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Video-Conferencing in Teaching Practical Hands-On Science to In-Service Primary Science Teachers in a Remote Region of Ireland

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ABSTRACT

Primary teachers were given in-service education in science through the medium of video-conferencing and other technologies in a blended learning environment. This study outlines a viable model of inter-institutional co-operation in terms of resources and outreach. Simple, cheap resources can be used to deliver video-conferencing to a small number of centres in the provision of a practical hands-on course in science for in-service primary teachers. Video-conferencing (VC), virtual learning environments (VLE), face-to-face (f2f) tuition together provide a rich learning repertoire from which to draw on. Open and distance learning works best using a combination of VC, VLE, f2f No one technology is adequate. Learning by open and distance format encourages (forces?) the learner to become acquainted with ICTs but it is important to note that no one technology can be relied on for tuition or communication e.g., SMS texting was used for infrequent email users. The course was designed around the three main influences in science education: the classroom, science content and science education theory.

KEYWORDS: *Video-conferencing, Hands-on practical, In-service, Primary*

INTRODUCTION

Ireland has been somewhat slow to embrace digital technology (except perhaps mobile phones) and in education, digital learning. Teaching tends to be conservative and thus when a request came to my institution to provide for a course in Donegal, some distance away from Dublin, it was envisaged that the facilitator would travel to Donegal to provide the course. However, a solution was found that would prove sufficient to both the students and the facilitator: the course would be taught in real-time using video-conferencing. However, the initial response of the facilitator's peers was less than enthusiastic, considering the issue of whether a practical subject could be taught at a distance or on-line. This work outlines the first phase of a study of the feasibility of using video-conferencing and other technologies (Figure 1) in the continual professional development of primary level teachers in Donegal. A range of technologies and methodologies was employed to provide what Smith and Meredith (2006) describe as blended learning. However, the emphasis in their work was asynchronous learning tools; in this work synchronous learning tools were seen as crucial to maintain the interest of the teachers, notwithstanding the advantages of asynchronous learning to a reticent group of

adult learners. The main problem addressed by the methods used was to diminish the isolation experienced by teachers (Meletiou-Mavrotheris and Mavrotheris, 2006). Mavrotheris *et al.,* (2006) describe the integration of audio-visual and data technologies in terms of distance learning. The first cohort (n=12) of the Diploma in Education (Primary Science Education) by open and distance learning were tutored in hands-on practical science activities. Ideally this would have been conducted in a face-to-face setting however, the travel time by car from the largest town in County Donegal to Dublin is four hours (one-way) making the conventional instruction arrangement of lectures two nights per week unreasonable. However, even with this consideration, some of the students had to drive 1.5 hours from one end of the county. Donegal is a large county of 4841 km^2 with a dispersed population of 137,575, and Letterkenny, although not the administrative centre forms the geographical centre and hosts the Letterkenny Institute of Technology. Letterkenny I.T. was chosen as the outreach centre/partner in connection with Donegal Education Centre and this project began as a partnership between three institutions of different missions and education sectors: an education centre, an institute of technology and a university college.

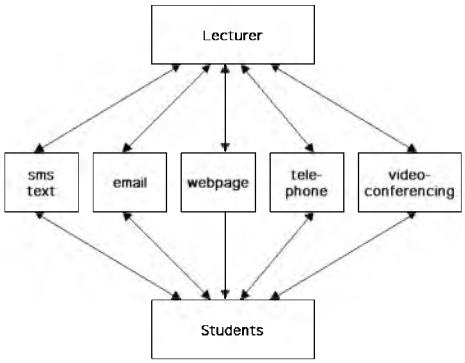

Figure 1. *Technologies employed in this study*

THEORETICAL BACKGROUND

The first main issue was the nature of the qualification offered by distance education, namely, the Diploma in Education. The establishment of academic standards and quality in this programme design, approval and review were informed by precedents from the United Kingdom (Duggleby *et al.*, 2002; Beetham, 2002; QAA, 2003). The Diploma in Education was devised originally as the lower rung on a step-wise structure to a taught Masters in Education and every effort was made to ensure that the students' work was contributory to the masters programme itself. The second main issue was what to teach. The on-going confusion between science *per se* and science education in the public arena and in the third level sector itself: the perception that in-depth content knowledge in science alleviates the lack of experience, education and training in science in order to teach science in primary

schools and the partial perception that education was traditionally an arts and humanities-based activity or set of activities meant that there was a demand for science content knowledge. Typically, however, it was not clear to the students at what level this should be. Theory was seen as a hurdle to successful classroom teaching, thus a model of education weaving content knowledge, exploration of theory and professional classroom practice was devised (Figure 2.). Such a model did not attempt to work at all the issues simultaneously but merely to make the teacher aware of them.

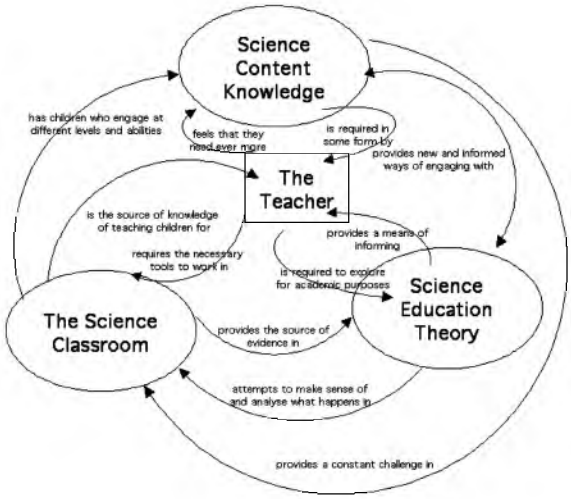

Figure 2. *Model of adaptive science teaching*

METHOD AND RESULTS

Ten two-hour hands-on practical sessions were delivered using Microsoft Netmeeting™ facilitated by a full-time lecturer in St. Patrick's College, Dublin and a laboratory technician in Letterkenny Institute of Technology. Teaching resources for use in the sessions were provided by both institutions. Microsoft Netmeeting™ is freely available and has a number of advantages and disadvantages as a teaching and learning tool. The advantages of using Netmeeting™ are that it is freeware software. It is possible to dial ISDN numbers and I.P. addresses and it possesses white-board and text-messaging facilities, the former an indispensible aid to the learners sited away from the facilitator and the latter as a discreet means of communicating between centres. The disadvantages of using Netmeeting™ is that it is 'Wintel' platform-reliant and it is thought anecdotally to be in conflict with some types of VC view-stations. The virtual learning environment was provided by: Geocities.com free webspace written in hypertext mark-up language. An existing ISDN line was used. However, because of the huge traffic on this line, for the most part a domestic telephone line was used to a greater extent. When the ISP or host server failed, audio-conferencing using the telephone line was used. The impor-

tance of having backup systems in the event of the service provider server failure was realised in which case audio-conference calling was used. This of course is expensive but would be considered a remedial action. Other expenses were: physical resources for practical sessions and travelling to Donegal to meet students. It was found that a dial-up connection with the remote centre provided an excellent audio link and a not-so-good video link, and that IP connections did the opposite. It would be thought expedient for the purposes of teaching and learning that to be heard might be more important than to be seen. Sufficient video quality is necessary to determine which students are present and whether they are performing the practical activities and to what degree. Mavrotheris *et al*. (2006) discussed the technical issues at length.

CONCLUSION AND FUTURE DIRECTIONS

A second cohort spread across an even greater catchment area of the north-west of Ireland successfully completed the certificate/diploma programme two years later. This required a move away from domestic video-conferencing technology to IP based video-conferencing using multipoint video-conferencing. This however was less than ideal and the trade-off between the quality of video and audio remained a real issue. Cost increased greatly and the community of learners were dispersed over a greater area and had thus a less coherent presence. A third cohort is planned to begin, and paradoxically, simpler technology is envisaged than multipoint IP-based video conferencing routed through the national network.

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