Cowan, P. (2013). The 4I model for scaffolding the professional development of experienced teachers in the use of virtual learning environments for classroom teaching. *Contemporary Issues in Technology and Teacher Education*, *13*(1), 82-98.

The 4I Model for Scaffolding the Professional Development of Experienced Teachers in the Use of Virtual Learning Environments for Classroom Teaching.

Pamela Cowan
Queen's University Belfast
UNITED KINGDOM

Abstract

Models of professional development for teachers have been criticized for not being embedded in the context in which teachers are familiar, namely their own classrooms. This paper discusses an adapted-Continuous Practice Improvement model, which qualitative findings indicate was effective in facilitating the transfer of creative and innovative teaching approaches from the expert or Resident Teacher's school to the novice or Visiting Teachers' classrooms over the duration of the project. The cultural shift needed to embed and extend the use of online teaching across the school was achieved through the positive support and commitment of the principals in the Visiting Teachers' schools, combined with the success of the professional development activities offered by the Visiting Teachers to their school-based colleagues.

Professional development in the area of information and communications technology (ICT) in teaching has been an ongoing challenge worldwide (Daly, Pachler, & Pelletier, 2009). Even the most ICT-literate schools in technologically advanced countries have struggled to go beyond the nonintegrated approach of adding an ICT task to the end of a lesson rather than embedding the use of technology seamlessly into their classroom teaching (Cuban, 2001). However, teachers who were the early adopters (Rogers, 2003) of technology and could see the potential of going beyond the norm to stretch pupils academically demonstrated no lack of pedagogical vision.

The drive from governments and districts in the past decade to utilize the potential of ICT to enhance learning and student performance further supported this vision (Department for Education and Skills, 2005; No Child Left Behind, 2002). As a result, various models of ICT professional development for teachers, ranging from the cascade model to individualized distance learning, have been advocated but with limited success (Lawless & Pellegrino, 2007). Often the mismatch between the theory presented at these training sessions and the teachers' own practices in their classrooms has been a hurdle teachers have found hard to overcome (Schofield, 1995). Consequently, they quickly resort to their comfort zone of tried-and-tested traditional teaching strategies, thereby abandoning the new pedagogical approaches.

Teachers are vocal about their requirements for successful professional development in using ICT in their teaching, with the common themes of time, reliable technology, and personalized, situated training repeatedly being the key requests across all school sectors (Brand, 1997; Grant, 1996; Schofield, 1995). However, teacher professional development had undergone scrutiny for many decades, even before the roll-out of technology into classrooms.

In the 1980s, Wood and Thompson (1980) reported that in-service workshops and courses focused on "information dissemination rather than stressing the use of information or appropriate practice in the classroom" (p. 377). By 1989, a national survey of teachers (Smylie, 1989) revealed that in-service training was the least effective means of professional development, whereas direct experience in the classroom was most effective in facilitating teachers in learning how to teach differently.

By the 1990s the work of Lave and Wenger (1991) and other situated learning theorists had highlighted the role of physical and social contexts in learning. Teachers' learning was considered to be part of a system dependent on the whole-school culture and, therefore, "social in nature but distributed across persons and tools" (1991, p.12).

A clear need existed in teacher development to establish communities of teachers who would work together within or across school contexts by supporting each other using peer coaching in a way that incorporated Guskey's (2000) three characteristics of professional development (intentional, ongoing, and systemic). This new approach to professional development challenged the previous perceptions and attitudes about staff development. A systemic cultural shift occurred toward accepting the benefits of teacher professional development to improve student achievement and toward the need to increase the level of commitment and sustained effort from teachers to implement such a change in their schools' ethos. This need for a systemic change to achieve effective staff development was further reinforced when ICT was added to classroom pedagogy.

Teachers Professional Development in ICT

As access to information technology has become more commonplace across all schools, ICT has increasingly become part of teachers' pedagogical toolkits. The initial focus has been on individual teachers' professional development in using the technology competently. Much of the early professional development training in ICT focused on the hardware and software, developing the skills to use the technology with little or no attention to the pedagogical uses of the technology in the classroom (U.S. Congress Office of Technology Assessment, 1988). As in previous in-service training events, teachers found difficulty in transferring the skills they had learned in ICT training labs into their daily classroom routine. "Teaching with computers was seen as making teaching more challenging rather than facilitating teaching" (Schifter, 2008, p. 48).

A review of the innovative Apple Classrooms of Tomorrow (ACOT) project revealed five stages of development in a teacher's practice to integrate computers into the classroom. The underpinning success of this project was the fact that "the ACOT project took the stance that staff development needs to be grounded in the context of practice, to see expert teachers modelling instructional practices as they work with students, and to provide time to reflect on observations and to discuss instructional and learning principles at work" (Yocam & Wilmore, 1994, as quoted in Schifter, 2008, p. 49). On reflection, the ACOT project was the initiation of a whole new style of professional development for teachers.

The model of work shadowing as implemented in businesses, where expert practitioners train novices, was suggested by Maddin (1997) as a mechanism of providing professional development in the effective use of ICT in classrooms. Novice or less-experienced teachers could observe high-technology-using teachers in their classrooms using the learner-centered pedagogies.

By 2002, Bradshaw had taken this idea further and also adapted the staged approach advocated in the ACOT project, combined it with the incremental modeling of good practice and support in context under the four categories, moving from

1. the present theory;
2. the present theory plus modeling through demonstration;
3. present theory, modeling and opportunities to practice in a nonthreatening environment;
4. present theory, modeling, opportunities to practice, and follow-up through coaching, study groups, or peer visits.

As with the generic teacher development paradigms, the transition from individualized to collaborative, whole-school commitment to ICT staff development is inherent in this model of peer coaching. Until recently, the focus has been on the individual teacher's ICT professional development. Advocates assumed that a critical mass of the technologically empowered teachers would result in a whole-school shift toward ICT in teaching, yet this outcome has not occurred. The move to a systemic whole-school approach to embedding sustainable ICT practice in all classrooms continues to be the new challenge for 21st-century schools.

Continuous Practice Improvement

The term Continuous Practice Improvement (CPI) refers to the intentional, ongoing, and systemic nature of this form of professional development that is directly relevant to classroom practice. The fundamental goal of CPI is "to improve teaching practice...through a combination of classroom rotations, technology training, and by fostering an on-going, collaborative relationship between visiting and resident teachers" (Spielvogel et al., 2001, p. 36).

Five key roles exist in the CPI model – the Resident Teacher and Visiting Teachers, the Substitute Teachers (one for each Visiting Teacher), the Mobile Facilitator or Educational Technologist, and the Project Director. Each of these players has a key role in determining the success of the project, and each person is dependent on the commitment of the others during the process.

The Resident Teacher is a highly effective user of technology in the classroom (an expert) and is also a good communicator of the processes needed to infuse technology into the

classroom. The Visiting Teachers, who are considered as the novices relative to the Resident Teacher's expertise, attend the Resident Teacher's school for 5 weeks to observe the Resident Teacher teaching exemplary lessons using technology. This immersion of the Visiting Teachers in the Resident Teacher's school, where modelling of best practice in infusing technology into the classroom practice is occurring, is key to the CPI process.

In parallel to the observations, the Visiting Teachers become actively involved in experimenting with technology-enhanced instructional methods alongside the Resident Teacher, thus, shadowing the expert and receiving peer coaching, as advocated by Maddin (1997).

At the end of the 5 weeks of observation and engagement with the technology-rich classes as part of the CPI program, the Visiting Teachers return to their classrooms and plan how the new skills and teaching strategies observed could be embedded in their teaching over the coming weeks. The Visiting Teachers and Resident Teacher continue to be in contact online so that the Resident Teacher continues to coach all the Visiting Teachers, thus, forming an online community of practice to develop and share ongoing classroom developments beyond the duration of the CPI program.

Finally, the role of the principal in the Resident Teacher's school and also in the Visiting Teachers' schools is paramount in the success of the CPI program. Technology itself cannot change teaching practices. Without the principal's support systemic change within and beyond the classrooms of the Resident Teacher and the Visiting Teachers would not be achieved.

Based on the ongoing need to locate a suitable model for teacher professional development in the area of ICT, this paper reports the use of an adapted-CPI program as a framework for the professional development of teachers who wish to infuse a virtual learning environment into their current pedagogical practices in grades 6-12 classrooms. A novel three-tier award scheme was used to celebrate the success of teachers at each step in the 4I Model:

- Integrating the functionality of the virtual learning environment in their teaching,
- Including and sharing their practices online with other teachers in their school or department,
- Experiencing immersion in the Resident Teacher's school,
- Disseminating and infusing the good practice resulting from CPI training to the wider educational community.

The evaluation of the effectiveness of this adapted-CPI program for teacher professional development in the area of online learning focused on three key areas: (a) the extent to which the immersion experience impacted the creativity of the design of online courses, (b) whether a transfer of knowledge occurred between the Resident Teacher's and the Visiting Teachers' schools, and (c) the sustainability of the adapted CPI program for classroom teachers' professional development in the use of virtual learning environments in the future.

The next section discusses the background to the study and how the CPI program was adapted to the Northern Ireland context by addressing the needs of the Visiting Teachers and meeting the financial constraints of limited substitute teacher coverage for the teachers being released from school. The main adaptation of the original CPI model was the movement from 5 weeks of intensive training immersed in the Resident Teacher's

school to 5 days of dedicated training distributed across an academic year. Online support was provided by the Resident Teacher and Educational Technologist in the intervening periods between training days, thus creating a scaffolded immersion and infusion experience in the professional development process for the duration of a full academic year.

Embedding the 4I model in the Three-Tier Award Scheme for Online Learning

A province-wide network of computers, complete with regional licences for software, is freely available to 1,224 schools and over 370,000 users (teachers and pupils plus education providers) in Northern Ireland. Within this network is an online portal (Learning Northern Ireland [LNI]), which provides teachers with the facility to create, build, use, and share online courses similar to the virtual learning environments offered by Blackboard, Fronter, or Moodle.

A three-tier award scheme provides recognition and formal accreditation of teachers' use of the portal, either as an LNI User, Leader, or Expert. The award scheme is mapped to the teacher competence model published by the General Teaching Council, which also accredits the LNI Awards. In addition, a 4I model also maps onto the award system as shown in Figure 1 and illustrates the incremental stages in professional development in online learning: integration, inclusion, immersion, and infusion.

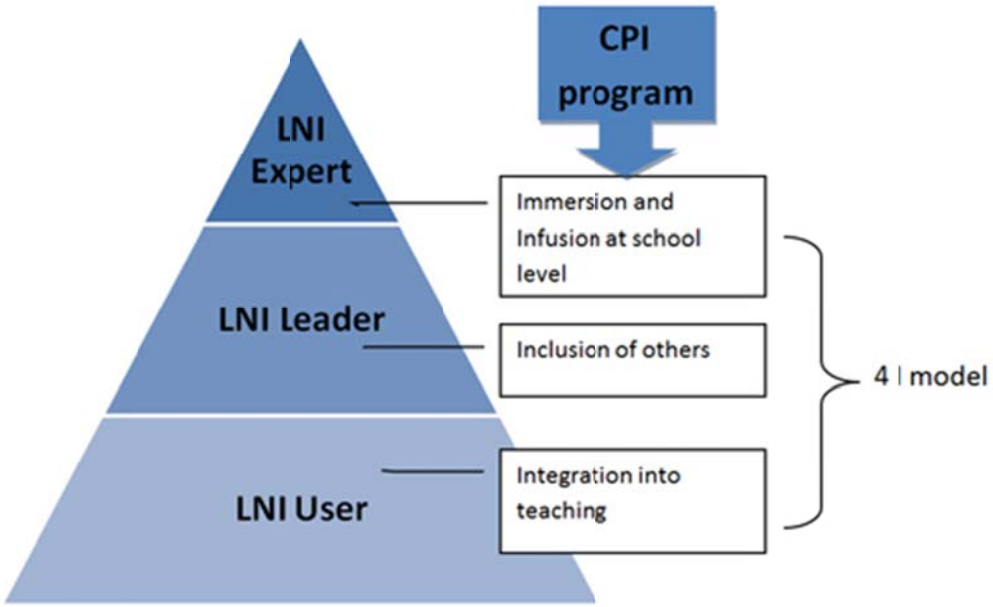

Figure 1. The CPI model embedded in the 4I model of teacher professional development for online learning.

The model begins with the integration of online learning into teaching, moving to the inclusion of other teachers, and finally, the immersion and infusion stages of online learning. The integration stage refers to the experimentation evidenced in teachers' use of online learning with pupils where small, bite-sized chunks of online activity are utilized in a blended learning approach. As the teachers' confidence increases and the level of integration of the online activity expands, the inclusion stage is entered. Inclusion refers

to the scaffolding of other less-experienced teachers, to encourage them to experiment with online activities with their classes, through the use of a shared online course. A typical outcome of this inclusion stage is the production of a subject-specific online course supporting collaborative pupil learning across multiple teachers' classrooms within a department in the same school. The final stage of the 4I model has two elements: the immersion of the novice online teacher in an expert online teacher's school, and the infusion of the new knowledge gained from this immersive experience into the novice teacher's online courses. This stage of professional development is referred to as the "immersion and infusion of online learning," completing the final two stages of the 4I model.

The 4I model fits neatly into the three-tier award system as follows. The LNI User Award is competency based and requires teachers to demonstrate their ability to use the built-in functionality of the virtual environment, such as upload content to a course, moderate online discussion forums, wikis, or blogs, reflect on user tracing statistics for the course, and assess pupils' work submitted electronically. This award is considered to be the "integration in teaching" (the first I in the 4I model) stage of professional development in the use of online learning in classrooms and acknowledges teachers' low-level usage of bite-sized elements of online learning in their teaching as the first step in this three-tier award scheme.

The next stage of the scheme is the Leader Award, which is open to all successful LNI Users. The LNI Leader must successfully mentor colleagues to gain their LNI User Award, thereby facilitating the internal training of teachers within a school via the cascade model. This award addresses the second I of the 4I model, namely the "inclusion of others" stage of professional development in online learning in classrooms. It is valued for its role in identifying self-selected key personnel who are willing to offer the ongoing support needed within a school to make a systemic shift to the use of online learning.

The final tier of the scheme is the LNI Expert Award. This award focuses on the pedagogical aspects of effective course design and use. Extensive and sustained use of LNI is required at this level with evidence of good practice with pupils in the use of an online course for teaching and learning or for internal staff professional development or both. The goal of the Expert Award is to disseminate good practice within and beyond the participants' own school or educational organization. This higher award addresses "immersion and infusion of online learning" (the third and fourth I of the 4I model) stages of professional development in online learning in classrooms and is the focus of this article.

CPI Embedded in the LNI Expert Award System

An adapted-CPI approach to infusing technology into the classroom (based on the work of Schifter, 2008) was adopted as the basis for the LNI Expert Award. An existing expert acted as the Resident Teacher within his school, showcasing how online environments can support aspects of classroom practice for the Visiting Teachers. In this study three Visiting Teachers received 5 days of substitute cover during one academic year to release them from their teaching responsibilities to attend the Resident Teacher's school.

Prior to the visits, an online forum was created by the Resident Teacher and used to encourage the Visiting Teachers to prepare for the first visit by reflecting upon and considering their current use of technology in their classrooms and where they thought developments could be made. The Resident Teacher also posted an outline of the schedule for Day 1 of the visits to other classrooms in the Resident Teacher's school,

where a range of technology-enhanced lessons would be observed throughout the day and across a range of subject areas.

The teachers of these lessons will be referred to as Resident Teacher participants. These observed subject areas were not restricted to those being taught by the Visiting Teachers, although one lesson in each subject area was included to ensure direct transfer of knowledge between the Resident Teacher's school and the Visiting Teachers. The online forum was also used to facilitate online mentoring and dissemination of resources and ideas between the Resident Teacher and the Visiting Teachers between the visits. Reflections by the Visiting Teachers were captured in the forums at key points in the mentoring process. All Visiting Teachers had to attend all five visits to the Resident Teacher's school.

Evidence of completing the LNI Expert Award required the demonstration of immersion and infusion of the use of a virtual learning environment and was threefold:

- The Visiting Teachers' reflections on the observation days and how these impacted their course design and implementation in their own schools. This element was signed off by the Resident Teacher
- The Visiting Teachers' use of an extensive self-created online virtual learning environment course on a topic of their choice with a group of learners (pupils or other staff members) and their reflections on the feasibility and benefits/disadvantages they experienced
- An online animated tour with voiceovers of their virtual learning environment course discussing how it was used and how other teachers may wish to use it in the future.

All animated tours of the online courses were also shared with the whole teaching community via an LNI portal, which allowed teachers to download complete online courses into their course area for modification and use with their own classes. This final sharing process completed the wider dissemination requirement of the LNI Expert Award.

The Evaluation Process

The primary aim of the study was to investigate the factors promoting the infusion of online technology into classrooms of the Visiting Teachers and to determine the impact of the Resident Teacher in supporting this process. Secondary goals in the study were the impact of the adapted-CPI program on the wider school settings of the Visiting Teachers. The research questions for the study were as follows:

- Does immersion in the Resident Teacher's school assist the Visiting Teachers in being creative in their course design?
- To what extent did a transfer of knowledge occur between the Resident Teacher's school and the Visiting Teachers' own classroom/school?
- How sustainable is this three-tier model of professional development for teachers?

Methodology

A hermeneutic phenomenology aims to develop a rich or dense textual description of the phenomenon being investigated in a particular context (van Manen, 1997). These

descriptions have relevance and connect with the experiences of a wider audience, resulting in the formation of a deeper understanding of the phenomenon under investigation. Using a hermeneutic phenomenology, the participants' journey over the duration of the study was captured by adopting a predominantly qualitative approach, due to the small number of teachers involved in the study.

The aim was to capture the story or pedagogical journey of each Visiting Teacher during the adapted CPI program. This goal was achieved through a combination of observations, photographs, interviews, and discussion forum postings. Data from these sources were used to support and challenge the inferences being made in the evaluation. The multiple data sources allowed for triangulation and comparison of the oral reflections made during the visits to the Resident Teacher's school, with the written reflections presented in the discussion forum between visits.

Initially, the Resident Teacher, the Visiting Teachers, and all the participants in the Resident Teacher's school, whose technology-rich lessons had been the focus of observation, were administered a survey, so that their overall attitude and enthusiasm toward using ICT in the classroom could be established at the outset of the study. Observation notes were recorded at each of the training days, including the Visiting Teachers' and Resident Teacher's reflections after each observed lesson.

The structure of the program for each day was reviewed to establish the quality of scaffolding being provided by the Resident Teacher to promote the Visiting Teachers' learning during the peer mentoring process. Periods of dedicated time were noted and how these were used to promote the sharing and collaboration of ideas within the group. The level of openness and trust established between the Visiting Teachers and Resident Teacher was also considered, as was their change in values over time. Due to ethical requirements to protect the identity of the schools and teachers involved in this study, the results are reported either collectively where consensus occurred or under the label of Visiting Teacher or Resident Teacher participant, which includes all the teachers from the Resident Teacher's school who were observed by the Visiting Teachers.

Analysis and Results

A grounded research approach was adopted to collect evidence regarding the social interactions or experiences of the Visiting Teachers and the Resident Teacher and teacher colleagues from the Resident Teacher's school through the systematic analysis of the data. An iterative process of coding was used, from which common themes emerged (Strauss & Corbin, 1990, 1998). The thematic analysis of this coded data revealed the four main areas influencing the Visiting Teachers' progress over the duration of the training:

- Pedagogy when using virtual learning environments to enhance pupil motivation and engage pupils' interest.
- Professional development, including the new skills learned.
- Time to develop ideas and new resources and time for professional development.
- A senior management team of school administrators (especially the Visiting Teachers' school principals), who served as the main players in the pedagogical change.

The open-ended questions from the survey confirmed a positive disposition toward the use of ICT in teaching from all the participants. It also revealed the value they placed on the use of ICT to enhance pupils' motivation and engage pupils' interest in their subject area. Comments from participants in the Resident Teacher's school indicated that they

utilized "the power of technology to stretch and challenge their learners" to go beyond the norm and achieve outcomes that were not possible prior to infusing the online environment in the teaching and learning process. The Visiting Teachers reported an awareness of "the potential of ICT" to unleash these experiences; however, they declared they were not utilizing it for this purpose at the start of the adapted-CPI program.

All participants reported they were "enthusiastic about their own professional development" and "valued opportunities to receive additional training in ICT-related areas relevant to their subject." The Resident Teacher participants described their role as subject champions in their school who initiated and sustained the current rate of change within and across departments. They also referred to the role of the school principal in supporting the "cultural change" within the school and promoting the nontraditional teaching strategies to parents as being important elements in sustaining the commitment of all teachers to the innovative online processes. The use of internally delivered, just-in-time ICT training sessions was also praised by the Resident Teacher participants and commented upon by the Visiting Teachers as a valuable mechanism to sustain their school's ethos toward innovative teaching pedagogies.

Pedagogy

The key findings in terms of the pedagogical benefits of the adapted-CPI model related to the perceived value of the observations in the Resident Teacher's school on the first 2 days of the program, the transfer of knowledge from the Resident Teacher participants to the Visiting Teachers and the impact of these conversations on the design of the Visiting Teachers' online courses, and the feedback from the Resident Teacher and Educational Technologist in support of the Visiting Teachers' planned design of their online courses.

Comments from the Visiting Teachers included, "Lesson observations were excellent....The Expert was also excellent." The comments were supported by the photographic evidence of the Visiting Teachers' attentiveness and involvement with pupils in the observation lessons and the quality of the discussions post observation with the Resident Teacher and Resident Teacher participants. The range of uses of online technologies used in the Resident Teacher's school was noted by all Visiting Teachers in their verbal and online reflections, and they valued this breadth of experience they could draw upon when designing additional online courses in the future (see example in the appendix).

The Visiting Teachers' remarks illustrated the Visiting Teachers' ability to transfer the knowledge gleaned from the observations and apply it in their own teaching contexts. They included the following: "Discussions can be used in LNI, Moodle or Fronter," and "Integrating other software into teaching such as Cmaps and digital recording...do not need to be related to LNI – they are useful in any [virtual learning environment]."

In the postobservation reflections, one Visiting Teacher commented on the Resident Teacher participants' ability to "sustain their own teaching style," even though they were delivering predominantly online activities to the pupils. Visiting Teachers also noted that the online environment freed the Resident Teacher participant to spend more time during the lesson with the lower ability or previously absent pupils, indicating a pedagogical benefit of virtual learning environments.

Visiting Teachers observed innovative uses of the discussion forum and were quick to follow up these sessions by asking for advice on implementing parallel activities in their own subject areas or across different age groups. Their reactions indicated a willingness

to adapt the ideas used in the Resident Teacher lessons and apply them in their own subject context. The Visiting Teachers reported that the resultant creativity embedded in their online courses was enhanced by their observation of other teachers' courses in the Resident Teacher's school. The improved creativity of their online courses was confirmed during the assessment and evaluation phases of the research.

The role and impact of peer coaching was especially notable to the Visiting Teachers, as in the following example statement: "The feedback from everyone was very good and forced you to make the changes to your online course. They pushed you a bit further, but the expectations were not too high or too low."

In most cases an analysis of the content of the Visiting Teachers' online courses indicated that ideas had transferred directly between the schools, for example, from the modern languages lesson in the Resident Teacher's school to an element of literacy in a Key Stage 3 Science lesson in a Visiting Teacher's online course (Figure 2). The self-evaluation process utilized by pupils through discussion forums in the Resident Teacher's school was adopted by another Visiting Teacher as the final pupil reflection/self-evaluation activity in her Key Stage 3 topic. Even the Resident Teacher's own staff development course offered an exemplary structure for a Visiting Teacher's online course designed for use with an examinations class in English literature.

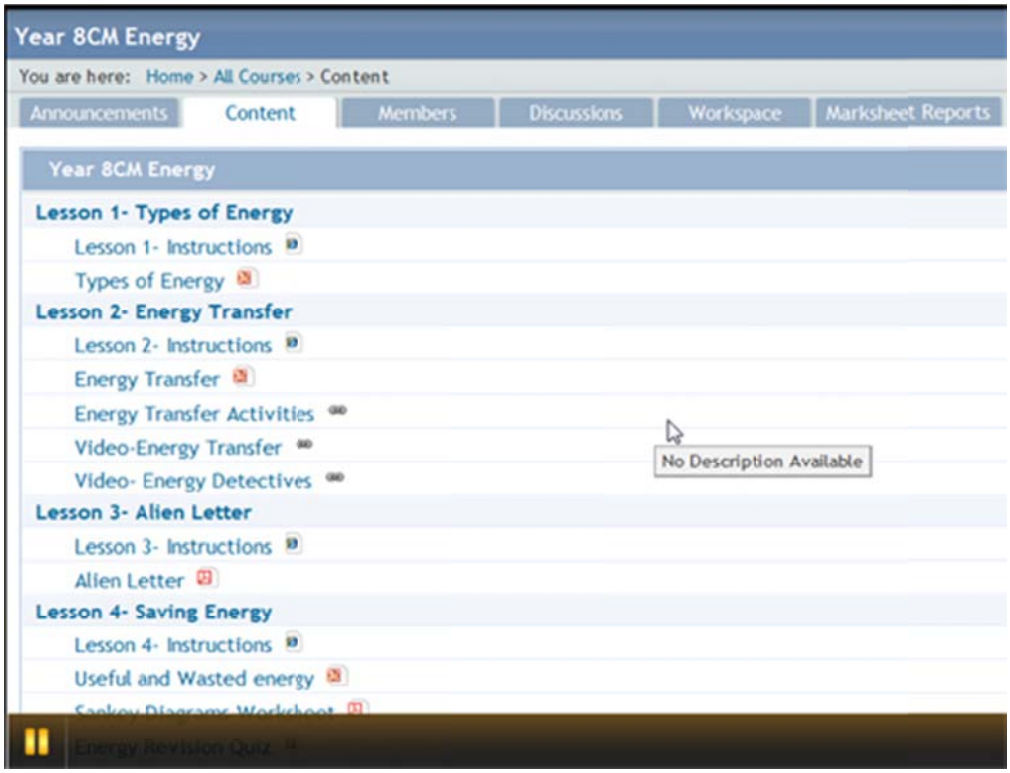

Figure 2. Screenshot from a Visiting Teacher's online science course.

In each of these cases the Visiting Teachers' reflective comments acknowledged the dominant impact of a particular observed lesson in guiding the design of their online course. Visiting Teachers recognized the role of specific approaches from the observed

lessons both during the informal discussions reflecting on the value of the lesson observations and when they presented their plans for their online courses. Their comments included the following:

- "This activity is like the one in the German lesson when..."
- "I really liked the idea of... so I have used it here to achieve ..."
- "I was impressed by the quality of the pupils' writing and thoughtfulness in the discussion forums, so I decided to try it in my course for ..."

Other examples of creativity and transfer of ideas between the Resident Teacher's school and the Visiting Teachers' school occurred naturally as the program evolved.

Professional Development of New ICT Skills

The benefit of the structure of this adapted CPI program was the spread of training days across an academic year, the use of the reflective process to embed new ICT skills in the training process, and the resultant stimulus to apply these ideas to their class teaching.

At the start of each training day, Visiting Teachers each shared a personal reflection with the group on their progress to date since, on average, 2 months had passed between each of these training events. This review period also allowed the Visiting Teachers to practice their new ICT skills as part of the reflective process. For example, the Visiting Teachers had never tried podcasting but had observed its use by the Resident Teacher participants with a class of pupils on Day 1. The Resident Teacher designed a specific reflective task for the review of the progress to date at the start of Day 2, which was recorded as a podcast and shared with the CPI team. One teacher embedded a similar podcasting activity into his online course for pupils as a formative activity.

By scaffolding the Visiting Teachers' learning over the 5 training days and supporting them by sharing resources and training materials online, the peer coaching by the Resident Teacher was embedded seamlessly into the CPI program. The Visiting Teachers reported looking for and using creative ways to embed their newly acquired ICT skills into their subject-specific online courses.

Time

Insufficient time is consistently reported as a barrier to the creative and innovative use of new technologies in the classroom, whether in regard to teachers' time for preparing instructional materials or pupils' increased time for completing ICT-based activities. The CPI program addressed this concern fully by providing Visiting Teachers with dedicated time to plan while attending the Resident Teacher's school. The intensive nature of the program also accommodated the one-to-one support and scaffolding of learning between the Visiting Teachers and Resident Teacher.

One Visiting Teacher noted, "I enjoyed the different aspects of the program. The time to create your own course, to compare ideas with the others and to readjust things." Another Visiting Teacher said, "There were no issues about the program interfering with the normal day-to-day life in terms of teaching." The assessment process did not even cause the Visiting Teachers concern: "Assessment was evidence-based, so there was no significant strain on my time to prove my expertise."

The Resident Teacher was able to work one on one with each Visiting Teacher, discussing, reviewing, and encouraging them to experiment with new ideas in their own courses by reminding them of some of the observations or by using the Resident Teacher's own experiences in the classroom to demonstrate alternative teaching approaches to achieve the same or better outcomes from the pupils. Using this shared collaboration, the Resident Teacher supported the development of Visiting Teachers' creativity in course design by nurturing and encouraging the transfer of ideas through adaptation, extension, or amending them in the Visiting Teachers' own courses.

Online reflections between training days were also used to maintain contact between the Resident Teacher and Visiting Teachers and to further develop the online community by all participants supporting and sharing ideas with each other: "It was easier to set aside time to do the Expert Award....There was time to talk to each other and share ideas. The training days were not rushed at all. It was a nice steady approach and very productive." Any concerns or issues raised by the Visiting Teachers at this time could be quickly addressed as peer support was provided by the Resident Teacher outside of the planned training days.

It was also noted that as pioneers of the new ideas within their own schools, the Visiting Teachers may have to address the technical issues either alone or with limited support, so a network of like-minded innovative teachers and the technical expertise of the Educational Technologist offered both collegiality and motivation during periods of perceived isolation due to the limited uptake of technology or lack of interest from colleagues in their own schools, and this support network was valued greatly by the Visiting Teachers.

Pedagogical Change

Support from the school principal played a key role in determining the successful transformation to and acceptance of online learning by teachers, pupils, and parents alike. In many cases the facilitation of the transfer of knowledge from the Resident Teacher's school to the wider staff in a Visiting Teachers' school was a direct consequence of the principal's provision of time for a whole-school dissemination process.

The role of the principal in the Resident Teacher's school was discussed as part of the adapted-CPI program, and the Visiting Teachers were encouraged to maintain their contact with their own principal to ensure that the cultural shift needed to infuse online learning across all departments in their school would receive the necessary support from the principal. The Visiting Teacher's time out of school, mechanism for disseminating their online course in school, and method for feeding into the school development plans or ICT policy were also discussed in the context of the role of the principal in supporting the whole-school infusion of online learning in the classroom.

In the interviews with members of the senior management teams in the participating schools, there was general consensus about the benefits to the school as a whole from the Visiting Teacher's completion of the Expert Award. Principals reported "a definite rippling effect across the other teachers in the school" and cases of "cascading the training to other staff members through awareness raising sessions." Visiting Teachers were also seen to be

> building capacity within the staff...and raising the profile of what you can do with this wonderful new technology and what pupils can achieve...from the higher

> quality resources being made available to them and acquiring practice in tools they can use flexibly in their own home.

Principals' Views

In relation to Research Question 3, the sustainability of this model of staff professional development was viewed positively by the principals and senior staff within the participating schools. Although issues such as finance did arise in the discussions, this concern was outweighed by the perceived benefits to the whole staff through the natural dissemination of new ideas across the school and the increased levels of enthusiasm by all staff to support each other when testing alternative pedagogical approaches and blended learning.

When asked directly for their view on the sustainability of this professional development model, some principals said that "release for five days over a year is quite a lot." Another senior staff member declared,

> There was no stress on the school day at all. We knew in advance and it was planned so there was no problem with release time. If teachers wish to develop themselves, the school has a commitment to this....Ultimately, professional development has the potential to benefit the children and has the potential to benefit more staff.

In relation to this particular program of staff development, it was agreed that "the LNI Expert Award is a mutually beneficial thing, as the individual is receiving a qualification and the school benefits too from the ideas brought back."

The financial burden of this type of professional development activity was noted by the principal in some Visiting Teachers' schools. The payment of substitute cover for the 5 days was met with a mixed response. In one Visiting Teacher's school the principal stated, "I think it is worth releasing a teacher whether you have sub cover or not." In another Visiting Teacher's school the reaction was, "Lack of funding will certainly limit the number of staff being released...more than five days is a problem." Another school principal stated,

> I would very much hope that there would be some central funding....You will get more buy-in from staff if you can provide some help with time provision. But it is reasonable to expect the schools to provide some buy-in as well since there are such great benefits for them as a whole too.

In general, the principals and senior staff were supportive of the adapted-CPI program and could articulate the wider whole-school benefits they had gained from one teacher participating in the LNI Expert award. As a result, they could envisage a more long-term cycle of professional development emerging through staged staff participation in the LNI Expert Award, which would provide continuous staff development ideas being infused across the school at a minimal cost in terms of total staff time out of school.

To increase the sustainability of the process, suggestions to reduce the number of days out of school and replace these with video-conferenced sessions were met with different opinions amongst the senior staff members interviewed. One member of a school's senior management team said, "I can understand that video-conferencing is cheaper and that personal contact is more expensive, but it is worth it." This view was supported by another principal who declared, "Good teaching and learning is built on good

relationships, and it is more difficult to have a good relationship electronically. Personal contact is key." In the context of a project that is encouraging increased use of online learning with pupils, this stance is an interesting one to assume.

In another school the principal seemed more attuned to the ethos of the project and was enthusiastic about making effective use of existing video-conferencing facilities saying,

> Video-conferencing could be part of the award as the facility exists in schools, and this would provide a very meaningful purpose to the facilities....The loss of the presence of being with others is the nature of a VLE anyway so it wouldn't be a problem.

In many ways the comments from the principals and senior staff in the participating schools were aligned with the aims and goals of the program. As observers who were external to the adapted-CPI program, they could see the impact of the training days at the Resident Teacher's school being transformed into professional development and sharing of good practice across a range of subject areas, both informally in staffroom conversations and also through internal staff training events.

The staged progression through the LNI Expert Award program over the academic year facilitated opportunities for the participating Visiting Teachers to complete small scale experimentation and testing of ideas to increase their confidence levels in planning toward and sustaining the use of an online course with a whole class for a complete topic. The Visiting Teachers' renewed enthusiasm and enlightenment resulting from each visit to the Resident Teacher's school helped maintain a whole school interest in the Visiting Teacher's progress in the adapted CPI program and empowered other teachers to consider completing the LNI Expert Award as a goal for their own professional development in the future. As the principals noted, the release of one teacher was impacting on the whole staff in terms of ICT professional development and, in particular, the use of blended online learning with pupils.

Discussion

The evidence from the Visiting Teachers' online courses, their screencast discussing the design of the course, and observations and discussions during the course creation phase and the Visiting Teachers' reflections throughout the program all support the assertion that the observation days in the Resident Teacher's school had an impact on the design of the Visiting Teachers' online courses.

An analysis of the content of the Visiting Teachers' online courses and their personal statements of reflection indicate that the transfer of knowledge between the Resident Teacher's school and the Visiting Teachers' online courses was strong. Also supporting this finding were the types of comments made by the Visiting Teachers and the ways they referred to specific observed lessons when discussing the innovative pedagogical approaches adopted in their online course for teaching their chosen topic.

As the Visiting Teachers were inspired by their observations of the Resident Teacher participants' lessons, it was natural that they would adopt some of the techniques observed as effective motivators of pupils' learning and embed them into their own online course, thereby increasing the creativity in their teaching. In a similar vein, on their return to school these Visiting Teachers freely discussed the strategies and novel approaches observed in their visits to the Resident Teacher's school with their colleagues

in other departments. Seeing them as innovative teachers, the staff was willing to listen to the ideas being shared and to try some of these ideas in their own school context.

Due to the time available between the five sessions, these Visiting Teachers were also able to adapt the ideas from other subjects in the Resident Teacher's school and use them in their own subject teaching with a range of classes. Evidence of this knowledge transfer to their own subjects and also to colleagues within their school became increasingly apparent in the Visiting Teachers' reflections. Snow days, revision podcasts, and discussions forum work for an ill pupil were used as illustrations of piloting new ideas for short or focused online courses.

Immersion in the Resident Teacher's school assisted the Visiting Teachers in using online learning creativity and transferring ideas from the Resident Teacher's school to the Visiting Teachers' own school contexts. In addition, the experiences in the Resident Teacher's school motivated both the Visiting Teachers and their colleagues to experiment with new ICT packages in a blended approach to support aspects of their traditional classroom teaching to enhance pupils' learning, as confirmed by their principals.

The sustainability of this model of professional development was addressed mainly by the principals and senior members of the Visiting Teachers' schools. The release of one teacher for 5 days throughout an academic year was viewed by the senior management team as a good investment of time and resources, due to the staged impact of the training on the wider school staff and the dissemination of internal staff training based on observed good practice in the Resident Teacher's school.

Although finance remained a concern that may negatively impact on the sustainability of this model of professional development, the principals said the adapted-CPI-style program offered good value for money compared to other training events organized internally or externally. With careful resourcing and attention to the times of the Resident Teacher school visits, the senior staff appeared willing to buy in to this program for other staff members in the future.

Through the continued support of the senior management team toward the use of online courses, the necessary school level cultural shift needed to embed this alternative approach to teaching and learning was achieved in all Visiting Teachers' schools over the course of the academic year and was supported by all teachers, pupils and parents. Clearly, Guskey's (2000) recommendation of intentional, ongoing, and systemic professional development holds true in the adapted-CPI program.

Conclusions

Past issues in the generic professional development of teachers reported in the 1980s were revisited again in the early 2000s as concerns for the professional development of teachers' ICT skills and pedagogical practices online. With the advent of online learning as the next area for teacher professional development, this article aims to address a similar pattern of needs in terms of experienced classroom teachers' professional development for online teaching. Training alone cannot assist teachers in infusing technology into their classrooms (Schifter, 2008); however, with the support of a principal, a cultural change can be adopted by all teachers and accepted by parents and other stakeholders in the educational sector. The adapted-CPI program, although expensive to implement, has already demonstrated effective and sustained embedding of technology into classrooms in Philadelphia in the U.S.

Using this adapted-CPI model spanning a full academic year with the 5 training days being supplemented with online support from the Resident Teacher and Educational Technologist, this model of staged training provided to a group of middle and high school teachers in Northern Ireland, with a variety of years of teaching experience in different subjects, worked effectively in securing the priority of online learning in teachers' and principals' fields of awareness. The use of a Resident Teacher as expert and the novice Visiting Teachers opened the door to experienced teachers viewing other more experienced online teachers' classroom practices. The value of this form of work shadowing (Maddin, 1997) has been underestimated for many years.

It is well known that pockets of exemplary pedagogical practice exist in all schools, yet even within a school, teachers find peer review of their colleagues difficult. Sharing and extending their good practice to other teachers is easiest when these teachers are present in the classroom to gain a valuable insight into how to manage and control the teaching process using alternative strategies. In this study, the adapted-CPI program achieved this goal with ease and, complemented by the 4I-model of continued professional development in online learning, proved to be effective in achieving the goal of immersing and infusing online teaching in grade 6-12 classrooms in the schools involved in this study.

Further research is needed on the 4I model of professional development in online learning, as to date, only one cohort of LNI Experts has been assessed. The financial burden of substitute cover may be prohibitive for some schools rather than the lack of availability of substitute teachers. The role of student teachers and newly qualified teachers who have not secured a job may provide the source of substitute cover needed to make this final stage in the 4I model feasible for all schools.

Use of video-conferencing to remove the need to travel to the Resident Teacher's school and extend the use of online support to develop teachers' skills in mentoring others online is another viable alternative to reduce the costs. Aspiring Experts, however, would still need time to be released from teaching commitments to participate in the videoconference sessions. For schools facing strict time constraints or lack of flexibility to cover classes, the use of subject-specific or interdisciplinary Teacher Meets—brief online encounters with other teachers to informally share good practice on a regular basis—may offer an alternative means of sustaining professional development opportunities in adverse circumstances.

References

Bradshaw, LK (2002). Technology for teaching and learning: Strategies for staff development and online support. *Journal of Technology and Teacher Education*, *10*(1), 131-150.

Brand, G.A. (1997). What the research says: Training teachers for using technology. *Journal of Staff Development*, *19*(1). Retrieved from http://wikieducator.org/images/4/4b/What_Research_Says_-_Training_Teachers.pdf

Cuban, L. (2001). *Oversold and underused: Computers in the classroom*. Cambridge, MA: Harvard University Press.

Daly, C., Pachler, N., & Pelletier, C. (2009). *Continuing professional development in ICT for teachers: A literature review*. London, UK: Becta.

Department for Education and Skills. (2005). *Harnessing technology: Transforming learning and children's services*. London, UK: Author.

Grant, C.M. (1996). *Professional development in a technology age: New definitions, old challenges, new resources*. Retrieved from the Local Systemic Change Network website: http://lsc-net.terc.edu/do/paper/8089/show/use_set-teacher_pd.html

Guskey, T.R. (2000). *Evaluating professional development*. Thousand Oaks, CA: Corwin Press.

Lave, J., & Wenger, E. (1991) *Situated learning: Legitimate peripheral participation*. New York, NY: Cambridge University Press.

Lawless, K. A., & Pellegrino, J.W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns and ways to pursue better questions and answers. *Review of Educational Research, 77*(4), 575-614.

Maddin, E.A. (1997). The real learning begins back in the classroom: On-the-job training and support for teachers using technology. *Educational Technology, 37*(5), 56-59.

No Child Left Behind (NCLB) Act of 2001, Pub. L. No. 107-110, § 115, Stat. 1425 (2002).

Rogers, E.M. (2003). *Diffusion of innovations*. New York, NY: Free Press.

Schifter, C. (2008). *Infusing technology into the classroom: Continuous practice improvement*. Hershey, PA: IGI Global.

Schofield, J.W. (1995). *Computers and classroom culture*. New York, NY: Cambridge University Press.

Smylie, M. A. (1989). Teachers' views of the effectiveness of sources of learning to teach. *The Elementary School Journal, 84*(5), 543-558.

Spielvogel, R., Brunner, C., Pasnik, S., Keane, J. T., Friedman, W., Jeffers, L., ...Hermos, J. (2001). *IBM's reinventing education grant partnership initiative: Individual site reports.* New York, NY: EDC/Center for Children and Technology.

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage Publications.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research techniques and procedures for developing grounded theory*. (2nd ed.). Thousand Oaks, CA: Sage Publications.

U.S. Congress Office of Technology Assessment. (1988). *Power on! New tools for teaching and learning.* Washington, DC: U.S. Government Printing Office.

van Manen, M. (1997) *Researching lived experience: Human science for an action sensitive pedagogy* (2nd ed.). Ontario, Canada: Althouse Press.

Wood, F.H., & Thompson, S.R. (1980). Guidelines for better staff development. *Educational Leadership, 37*(5), 374-378.

Yocam, K., & Wilmore, F. (1994). *Creating an alternative context for teacher development: ACOT's two year pilot project.* Cupertino: CA. Apple Computers Inc.

Author Notes

Gratitude is extended to Hewlett-Packard for their financial support in this study, to the members of C2K who acted as the Mobile Facilitators, Educational Technologists and Project Director, and to the Resident Teacher for his dedication and commitment to hosting valuable professional development experiences both face to face and online. Grateful thanks are also extended to the Senior Management teams in all the participating schools for their willingness to be involved in the study and for their reflective comments as observers of the wider impact of the program. Finally, a deep appreciation is extended to the Visiting Teachers who devoted their time and energy to making the project an enjoyable experience and for openly sharing their journey.

Pamela Cowan
Queen's University Belfast
UNITED KINGDOM
Email: p.cowan@qub.ac.uk

Appendix A

Page Options Help

LNI Expert 2010 Observations WIKI

- Home
- Observation 1 CMAPs
- Observation 2 Digital Recording
- Observation 3 LNI Science
- Observation 4 Peer assessment
- Observation 5 LNI Discussions
- Observation 6 (Presentation) - Using LNI

Last modified at 14/02/2011 01:25 PM by N [Edit]

Lesson date & timings	Subject	Teacher	LearningNI/ICT Focus	Observation & discussion times
Mon 7/6/10 period 1	History	Head of History	CMAPs concept mapping, year 9	Discussion period 3

	Thoughts during observation	Post-observation reflection (Ideas re. integrating observed ICT tools into own teaching and learning)
N	Having previously used mind mapping software with some scepticism this lesson demonstrated effective use of this type of software. CMAPs is clearly a very user friendly tool as all pupils appeared very confident when using it. The software also appeared to be very engaging as pupils were enthusiastically producing a very visual representation of the area of study. The use of hyperlinks and pictures makes this piece of software much more powerful than the traditional pen and paper exercise. The use of peer assessment via discussion using the two stars and a wish approach was excellent and one which I have used since.	While we have commercial mind mapping software in school, the use of CMAPS is attractive as it is free and can be used at home and easily uploaded to a workspace whereas our software (Mindjet Mind Manager) can only be used in school (not all computers have it installed). I fully intend to encourage the use of mind mapping software from year 8 to sixth from both as a revision tool but also to help relate current learning objectives to previous learning.
B	The students were familiar with the CMAPs software and could use it with ease. The resulting concept map was attractive and colourful. I felt this made it interesting for pupils as there was an instantly professional standard, difficult to achieve on paper. It was also effective to be able to link pictures and create hyperlinks, allowing the document to develop into a useful reference tool. I think CMAPs would be very useful particularly for visual learners and provided a collaborative way for teaching and learning a topic.	I can see the benefits of having Cmaps available on LearningNI as may learners find it a useful tool for end of topic revision and essayplanning. I would use it in English for many tasks where analysis is required eg tracing the development of a theme in a text or the methods used by a writer to create effects.
M	The students appeared to be very comfortable with the CMAPs software. They were able to use it quickly and independently during the lesson, and managed to partially create a colourful, eye-catching and personalised concept map for their history lesson. The fact that the software is free to download, meant that completion of the CMAP could be set as a homework task. Students with no access to the software at home would still be able to continue with preparation on paper. I would have expected to see this tool being used at the end of a topic, in order to revisit the main concepts and keywords. It was very interesting to see it being used at the start of a topic instead, giving students an overview of where they were going over the next few lessons. All students like the opportunity to be creative. The fact that this software allows them to pick their own colours, fonts and layouts etc was a big hit with the students. It was also brilliant that you could link in pictures, or hyperlinks to external websites. I had never seen anything like CMAPS before.	Although free to download, it would be useful to have this software available within LearningNi. This would avoid the need to install it onto individual workstations within the school. I would like to complete a staff training session on CMAPS that focuses on how students could use it to structure an essay. This would help teachers to think about other uses themselves. I would also like to use it myself to organise group work. It would be a really good way for students (and myself) to see the overall task, groups membership and individual work allocation. Eg the year 9 Public information System wiki.

Screenshot of wiki capturing three Visiting teachers reflections (denoted by N, B, M) on an observed lesson in History with a class of pupils aged 13.

(Identifiers have been removed for Ethical reasons).