², Christina Ottander³, Margareta Ekborg⁴, Ilka Parchmann⁵, Sarah Brady¹, and Eilish McLoughlin¹

¹ Centre for the Advancement of Science & Mathematics Teaching and Learning, Dublin City University, Ireland
² Universita' di Palermo, Italy
³ Department of Mathematics, Technology and Science Education, Umea University, Sweden
⁴ Malmo University, Faculty of Teacher Education, Sweden
⁵ IPN – Leibniz Institute for Science and Mathematics Education, University of Kiel, Germany

Abstract: The ESTABLISH FP7-funded project is involved with development and implementation of professional development workshops to support teachers in adopting more inquiry based approaches in their teaching. Identifying teacher views, goals, practices and the challenges they face in implementing inquiry activities, can inform teacher educators of the needs of their participating teachers. This can also inform them to provide the appropriate support in order to help teachers overcome obstacles and develop their own practice in inquiry. This paper outlines the initial results from a profiling instrument used to examine teachers’ beliefs about IBSE, attitudes to teaching science and teaching by inquiry and some ideas about their current practices. The data presented in this paper outlines the profile of the teachers when they came to the first of the ESTABLISH teacher workshops in a number of European countries. This paper outlines a summary of the development of the evaluation tool, how the evaluation data was collected and analysed and highlights the key findings.

Keywords: Continuing professional development in Teachers, Inquiry-based teaching

BACKGROUND, FRAMEWORK AND PURPOSE

Inquiry-based teaching requires teachers to become facilitators of learning rather than being the source of all knowledge. The National Science Education Standards advocate that teachers “create an environment in which they and their students work together as active learners” and orchestrate learning, so that students are engaged, focused and challenged throughout each class (National Research Council, 1996).

The challenge that teachers have as regards changing their methods of instruction to more inquiry practices can stem from their own personal beliefs and their own
education. Eick and Reed (2002) showed that teacher role identities are influenced strongly by the individuals own life experience of teachers as well as the strength of their teaching beliefs. Having strong beliefs about teaching, based on reflection of these past experiences, can also lead to a stronger role as a teacher in the classroom.

Also, as many teachers themselves have been educated under concept-based programmes (i.e. knowledge without context), this background may inhibit or slow down their shift to a more context-based method of instruction (King, Bellocchi, & Ritchie, 2008). Addressing and understanding these conceptions within teacher education programmes can help teachers to overcome potential obstacles and them in implementing inquiry approaches.

The ESTABLISH FP7-funded project is involved with development and implementation of professional development workshops to support teachers in adopting more inquiry based approaches in their teaching. During the project, the ESTABLISH consortium members, from across 11 European countries, have hosted a great number of science teacher education events, each one tailored to cultural contexts, but all at their core striving to support the teachers to become proficient and confident in a number of identified skills relating to inquiry approaches. By adopting this flexible framework for the implementation of teacher education, ESTABLISH is able to promote a universal approach for implementing inquiry-based science teaching across Europe. Identifying teacher views, goals, practices and the challenges they face, make teacher educators more aware of the needs of their participating teachers and in turn can allow them to provide the appropriate support in order to help teachers overcome obstacles and develop their own practice. The profiling instrument described here, aims to gather data about these in-service teachers so as to understand their starting attitudes and understanding of IBSE before participating in the ESTABLISH Teacher Education Programme.

METHODOLOGY

A new instrument in the form of paper-and-pencil questionnaire was developed, informed by numerous sources (TALIS (TALIS 2008 Technical Report, 2010), PSI-T (Campbell, Abd-Hamid, & Chapman, 2010), CLES-T (Taylor & Fraser, 1991), and the VNOS questionnaire (Abd-El-Khalick, Lederman, Bell, & Schwartz, 2001), to profile teachers views on the multifaceted area of IBSE. Two variations of the questionnaires for in-service teachers were developed; the A- for determining the profile at the start of the workshop intervention and then the B- that will be administered after completion of ESTABLISH workshops and following the teachers implementing trial inquiry activities within their classrooms. This paper discusses part of the findings obtained from the teachers across several European countries who had completed the A questionnaires, and in particular, the differences between teachers’ level of experience and their attitudes towards inquiry.
The data from the A-questionnaires was coded according to country and then analysed statistically. The data was analysed using multi-dimensional scaling (MDS), which provides a graphical interpretation of the similarity/dissimilarity between data. Countries with similar average responses will cluster together, while countries with differences in their average responses to this series of questions are further apart.

In this paper, an overview of the teacher sample is given and the analysis of the responses in terms of questions focussed on their attitudes to inquiry.

RESULTS & DISCUSSION

Overview of sample

In total, 458 teachers attending teacher education programmes, organised by 13 institutions, completed the first questionnaire. The institutions are coded A to M. The overall teacher sample has a spread of age, teaching experience and experience with inquiry based science education (IBSE). Half of the teachers were in 36-50 year age group and three-quarters were female. Most of them (>88%) were teaching in mixed gender schools, with only four countries having teachers involved in single-sex schools (countries A, C, D, I). From the data received from each country, female teachers outnumbered male teachers, with the exception of two countries, H and J.

In terms of teaching experience generally, a third of the overall group had 10 years or less teaching experience, a third had 11-20 years and the remaining third had over 20 years-experience.

In completing the questionnaires, the teachers rated themselves in terms of their experience with IBSE, either as a beginner (BE), having some experience (SE) or very experienced (VE). Using this rating, the overall cohort consisted of 48% BE, 45% with SE and 7% VE teachers. It is interesting to note that experience in IBSE is not related to the age of the teacher or years of teaching experience (see Figure 1).

From Figure 1, it is clear that the mode of each group with regards to years of teaching is 11-20 years, while that of age is 41-50 years.

All of the analysis of the data was carried out based on the teachers self-rating of their experience in IBSE.
Figure 1. Age distribution and years of teaching experience for those rated as Beginners, Some experience and Very experienced in inquiry

Attitude to Inquiry

Barriers to implementing inquiry practices in the classroom have been noted from the literature to include lack of classroom time, lack of ‘good’ students and that inquiry is not suitable for the curriculum. These aspects were chosen to include in the A-questionnaire as a series of statements, to which the teachers indicated their level of agreement. Individual teacher’s level of agreement to these statements was combined to give an indication of the teachers’ attitudes to inquiry:

- I think inquiry takes up too much classroom time for me to implement;
- The use of inquiry is appropriate to achieving the aims of the curriculum;
- Inquiry based teaching is only suitable for very capable students.

Variations in responses to these questions are evident between teacher cohorts. To carry out MDS analysis, a hypothetical ‘ideal teacher’ response was included in the data set, which indicated responses to the three statements above as strong agreement that inquiry does not take too much classroom time to implement, that inquiry is appropriate to achieving the aims of the curriculum and is also suitable for all students. This response is shown in the MDS analysis (Figure 2) as ‘ideal’.

The MDS analysis indicates that the data set can be divided into three clusters of teacher cohorts (Figure 2). Cluster 1 includes the ideal and cohorts M, G, and K, indicating that these cohorts responded in a similar way to the ideal response. Cluster 2 and cluster 3 are further removed from the ideal, indicating that their responses were not similar to the ideal response. The difference between cluster 2 and cluster 3 lies principally in the response to whether inquiry takes up too much time, cluster 2 responses are uncertain, while cluster 3 responses disagree with this statement.
The MDS analysis shows that there are similarities in the responses by particular cohorts of teachers, in terms of their attitudes to inquiry as previously defined. To determine why the groups have clustered in this way, an analysis of the different curricula in each country and the role of inquiry within the curriculum in conjunction with analysis of time available for science teaching might be informative.

The cohorts that are in Cluster 1 in the MDS analysis are also the cohorts that have high proportions of VE teachers, in comparison to other cohorts. Therefore further analysis of the data in terms of the experience level of the teachers was carried out. Figure 3 shows the responses to the three statements, based on the level of teacher experience in IBSE.

![MDS diagram for Attitude to Inquiry (Letters A-M refer to different teacher cohorts)](image)

**Figure 2.** MDS diagram for Attitude to Inquiry (Letters A-M refer to different teacher cohorts)

Analysing the responses, based on level of experience, clearly shows a greater level of uncertainty in the BE grouping and increasing certainty for those with SE and VE for all three questions in this section.

A dominant reason from literature as to why teachers do not implement inquiry in the classroom is the perception of the lack of available time. However Figure 3, first graph, clearly indicates that for the VE teacher, that time is not an obstacle in implementing inquiry methods. Those classifying themselves as having some experience with inquiry are more divided with almost equal numbers agreeing and disagreeing with the statement. The beginner group are more uncertain.

While the majority of the teachers overall felt that inquiry methods are appropriate to achieve the aims of their curriculum there was again a significant difference between beginners and very experienced teachers responses to this item with the very experienced group strongly agreeing that inquiry methods were appropriate to the curriculum (Figure 3, second graph).
The SE teacher group also showed agreement with this statement with the BE group similar in responses to the SE group. There is an interesting group of VE teachers who indicated strongly that inquiry was not suited to the aims of their curricula. This group have been identified to try to determine whether this is due to their particular curriculum or due to their attitude to IBSE.

In terms of inquiry being a suitable methodology for all students, again the VE teacher group are more strongly of this opinion with the BE group more uncertain.

CONCLUSION

During the ESTABLISH project a profiling instrument was designed to collect characteristic data about in-service science teachers so as to identify the starting points for these teachers and observe changes which may occur following their participation in the ESTABLISH Teacher Education programme. The group of teachers that participated in this study covered the spectrum of ages and years of teaching experience of the teaching profession. Many of the attitudes recorded in this study were very positive towards inquiry based teaching. Most of the teachers agreed that inquiry methods were appropriate to achieve the aims of their curriculum, and as this sample group were from a number of European countries, this would indicate that inquiry methods can fit in with the respective national science curricula.

The data reported in this paper form only a part of a bigger study to determine in-service and pre-service teachers’:

- Understanding of inquiry
• Attitude towards inquiry
• Importance of Industrial links
• Practice in the inquiry classroom
• Personal skills in relation to inquiry

And also to determine any changes in these elements following the ESTABLISH Teacher Education Programme.

From the data reported in this paper, it is clear that there are distinctions among the teachers based on their level of experience in inquiry based teaching methods. Those teachers who rated themselves as ‘very experienced’ were obvious practitioners of inquiry practices and had overcome problems often associated with IBSE, such as time, curricular pressures etc. For those who were rated as ‘beginners’ in IBSE, responses indicate that these issues are still a problem for them. It is important to developing a Teacher Education Programme in IBSE, that these issues are discussed and that those beginning in IBSE can be supported to overcome them.

Using this approach of understanding the profile of the participating teachers, the focus of the Teacher Education Programme can be designed and adapted to appropriately suit the needs of those participating so as to support and sustain the use of inquiry as the main teaching method.

REFERENCES


