

Science Enhancement and Learning through Exchange and Collaboration among Teachers (SELECT)

FINAL REPORT OF THE SELECT PROJECT
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Section 1: Executive Summary

This report describes the Science Enhancement and Learning through Exchange and Collaboration among Teachers (SELECT) project. The SELECT project was carried out between 2011 and 2012 and worked with teachers from Dublin and Belfast to disseminate and share best practice in science teaching and learning.

The report presents the background to the study, the context in which it was carried out, and analyses and evaluates teacher responses to the project.

The SELECT project aimed to promote the use of video and video-based technologies to aid collaboration between teachers. At the end of the project questionnaires and interviews were completed to gather teacher responses to the project. After the collation of the data, researchers worked collectively to analyse and interpret the findings. Teachers identified video and video-based technologies as useful for their own professional development and for the promotion of child learning. However, they claimed that direct social interaction was the most effective means of dissemination. Video and video-based technologies cannot replace social contact but can be used effectively alongside, to boost the dissemination process.

Section 2: Introduction

The Science Enhancement and Learning through Exchange and Collaboration among Teachers (SELECT) project explored how teacher exchange and collaboration might enhance and develop science teaching and learning. The project involved working with two groups of teachers in Belfast and Dublin. In each city the two groups of teachers were currently engaged in the European wide Fibonacci Project. The Fibonacci Project is an EU funded inquiry-based science and mathematics education programme that is aimed at helping to develop an integrated strategy for scientific literacy and awareness for primary and post-primary schools across Europe. The main goals of the project are to bring about change in the way science and mathematics are being taught throughout Europe and to increase scientific literacy in younger generations. The Fibonacci consortium includes 37 centres with members from 24 EU countries. The SELECT project arose out of the Fibonacci project, and set out to further support science teaching and learning, and dissemination of good practice.

The SELECT project aimed to:

- Facilitate teacher exchange and collaboration with respect to best practice in science teaching and learning.
- Use exchange and collaboration to extend and develop the expertise of two groups of teachers.

The Dublin-based teachers (primary and post-primary) worked in partnership with science education staff from St Patrick's College Drumcondra, to develop an expertise in classroom practice relating to the 'Nature of Science' (NoS). In Belfast, the teachers worked with science education staff from Queens University and Stranmillis University College in developing creative approaches to science teaching and learning in the primary and post-primary sectors. Sharing good practice between Belfast and Dublin teachers was hoped to further develop the teaching and learning of science.

Section 3: Contexts

a) Dublin

In the Republic of Ireland there were 22 teachers from 10 schools around Dublin and over 800 pupils participating in the project. Since September 2010, these 22 teachers, on a regular basis, engaged with an innovative continuing professional development programme aimed at developing their pedagogical and conceptual knowledge on the Nature of Science. The workshops place a strong emphasis on hands-on inquiry based approaches to teaching and learning science. There is a particular emphasis on looking at the nature of science as a human activity, creativity in science, the nature of scientific inquiry, the importance of the history of science and developing an awareness of the importance of science in society, science in the media and science in our daily lives. The programme also focuses on the development of teachers' (and students') own scientific skills.

A range of teaching methodologies were modeled and employed over the course of the two years and numerous teaching resources developed by tutors and participating teachers. Further details of the Fibonacci Project in Ireland can be found on www.Fibonacci_project.ie

For the purpose of this report however, it is important to highlight two aspects of the Fibonacci Project in Dublin that are of particular relevance to the SELECT project, namely the Dublin teachers' experiences of using flip cameras and their experience in interacting with a virtual learning environment (VLE) MOODLE.

During the first year of the Fibonacci project, all Dublin teachers were given flip cameras and asked to use these in their classrooms. They used the flip cameras in a variety of ways, including: to video each other teaching, to video children doing science, interviewing children and some have given their pupils the flip cameras to record scientific activity in groups, or to bring flip cameras home to record investigations children are doing at home.

The Dublin teachers were also enrolled on a virtual learning environment (VLE) MOODLE as part of the professional development programme. At the beginning tutors uploaded resources for the teachers to access but as the teachers became more proficient and confident at using MOODLE they started to upload and share teaching resources with the other

Fibonacci teachers. They also used MOODLE as a discussion forum and as a means of sharing information with each other.

b) Belfast

In the Northern Ireland (NI) project there were 8 teachers (six primary and two post-primary) from four schools in the Belfast area, ranging from Foundation Stage teachers to GCSE level teachers (children aged 5-16 years). As part of the Fibonacci project the Belfast-based study became known as the Creative Science Investigations (CSI) Project, and had the aim of promoting innovative science teaching methods that would enhance children's experience of, and learning in, science and offer children more direction in their own learning. The Fibonacci project began in September 2010 with an initial launch and workshop to introduce participants to the project and to develop its aims and targets in collaboration with them. Hans Persson, the Swedish educationalist was present to demonstrate to participants, examples of some creative teaching methods. Teachers were then encouraged to develop and deliver a scheme of work using creative science methods with support from their peer teacher. Teachers were provided with a Flip camera each to record their science lessons in school. Teacher support was available to aid any problems or issues throughout the teaching period.

In May 2011, teacher pairs were invited to a dissemination event to present their work and share their findings with the rest of the NI group. Hans was in attendance again to share in the dissemination, and to provide additional demonstrations of creative science teaching. Teachers developed child-centred, creative approaches to science in the classroom and recorded pupil responses and learning. Presentations involved the use of video clips, powerpoint presentations, and displays and photographs of children's work and ideas. Teachers enjoyed having the opportunity to share their work, discuss their successes and difficulties within the project, and gather more ideas for science teaching from one another, and from Hans. Teachers valued having a social space in which to discuss approaches to teaching science.

In addition to having the Flip cameras and the dissemination day, teachers were also signed on to a virtual learning environment called DIVER. Their presentations in May 2011 were video recorded and uploaded onto DIVER where the research team and the teachers could watch them back, highlight specific clips and raise issues and questions in relation to any

specific footage. Similar to the Dublin cohort the Flip cameras and DIVER were relevant for the SELECT project.

c) Participants

Dublin Participants

Researchers	Teachers
<p>Dr Cliona Murphy, Education Dept, St Patrick's College, Dublin</p> <p>Dr Greg Smith, Biology Dept, St Patrick's College, Dublin</p> <p>Dr Janet Varley, Biology Dept, St Patrick's College, Dublin</p>	<p>Bayside Senior School</p> <ul style="list-style-type: none"> • Emer o Connor • Siobhan Treacy <p>Scoil Aine Girls' Senior School, Raheny</p> <ul style="list-style-type: none"> • Mary O Sullivan • Laura Shepherd <p>Scoil Mhuire Boys' National School, Marino</p> <ul style="list-style-type: none"> • Harriet Cooney • Rosaleen Groarke <p>St Vincent de Paul, Girls' National School, Marino</p> <ul style="list-style-type: none"> • Eilis Collins • Laura Mulvey • Fidelma Mc Ginn <p>St Patrick's Boys' National School, Drumcondra</p> <ul style="list-style-type: none"> • Brendan Coyle • Helen Mc Cabe <p>Our Lady of Victories. Boys' National School, Ballymun</p> <ul style="list-style-type: none"> • Eoin Dolan • Sinead O Sullivan <p>St Paul's Boys' School, Brunswick Street</p> <ul style="list-style-type: none"> • Roisin Ni Bhroin • Lyndsay Kenny • Roisin Ryan <p>St Colmcille's, Knocklyon</p> <ul style="list-style-type: none"> • Niamh Ni Fhearghail • Paddy Patton <p>St Martin de Porres, Tallaght</p> <ul style="list-style-type: none"> • Valerie Kavanagh • Anne Mc Morrough <p>St Pius Boys' National School, Terenure</p> <ul style="list-style-type: none"> • Sinead Lally • Triona O Neill

Belfast Participants

Researchers	Teachers
<p>Dr. Colette Murphy (Trinity College Dublin, formerly, Queens University Belfast)</p> <p>Dr. John McCullagh (Stranmillis University College)</p> <p>Andrea Doherty (Stranmillis University College)</p>	<p>St. Peter's P.S. Mary Jordan Anne O'Kane</p> <p>Botanic P.S. Carol Thompson Victoria Watson</p> <p>Victoria College Martin Donaghy Laura Montgomery</p> <p>Strandtown P.S. Yvonne Clarke Joanne Beggs</p>

d) Project Calendar

<i>Date</i>	<i>Event</i>	<i>Details</i>
May 2011	SELECT Project introduced within Fibonacci Project	<ul style="list-style-type: none"> • Introductory seminars outlining project details (one in Belfast, one in Dublin) • Baseline audit of teachers' practice with respect to NoS (Belfast) and CSI (Dublin)
June- September 2011	Planning for exchange visits	<ul style="list-style-type: none"> • Teachers in each location prepare best practice exemplars • Teachers identify video recordings for future group analysis using DIVER
September-October 2011	Exchange visit to Dublin	Belfast teachers give seminar on CSI
	Exchange visit to Belfast	Dublin teachers give seminar on NoS
	Use of 'DIVER'	Teachers use DIVER to further develop their practice
September –October 2011	Teachers develop their practice with respect to the NoS (Belfast teachers) and CSI (Dublin teachers).	Teachers incorporate the approaches observed during the exchange visits to their partner schools and during their use of DIVER
November2011-September 2012	Project Evaluation	Data is collected using semi-structured interviews, focus-group interviews, field notes, teacher observations, video analysis, analysis of use of DIVER
September- October 2012	Production of Project Report	

Section 4: Data Collection & Analysis

As explained above, as the teachers involved in the SELECT project were also engaged in the longer-term Fibonacci project, the SELECT project represented a development and extension of the Fibonacci project within the same time frame. Owing to teachers' involvement in the two projects simultaneously, the researchers needed to develop a specific evaluation of the SELECT whilst acknowledging that teachers were also continuing as Fibonacci project participants. To this end, an exit questionnaire for the SELECT project in Dublin was chosen as a means to access teachers' views on the SELECT project in a straightforward manner. In Belfast, given the smaller number of teachers involved, interviews were employed as a data collection method. Interviews were selected in correlation with teacher's attitudes throughout the year. Teachers referred to a social space with verbal communication as the most productive and most appealing environment for their participation and it was therefore concluded that interviews would produce more data in terms of both quality and quantity.

The questionnaire in Dublin was designed to be relatively quick and easy for teachers to complete. It contained seven open-ended questions, five of which were specifically related to the SELECT project and one (question 3) that was related to one aspect of the Fibonacci project. The first question asked teachers to comment on the Fibonacci project in general terms in order to 'set the scene' for the teachers and contextualise researchers' interpretations of later questions, although it was not specifically analysed for the purposes of the SELECT project. Question 3 was included so that a comparison could be made between the teachers' experiences of using MOODLE within the Fibonacci and SELECT projects.

The teacher questionnaire was developed by three researchers in collaboration, and, following piloting with a non-participating primary teacher, was disseminated to SELECT project participants via email. Whilst this could not guarantee anonymity of responses, confidentiality was assured and the questionnaires were assigned a code once they were received and printed out. Of the 20 questionnaires that were administered, 18 were returned, representing a response rate of 90%.

Teachers' responses were read, re-read and coded separately by the three researchers and then compared to identify themes common to all three researchers' separate interpretations and hence establish inter-rater reliability. These themes were then collated to facilitate overall analysis.

The teachers' responses to each of the questions two to seven will be considered in turn in Section 4.

In Belfast the three researchers created an interview schedule collaboratively to address various aspects of the SELECT project. A member of the research team then completed semi-structured interviews with the participants. Interviews were done on a 1:1 basis where possible, with one teacher pair interviewed together due to time restrictions. Interviews were audio recorded and transcribed and responses coded.

The questions presented to the Belfast participants were as follows:

- Question 1: From your experience what were the best and worst aspects of being involved in the SELECT project?
- Question 2: Did you find the SELECT Project enjoyable? Why?
- Question 3: Did you find the SELECT project useful? Why?
- Question 4: How do you feel about the usefulness of video in the classroom?
- Question 5: What was your experience of the DIVER and Moodle programmes used for sharing videos?
- Question 6: Can you comment on the seminar days in both Dublin and Belfast? How did these compare with your previous experiences of CPD?
- Question 7: What were your thoughts on the Dublin collaboration?
- Question 8: What advice would you give teachers starting this project?
- Question 9: If you were running the project, what would you keep and what would you change?
- Question 10: Have you any other comments?

Section 5: Findings

The evaluation of the Dublin and Belfast teachers will be presented separately, as each team of researchers analysed the data differently.

a) Dublin Teachers

Results

Question 2: How do you feel about usefulness of using your flip cameras in the classroom?

The teachers gave a range of positive and negative responses in relation to this question. The majority of the teachers (11) asserted that the flip cameras were a great resource. Some of the teachers (seven) maintained that the flip camera enabled them to reflect on children's learning and found it to be a useful tool as a means of formative and summative assessment. Others (four) said that they found the flip cameras useful for giving presentations to their pupils and peers, while seven of the teachers commented on the extent to which the children enjoyed using the flip cameras during their science lessons. Other positive comments included the children enjoying watching themselves on the video footage and that the cameras encouraged student interaction and reflection. Some teachers (four) had given the children the cameras to use as a method of recording results of investigations independently.

A third of the teachers reported that they did not use the flip cameras frequently. A range of reasons were provided in this regard. Some (four) reported that they found the software challenging, and another four asserted that they hadn't sufficient time to use the flip cameras as well as trying to organise the hands-on interactive science lessons. Using alternative video tools and editing software packages was a reason four of the teachers provided for not using their flip cameras regularly. Just under half of the respondents (seven) commented on the poor sound quality on the flip cameras while two maintained the camera was considerably easier to use if there were 2 adults in the classroom.

Question 3: What was your experience of the MOODLE programme used for sharing resources with the Dublin teachers as part of the Fibonacci Project?

The Dublin Fibonacci teachers who took part in the SELECT project were just starting their second year of the Fibonacci Project professional development programme. During the first year of the programme they were enrolled on a designated college Fibonacci MOODLE site. The course tutors put up resources on this MOODLE site and encouraged the teachers to use these resources and to upload and share their own teaching resources. This virtual learning environment (VLE) was also used as a forum for organizing meetings, sharing ideas and so forth. The tutors included this question on the SELECT questionnaire, so that a comparison could be made between the Dublin teachers' experiences and engagement with the Fibonacci and SELECT MOODLE sites.

In response to the question regarding their engagement with the Fibonacci MOODLE site, the teachers had a range of positive and negative comments. From a positive perspective 13 of the teachers commented on MOODLE as a great bank of resources from which they could draw and seven of the teachers maintained it was a good method of sharing messages and information and for keeping in touch with the group. Of the 18 teachers who responded, two explicitly stated that they found the Fibonacci MOODLE site to be accessible. However, while 13 of the teachers felt it was a good means of accessing resources, 10 of the teachers said they hadn't engaged with it much. The main reasons cited for the apparent lack of engagement included lack of time, not being very proficient at using MOODLE and a preference to sharing ideas and engaging with the activities during the face-to-face workshops.

The analysis of question 6 will be presented next, as it relates to teachers' responses to use of MOODLE as part of the SELECT project.

Question 6: Did you use the SELECT MOODLE page to share resources?

The SELECT MOODLE site was set up following the first face-to-face professional development day with the Dublin and Belfast teachers. Both sets of teachers were enabled to log onto this site to read materials and contribute to it. The Dublin teachers' responses to their engagement with the SELECT MOODLE page were not as positive as their responses relating to the Fibonacci MOODLE. Of the 18 of the teachers who responded, 15 reported not using the SELECT MOODLE at all, two said they had and one stated that they were unable to remember whether they had used it. The main reasons put forward for this lack of engagement was time, with nine of the teachers asserting this. Other reasons cited included a

preference for sharing ideas during workshops (three), a preference for using the Fibonacci MOODLE was mentioned by three of the teachers, four reported technological difficulties and one teacher felt they did not feel the need to share.

As explained earlier, the SELECT project also incorporated two face-to-face meetings of the Dublin and Belfast teachers, in which both sets of teachers engaged in continuing professional development days as joint participants. The nature of the impact of these days will be discussed next.

Question 4: Can you comment on the seminar days in both Dublin and Belfast? How did these compare with your previous experience of CPD?

The Dublin teachers' reflections on the seminar days in Dublin and Belfast were very positive.

Dublin Seminar Day

Workshops

All of the teachers indicated that they particularly enjoyed the two workshops during the Dublin seminar day. They found the workshops to be fun, engaging and enjoyable. Five of the teachers asserted that the workshops were educational and five explicitly reported that they were 'worthwhile'. The workshops providing lots of ideas to implement in their classrooms was something on which 12 of the teachers reflected. Only one teacher had a negative comment regarding the workshops, and she felt that they could have been more hands-on.

Belfast teachers' presentations

Thirteen of the Dublin teachers articulated that they found the Belfast teachers' presentations to be very interesting while 12 commented positively about gaining an insight into science activity in Belfast schools. Five teachers had slightly negative comments regarding the presentations, two felt they were too long and a little repetitive, two felt that the presentations added little to what they already knew and one suggested that they would have benefitted more from working on new ideas with the Belfast teachers.

Discussion regarding use of DIVER / MOODLE

The reflections regarding the discussion session of using DIVER/ MOODLE were mostly negative. Nine of the teachers had negative comments specifically about the use of DIVER.

Some maintained it mirrored the functions of MOODLE, so therefore questioned the need to use it at all. Others felt that MOODLE was more user-friendly and two commented on the additional workload that the use of DIVER would put on the tutors. Two of the teachers wrote that they had not learned anything new about MOODLE during this session, three found the discussion confusing while two teachers asserted that they found the discussion useful.

Belfast Seminar Day

Presenting to Belfast teachers

Due to costs, only ten of the Dublin teachers were permitted to travel to Belfast as part of the SELECT project. All ten of these teachers responded to the SELECT project exit questionnaire. Out of these ten, three said that they enjoyed presenting, two said they learned a lot about what their (Dublin) peers were teaching in Dublin schools and two felt that the Belfast teachers had benefitted from the presentations. On the more negative side, three felt that there was too much overlap between their presentations and that they should have collaborated more prior to visiting Belfast, two reported being nervous and two felt that this session could have been more hands-on.

Plenary discussion

Out of the ten teachers who travelled to Belfast six of them asserted that the plenary discussion session was worthwhile with four commenting on it as an excellent mode of sharing ideas as a community of practitioners.

Question 5: What are your thoughts on the Belfast collaboration?

The teachers were asked to comment generally on their overall thoughts on the Dublin – Belfast collaboration. Out of the 18, eight of the teachers stated that they felt it was a great opportunity to share and discuss ideas and experiences, four asserted that it was a good means of gaining insight into teaching and learning in different geographical areas and five found it interesting to see what other teachers were doing in terms of teaching about Nature of Science. However, three of the teachers felt that although the idea of collaboration was a good one, it was not really followed up after the two seminar days. Other comments made in response to this question included: insufficient time to develop the collaborations; requiring more dedication on behalf of the teachers; and one teacher maintained that there was no genuine collaboration.

For the most part the teachers were very positive about the idea of a Dublin – Belfast collaboration and felt it had been a good and worthwhile thing to do. Six of the teachers asserted that they thought it was a good idea, but felt it was difficult to put into practice. The main reason offered for this difficulty was lack of time.

Question 7: If you were running a project like the SELECT project (Dublin-Belfast collaboration), what would you keep the same and what would you change?

The teachers had numerous positive comments and suggestions in response to this question. Of the 18 respondents, 10 gave positive comments about the seminar days and felt sharing ideas with other teachers was worthwhile. In terms of suggestions for future collaborations, six suggested that there should be more regular contact, four suggested that the Dublin / Belfast schools should have been paired up from the beginning, visiting each other's schools was suggested by three of the teachers while another three suggested that there should have been more emphasis on sharing resources via MOODLE. Avoiding overlap was something two teachers commented on and one felt that the seminar days should have been closer together.

Discussion

This discussion will focus on some of the key issues arising from the exit questionnaires, and conclude with some recommendations for future approaches to similar North-South teacher collaboration projects.

Value of seminar days

In general it appeared that the Dublin teachers valued the face-to-face meetings in the seminar days as the most positive aspect of the SELECT project. The combination of discussion with Belfast colleagues, sharing of ideas and recognition that teachers in another area were experiencing similar challenges in implementing science in the classroom appeared to have been beneficial professional experiences. Hands-on aspects of these workshops were commented on positively within this context. It should be noted that such approaches were not unique to the SELECT project, although their use was one of the ways in which dialogue between the Dublin and Belfast participants was facilitated. However, it appeared that the number of meetings – which for half of the Dublin teachers was just the one - may have

placed a limit on the extent to which genuinely collaborative relationships between Dublin and Belfast teachers could have developed.

Value of technological approaches

The flip cameras had been introduced within the Fibonacci project prior to the start of the SELECT project, and some of the Dublin teachers appeared to be using these to positive effect in their classrooms, including enabling children to use them as part of their work in recording science activities. However, one intention of the SELECT project had been to move the teachers into using videoed materials to select, edit and upload clips for sharing and discussion using DIVER/ MOODLE. It appeared that this aspect of using the flip cameras had not especially engaged the enthusiasm of most of the Dublin teachers, who cited various reasons for this, relating to its similarity to ways of using MOODLE, confusion and concerns about the amount of time required to do such work. It was not surprising therefore that no materials of this type were uploaded by the Dublin teachers.

In addition, the SELECT MOODLE site had not been used by the majority of Dublin teachers, even though slightly more than half of the respondents engaged with reasonable regularity with the equivalent Fibonacci MOODLE site. This raises questions about why teachers who were willing to engage with MOODLE in general – in the Fibonacci project – were not engaging with this communication method within the SELECT project, as for these teachers the technology itself would not appear to have been the barrier. Perhaps it was the case that insufficient time was given to the process of setting up meaningful or specific collaborations between Belfast and Dublin teachers during the face-to-face meetings and that in consequence, the Dublin teachers did not feel the need to engage with a further group of teachers beyond the Fibonacci project participants, who were already an established group at the time the SELECT project ran. However, further data would need to be gathered to assess the validity of such a suggestion. The Dublin Fibonacci project itself is still underway, and it may be the case that further insights into the way(s) to encourage virtual collaboration and technology use may be gathered from the evaluation of this larger, longer-term project.

Preparation and time

Teachers commented on the need for more time in a range of contexts in relation to the SELECT project evaluation. This included requests for more time for certain kinds of engagement during the face-to-face seminars, time to use technology in general and the VLE for further exchange of ideas and time to take on board new skills before being confident in

using them. Teachers who had presented in Belfast had also commented on a desire to have spent more time collaborating with their other Dublin colleagues in advance of the Belfast trip, in order to have created a more coherent set of presentations for the Belfast teachers. In asking teachers to prepare these presentations, it is acknowledged that the teachers had not been provided with opportunities facilitated by the Dublin tutors to engage in such preparatory discussions, which in hindsight could have been offered.

It is acknowledged that the Dublin teachers were already participants in the Fibonacci project, which already involved an expectation of time commitment for continuing professional development and ongoing work in classrooms. Perhaps the extension of Fibonacci via the SELECT project put too high an expectation on these already busy teachers, with the result that they were unable to find the time to engage beyond a certain level with the extra expectations required. Perhaps more integrated planning of the relationship between the Fibonacci and SELECT projects on the part of the tutors could have ameliorated the expectations made of the teacher participants across the two projects, as it appears that teachers may have viewed the SELECT project as an additional burden rather than an extension of their existing work within Fibonacci. Part of that planning could also have attended more to the way(s) in which more secure relationships could have been established between the Dublin and Belfast teachers during their face-to-face meetings, so as to encourage later communication through the VLE.

It should also be noted, that although no specific questions on the questionnaire asked about the impact of the SELECT project on Dublin teachers' own practice in schools, no comments were made by respondents about this very significant issue, with perhaps the exception of the use of flip cameras in classroom contexts. It is therefore difficult to say whether the positive aspects of the SELECT project had had any such impact and hence it is hard to comment on the depth of professional development that had taken place. The more general question about the Fibonacci project at the start of the questionnaire had indicated that teachers perceived positive effects in school as a result of engaging with this (larger) project and perhaps it is the case that the final evaluation of the overall Fibonacci project will provide further insights into the mechanisms by which collaborations with other teachers may feed into classroom practice.

b) Belfast Teachers

The aim of the interviews with the Belfast cohort essentially focused on answering the question ‘*Was the project effective in developing, and enhancing science teaching and learning?*’ Following the transcription of the interview recordings and the collation of the data, three main topic areas emerged from participant responses:

- Aspects of the project teachers felt enhanced their involvement
- Aspects of the project teachers found less useful in the study
- The value of video-based technology in science teaching and learning.

Overall teachers’ responses within each area related to their personal and professional development within the project, and to the effect of the project on child learning.

(i) Aspects of the project teachers felt enhanced their involvement

Teachers all identified the project as enjoyable, useful and as positively affecting both the teaching and learning of science. Aspects they identified as successful with regards to the project included the workshops, the opportunity for social interaction, benefits to child learning, an open and safe environment, support from the research team, and the ability to interact with teachers from the Dublin cohort. They also described the use of video within the classroom as highly positive, but video will be discussed separately in section (iii).

Workshops

All teachers agreed that the SELECT workshops were engaging, worthwhile and extremely beneficial for both the teaching and learning of science. Teachers identified Hans, specifically, as a successful component of the workshops. They described his attitude towards science teaching and learning as inspiring and exciting and stated that the activities he demonstrated were practical, engaging, hands-on, and that they could be used in the real life classroom. Teachers enjoyed being able to present and share their ideas in the workshops and also identified the ability to glean ideas from each other as a positive. Teachers identified the mixture of primary and post-primary teachers as a positive aspect of the project also as it allowed a wider range of activities and differentiation of activities to evolve.

Social Interaction

All teachers identified the chance to interact, chat and talk about science teaching within a group situation as important to the success of this project. They enjoyed having regular meetings and general contact with other teachers who shared the aim of promoting science in education. The teachers enjoyed findings out new ideas from one another and claimed that

social interaction aided in this process. Teachers also claimed that having a peer from their school to be their partner within the project was beneficial. This allowed them to attend workshops together and upon returning to their school, reflect upon what they had learned and then as a team develop ideas and approaches. In relation to the Belfast and Dublin cohorts attending workshops together however, teachers identified the smaller, local groups as more successful. They felt they understood and constructed better understandings in smaller groups where there was closer interaction.

Benefits to Child Learning

All teachers identified their participation in the SELECT project as beneficial to children's learning. This generally reflected on children's enhanced ability to lead and direct their own learning, and to construct their own understandings within science. Teachers claimed that by allowing children the chance to do so, children had deeper understandings of ideas and concepts, and were more enthusiastic and more involved in science. They developed thinking skills and teachers described them as "*great little scientists*" as more "*solid science*" was taught. A few of the teacher owed the enhancement of children's learning to the environment created in their classrooms following their implementation of teaching strategies gleaned from the SELECT project.

An Open and Safe Environment

Through their participation in the project teachers identified developments in their practice of science teaching. Teachers discussed how they had gained confidence, had become refreshed and rejuvenated through the project, and explained how this helped them to develop new classroom practices. Teachers became more aware of the need to involve children in constructing their own learning and how this then affected the learning environment they provided. Teachers' described how within their classrooms, science became increasingly child-led, all children's responses and ideas were listened to and valued, and children showed excitement and engagement within science as a result. Teachers did not have right or wrong answers and encouraged children to make suggestions and put forward any ideas they had. Through the duration of the project, teachers claimed that children became increasingly enthusiastic in doing so and became more engaged in science. It was claimed by teachers that as the project progressed the teaching approaches they had developed then became employed in other curricular areas and were disseminated as a result.

Support from the Research Team

The research team were involved closely with the teachers involved in the study through offering ideas for practice, helping with resources and dealing with funding issues. Visits to schools by the research assistant were particularly valued by a number of teachers. Teachers claimed that collaborating with the researchers made them feel supported and was a source of comfort and confidence, as they changed their classroom practice and aimed to improve child learning.

Interaction with the Dublin Cohort

Belfast teachers claimed that the workshops with the Dublin team were worthwhile and engaging with regards to the types of activities demonstrated and experiences shared. They described the workshops and the interaction with Dublin in general as refreshing:

“You know what was interesting about going to see the Dublin teachers- you know we could see they were still teaching science- and that was so refreshing to see...It was nice to see that they still had that approach instead of just ‘the world around us’. It reminded us that you know, actually, science is so important”

Teacher 6

Overall through participating in the SELECT project teachers valued sharing ideas and experiences of science teaching and learning and all agreed that social opportunities to do so were most beneficial. Being inspired as teachers and becoming refreshed and forced to re-think their ideas were also identified as components of success. When groups met regularly and in small groups, ideas were more easily shared and teachers felt more comfortable and supported with the involvement of the research team. Following the implementation of new teaching strategies and approaches learned from others, the teacher identified a change in their classroom environment where children had more input and were more engaged and excited about science.

(ii) Aspects of the project teachers found less useful in the study

Out of the seven interviews completed, three teachers identified no negative aspects of being involved in the SELECT project.

Belfast teachers identified that perhaps time was restrictive upon their participation in the SELECT project and claimed that more time for planning could have been beneficial. Teachers claimed that meetings between Belfast and Dublin teachers specifically were not regular enough. As a result there was not very much time to exchange information, and not enough time to meet the Dublin teachers on a social basis. This proved unsettling for some

Belfast teachers who felt that the larger group in Dublin was intimidating and affected their ability to successfully share their ideas and experience. Some also described the two separate groups as being too different and as having curricula that were also too different. This appeared to restrict, the effectiveness of the meetings between Belfast and Dublin.

The teachers also suggested that including more teachers of the same class year might have been useful, as it would have allowed greater collaboration in developing new approaches that would suit specific age groups.

(iii) The value of video-based technology in science teaching and learning

The use of video cameras and of video-based technologies to support collaboration and the exchange of science teaching and learning approaches was instrumental in this study. Teachers identified both positive and negative aspects of each of these within their interviews.

Video

Teachers in the Belfast SELECT project all agreed upon the value of using video, in general, in the classroom for science teaching and learning. It aided both teacher professional development and children's learning. Teachers became more proficient in the use of video cameras with which they claimed they had no prior experience. The use of video also allowed teachers to create new methods of assessment. They could use video clips as records of classroom practice and could return to the video to re-evaluate or re-address both child learning and their own practice. Teachers specifically identified the video as valuable in allowing them to become reflective practitioners as they could observe their own questioning skills, for example. Teachers could also look back at episodes of child learning and peer interaction and observe events they may have missed during the teaching of the lesson. They could explore more deeply group dynamics also. Video was also identified as valuable for child learning in that the clips could be replayed to the children who could then revise and revisit specific topics. Children enjoyed seeing themselves on camera and became more focused in lessons where the camera was used. In some schools children began to use the cameras themselves, thereby enhancing their technological skills also.

The only negative aspect of the videos identified by one teacher was the difficulty she experienced in video editing for the purpose of presenting her work to the rest of the group.

Video-based Technologies

Teachers were introduced to Digital Interaction Video Enhanced Reflection (DIVER), a virtual learning environment where they could upload and discuss their video clips with other teachers within the Belfast cohort of the SELECT project. Teachers initially discussed the value of such programs and how they could aid the dissemination of good practice. However, upon participation in the project teachers experienced many problems and issues with DIVER and no teachers used the program throughout the duration of the project. Teachers viewed DIVER as time-consuming, intimidating and confusing, requiring a lot of energy. Teachers felt that their planning and actual teaching of science was more important than discussing it online. They also experienced difficulties in accessing the DIVER program due to restrictions on school computers.

Overall, teachers labelled the DIVER program as not viable for long-term collaboration. They valued video both for child learning and their professional development but all agreed that virtual environments for disseminating and sharing these videos were ineffectual.

Section 6: Conclusions and Recommendations

In conclusion, the SELECT project created some positive opportunities for the participating teachers. The face-to-face seminars were in general quite highly regarded, especially in relation to the 'hands-on' experiences and opportunities to share with and learn from each group of teachers. However, the use of technological resources was limited to individual teachers working in their own classrooms rather than engaging with more general resource sharing via a VLE within the SELECT project. On reflection, the researchers/ tutors may have set up too great a set of expectations for these already busy teachers to engage with others within a very challenging time schedule.

The potential benefits of such engagement and collaboration have only been glimpsed at in the SELECT project, and with this in mind, a number of recommendations in relation to setting up projects such as SELECT in the future are suggested below.

Setting up contexts for better collaboration

More emphasis should be placed in future on facilitating exchanges of this type in way(s) which promote more ownership of professional development on the part of the teachers and in-depth collaboration between teachers from different areas. Ownership of professional development can be very empowering for teachers – they realise they have knowledge and skills worth sharing, and they share these with colleagues. During the design stage of future collaborative projects participants should be encouraged to take an active role in the design and content of the workshops. If the content is focused on participants' needs the teachers value the experience more. Hawley and Valli, (1999) claim that professional development that involves teachers in the planning “increases the likelihood that individuals will feel and be freer to engage in reflective practice and experimental learning” (p. 140). It is likely therefore that teachers would probably use what they learn when professional development is centred on their concerns and relevant to their particular contexts and needs.

The collaborative approach used in the Hawley and Valli (1999) study encouraged teachers to support each other as a community of learners i.e. a network of learners. Findings from other studies indicate that when teachers have the chance to talk with colleagues about ideas and teaching strategies acquired during professional development, they were more likely to use them in their classroom practice. King and Newmann (2000) noted that, “Teacher learning is most likely when teachers collaborate with professional peers, both within and

outside of their schools, and when they gain further expertise through access to external researchers and program developers” (p. 576).

Appropriate and in-depth support for using technology and VLEs

Some professional development programmes have successfully included various technology-related parts, such as: web-based virtual learning environments (VLE), online and electronic conferencing features. An important aspect of such technology is that it can overcome location and time constraints. However, technology is only as good as the people who use it. It is vital that teachers are given adequate time and training to overcome challenges, such as lack of confidence in using ICT.

Focus on impact on practice

In discussions between Belfast and Dublin teachers, the benefit of sharing existing practice was recognized. However, it was not possible to say that the coming together of these two sets of teachers had greatly impacted on classroom practices of any of the Dublin or Belfast teacher participants. This should be a key aim of any professional development initiative. Perhaps more in-depth sharing and extensive communication could have been facilitated by a pairing of schools or individual teachers from Belfast and Dublin, as suggested in the questionnaire responses. The role of tutors in assisting with such engagement and promoting continued dialogue would therefore have to be determined. In a longer-term pairing, visits to schools could perhaps be organized, with paired teachers, both, observing, supporting and ultimately co-teaching in each other’s classrooms. One Belfast teacher also suggested the possibility of a “resource amnesty day” that both groups could attend and bring any resources they have for science teaching. Attendees could then swap, share and discuss these resources and share their experiences of using them in science in the classroom.

All of the above recommendations involve a greater time span for setting up such projects and hence a corollary commitment of time – and indeed resources – on the part of the teachers and schools involved.

The findings of Belfast teachers highlighted specifically, the need for inspiration and relevance to initially engage their attention and support for the project. They identified social contact as the key characteristic which resulted in the success of the project and which should be the cornerstone of all continual professional development (CPD), programmes. Teachers acknowledged the potential value of using video-based technologies but insisted

upon the need for social interaction to best share experiences from the classroom. They enjoyed the opportunity to share their ideas with other teachers directly and claimed that opportunities for doing so are often limited. Teachers very rarely receive science CPD and as a result science and good science teaching remain within the classroom rather than being shared and disseminated. The original aims of the SELECT project were to use video and video-based technologies to enhance dissemination of science teaching and learning. Teachers enjoyed the use of Flip cameras to record their practice within the classroom and consequently use the footage for their own professional development, and to promote child learning. Through participation in the project, however, teachers described the best way to disseminate not as through the use of video-based technology but through providing time and contexts for direct social interaction. Video-based technology should not replace face-to-face interaction but should be used in conjunction with it, so as to enrich the dissemination process.

The support of SCoTENS to undertake this project is very gratefully acknowledged. In seeking to explore some of the ways in which North-South teacher exchange and collaboration in primary science can be most effectively facilitated, it is hoped the lessons learned within this project can be of use within other collaborations.

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