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Creating powerful teacher education opportunities: The need for risk, relevance, resource, recognition, readiness and reflection

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Abstract

Two projects described in this paper illustrate what a successful teacher education model can look like, what its aims were, what happened in terms of teacher professional development, and what pupils accomplished as a result. The paper also describes policies, organisational features, resources, and relationships that informed the projects. In effect, both projects involved a community of teachers, educators and scientists working to develop resource materials involving various technologies for classroom use. Data was collected through teacher surveys, online dialogue, interviews, pupil work, teacher 'show and tell' and limited classroom observation. The data suggests that pedagogic change warrants the presence (in some fraction) of the six elements of relevance, recognition, reflection, resource, risk and readiness. The extent to which these factors were present influenced the pace of pedagogic change. The extent to which teachers made judgements about these facets determined the scope of the pedagogic change.

Introduction

A relevant science education is at the heart of an innovative, knowledge society (National Academy of Engineering, 2005) if it is to produce sufficient numbers of qualified scientists and produce a scientifically aware public (Science Strategy for Scotland, 2001).

In Scotland, The Public Attitudes to Science and Engineering Scottish Comparison Report (Scottish Executive, 2001) showed that 65 per cent of Scots have no formal qualification in any science subject. Not surprisingly, in Scotland, the last few years have seen significant calls to address this situation, and possibly as a consequence, Scotland has pursued ambitious courses of action. For example, the Curriculum for Excellence (Scottish Executive, 2004) is seeking to promote a 'less crowded and better connected' curriculum that offers more 'choice and enjoyment'. Science for 3–18-year-olds became the first subject nominated for review. In 1999, the HMI reviewed assessment arrangements, because evidence suggested that assessment for primary and the first two years of secondary schooling was fragmented (Hutchinson & Hayward, 2005). The Assessment is for Learning project is trying to develop informed policy by involving teachers, schools, local authorities and teacher educators (Hutchinson & Hayward, 2005). In 2001, the £800 million National Agreement 'A Teaching Profession for the 21st Century' ('McCrone') agreement resulted in the following: teacher salary increases; a 'chartered' teacher route to financially reward classroom expertise; proposals for cohesive teacher education programs, including guaranteeing all probationer teachers a post in their first year, and a list of teacher competence statements. The agreement provides contractual understanding for professional development and requires teachers to maintain a professional development record that takes into account their individual needs as well as school, local and national priorities.

In tandem with planned reforms, some modifications were driven by circumstance. For example:

- The lack of availability of teacher managers has probably created 'faculties' in schools.
- There were concerns regarding the gap in cognitive demand between 'Standard Grade' and 'Highers'. Some schools opted for the Higher Still program with Standard Grades being replaced by Access,

Intermediate 1, Intermediate 2, leading to Highers and Advanced Highers.

- Primary school teachers were encouraged to include more and more technology, and to be more accountable for the quality of science provision.

The literature on the use of technology in science classrooms in terms of the potential of dataloggers, CD ROMS, simulations, multimedia authoring, modelling, computer- assisted learning, integrated learning systems and the internet (Newton, 2000; Orion, Dubowski & Dodick, 2000; Rodrigues, 2002; Pallant & Tinker, 2004; Watson, 2001; Rogers, &Newton, 2001; Nachmias, Mioduser, & Shemla, 2000) was growing. However, Cuban (2001) in the USA and Smeets and Mooij (2001) in Europe were signalling that though resource levels in schools had increased, informed use had not. This concern was registered in Scotland (Stark, Simpson, Gray, & Payne, 2000), with Williams, Coles, Wilson, Richardson and Tuson (2000) reporting that mathematics and science teachers displayed more negative attitudes and lower use of information communication technologies. It was argued that even with financial support to purchase equipment or provide professional development for teachers, most teachers continue to use the technology to reinforce existing practice (Cuban 2001; Smeets & Mooij, 2001). Many failures to introduce innovation successfully have been shown to stem from the fact that the introduced innovation was not related to school practices (Fullan & Hargreaves, 1992). It is also possible that limited opportunity for reflecting on practice may result in teachers having limited occasions to communicate what they are doing in their own schools, much less with colleagues in other communities. Consequently, as Olson (2000) suggests these constraints do not take into account the culture of classroom practice and the pivotal role of the teacher in bringing about change in their classrooms. The influence of science teachers on what and how to teach is often considered to have the most significant impact on student achievement, attitude and motivation. Teachers' personal beliefs affect the degree of pedagogic change, especially when ICT is being advocated (Becker, 2000).

A tale of two projects

Given these viewpoints and the opportunities that were arising as a consequence of various Scottish education reforms in pedagogy, curriculum and assessment, funding was sought for two teacher education projects that shared the same fundamental model of professional development, but involved different school-level cohorts. This paper compares and contrasts the successes, challenges and strategies for the continuing professional development projects. Both projects were designed to encourage teachers to adapt their practice to the changing conditions they face, and to purposely deepen their expertise. One project was aimed at primary school teachers, and the other project was aimed at secondary school science teachers. The use of information communication technologies to promote interest in science and help learners develop a better science understanding was the vehicle used to encourage teachers to develop their understanding of teaching and learning.

Both projects involved a community of teachers, educators and scientists working to develop resource materials involving various technologies to be used in their classes. The primary school project first phase involved 4 Scottish councils, 10 schools (16 teachers), 9 scientists, and 2 secondary school teachers and took place over 10 months. The primary school project second phase involved 3 Scottish councils, 15 schools (17 teachers), 5 scientists, 2 secondary science teachers meeting over 5 months. Supply cover costs were met by the project, and ICT resources were provided. The community met once a month face-to-face and maintained online contact in between monthly meetings through a virtual learning environment (VLE).

The secondary school project first phase involved four teachers initially. The secondary school second phase involved teachers who were paid an honorarium and randomly divided into three groups, with each group managed by a project officer. They determined when to meet. But all the teachers had access to the VLE.

Data was collected through teacher surveys, online dialogue, interviews, pupil work, teacher 'show and tell' and limited classroom observation and externally commissioned project evaluations

Overall impact

Dr Joanna Le Metais evaluating the secondary school project and Professor Sally Brown evaluating the primary school project identified general areas of growth. These areas included substantive curriculum development, developments in teacher confidence levels and the noticeable impact of classroom strategies on pupils' learning and engagement.

The project data suggests that teachers who reflected on their practice and were ready and willing to take a risk with a facet of their teaching and learning environment, when they have their practice recognised and are provided with adequate resources and relevant support, are likely to produce more sophisticated classroom practice that reflects expertise that has been

consciously developed. In essence the project model involved:

Teachers demonstrating	Facilitator/ Programme providing
Readiness	Resources
Risk	Recognition
Reflection	Relevance

However, the intricate relationship between the six facets determined the extent of pedagogic change. The extent to which teachers made (contingent or deliberate) judgements about these facets determined the scope of the pedagogic change.

Resource in both projects included time, equipment and the support community. Both projects were well resourced in terms of time and equipment, but unequally resourced in terms of community support. This aspect of resource affected the nature of pedagogic change. For example, didactic project officers who continued to 'instruct' and who failed to recognise the teachers' expertise managed the secondary school teachers who produced 'usual' teacher materials and took few risks. These project officers assumed that the teachers' existing skills and accomplishments were of no consequence and that the teachers would benefit from being instructed by the project officers on which strategies to use. In contrast, the secondary school teachers who produced dynamic teacher materials that involved challenging or innovative classroom strategies were managed by project officers who were more open minded and attempted to model risk taking and learning with and from others.

The relationship between recognition and risk was signalled forcefully in the primary school project. Teachers who took the initial risk (tried something with their classes and reported it

during primary project 'show and tell' meetings) came to be recognised as expert teachers within the group. This recognition encouraged them to become more innovative. Some of the more hesitant primary school teachers who eventually took risks and modified classroom practice found their action was recognised and commended by peers, pupils, parents and grandparents. This recognition encouraged them to continue to change their practice.

The notion of readiness applies to teachers and schools. School leadership was crucial in determining the relationship between reflection and readiness. Teachers working in environments where change was not encouraged struggled to introduce new practices. Likewise, teachers who had not reflected on their practice were not ready for change.

The relevance of the project in terms of the reality of classroom practice was significant in determining pedagogic change. But the degree of relevance was influenced by reflection and resource. Stimulating interaction with peers, who recognised the challenges of the classroom, and the nature of engagement with scientists who were able to communicate science well encouraged teachers to review their practice.

Uninterrupted time, good working conditions and a supportive community reflect the basic premise that the work of teachers has a life beyond the individual, and that this will make a difference to the teaching profession.

Many of the primary school teachers, have gone on to have their practice recognised more formally (through HMIE statements, invitations to present at conferences, invitations to manage local council Continuing professional development (CPD) for other teachers and national newspaper coverage, or they have been short-listed for national teacher competitions). Most of the

teachers asked to be kept informed of future opportunities to engage in this type of professional development.

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