Introduction
The action research project reported here focuses on developing both the technical and pedagogical competence of classroom teachers with learning technologies, and tracking this process to classroom implementation in relation to information and critical literacies, and measuring learning outcomes. It used conceptual models of transformational leadership and autonomous learning as process frameworks to implement and evaluate a number of professional development strategies linked to the World Wide Web and multimedia: basic applications; publishing tools; and presentation tools.

The project was situated within an action research framework, using the stages of plan, implement, evaluate and reflect to chart progress and outcomes. It sought to move the use and learning integration of learning technologies beyond pockets of success within the school to a change in whole school culture. This paper outlines the project philosophy and process, and highlights key outcomes. In doing so, this paper provides a conceptual model for staff professional development in this context.

The school context
This project was undertaken in early 1999 at Bethlehem College in Sydney, a Catholic Education systemic school for 860 girls in Years 7-12. The college has moved through out; and its relationship to clearly identified school based needs and learning outcomes for students. The project was undertaken by Judith O'Connell and myself. Judith is the teacher-librarian and curriculum coordinator at Bethlehem College in Sydney. The project was part of the DEETYA funded initiative Innovation and Best Practice Project and led by the School of Educational Psychology, Measurement and Technology at the University of Sydney. We gratefully acknowledge the funding received to undertake this project.
a number of key phases since 1995 in its approach to implementation of learning technologies as a curriculum innovation, and this project is part of a sustained response to identified needs during this process. Key points in the innovation cycle since 1995 have included: development of a school based learning technologies policy and plan; full professional development days focusing on learning, literacies and management aspects of technologies; undertaking a learning needs analysis; establishment of a technology committee; research analysis of staff perceptions of the information search process; and development of a teacher competencies benchmark and implementation plan. In addition, a specialist learning centre, the Sophia Centre, was established within the college library to nurture integrated electronic learning technology activities within the mainstream curriculum.

Against this context, a number of other factors motivated this specific project. Analysis of teachers' estimates of their personal expertise and zone of comfort with various research tools, matched with their expectations for the same tool for student learning, showed that personal expertise and zone of comfort did not relate to their expectations for their students. There was also a significant discrepancy between teachers' familiarity with information sources and information technology, and teachers' view of the sources' importance for student learning. In addition, there was mounting pressure created by students who were comfortable in such an environment as opposed to teachers who were not, and the realisation that it was not sufficient to let students "work it out" and for teachers to expect the students "to teach me".

It also was becoming clear that the amount of staff training was not necessarily related to the quality of implementation. Despite the extensive and beneficial programs to date, there was still a clear need to ensure ongoing, interactive, cumulative learning necessary to develop new conceptions, skills and behaviour, and from which are derived significant learning outcomes. Little curriculum change was occurring, as evidenced by classroom practice, units of work and developments in subject programs. Some teachers were even 'forgetting' how to use technology as a simple working tool. It had become clear that grounding procedures for implementation of curriculum change, within a clear and effective framework of professional development, was essential for achieving innovation and change in the use of electronic learning technologies within the curriculum.

Guiding frameworks: transformational leadership and the autonomous professional

Transformational leadership is a particular style of leadership that gives emphasis to transforming rather than transacting in a context of rapid environmental change (Ryan, 1997). Fullan (1993) argues that where change in fundamentals is concerned, the process can become problematic. He claims that the way that teachers are trained, the way that schools are organised, the way that the educational hierarchy operates "results in a system that is more than likely to retain the status quo than to change it." When change is attempted under such circumstances it results in defensiveness, superficiality, or at best short lived pockets of success. The building of new commitment to a very new competence, can, therefore, be a very fragile process. Change defines proficiency. It devalues current skills, even if they have been applied artfully, and even if those who have been applying them still see them as valid and successful.

Learning about information technology and integrating it meaningfully into classroom practices demands pedagogical change. Its successful implementation requires staff to move from what has become at least 'old competence' to what is now defined as 'new competence'. When the scope and sophistication of such a change goes far beyond minor modification, as it does with the introduction of learning technologies, this transition is especially challenging. This is the essence of transformational leadership: valuing and integrating change, not in the sense of bringing about minor modifications and transitory outcomes often embedded in such initiatives, but in transforming and reshaping the culture of the school.

Transformational leadership involves four dimensions (Caldwell & Spinks, 1992.) These are:

- cultural leadership, focussing on learning as constructive and transformative
- educational leadership, focussing on the development of critical and information literacies for electronic information environments
- strategic leadership, focussing on understanding of technological issues and trends, and establishing long term vision and future directions
- responsive leadership, focussing on understanding individual/group needs as a basis for setting direction.

These four dimensions established four guiding principles that shaped the implementation of the action research on professional development: its substantive content; its context; its process; and its goals.

We also sought to implement a program that was informed by the literature on professional development itself. This was initiated through the examination of a number of professional development models, in order to conceptualise the structure and process of the targeted programs to be implemented.

In the first instance, a number of key features of the long-standing Andragogical Model of Knowles (1990) were examined. From this model we identified twelve salient features that were considered essential in underpinning the development process for staff. These included: (1) non prescriptive attitude; (2) issue centred curricula; (3) problem posing; (4) links to practice and experience; (5) continuous negotiation and redefinition; (6) shared responsibility for learning; (7) valuing process; (8) dialogue; (9) equality; (10) openness; (11) mutual respect; and (12) integrated thinking and learning. Boud's Autonomous Learner Model (Boud & Griffin, 1987) clarified for us the broad framework for the learning to take place through the developmental program. The key ideas of this model are illustrated in Figure 1.
Autonomy with approaches to learning  
opportunities for staff to identify what to learn; how to learn; demonstrate learning; evaluating learning; reflecting on learning process

Autonomy with content  
understanding content; setting boundaries; valuing own understanding; creating meaning out of content; ability to transfer

Autonomy with intellectual skills  
able to identify skills needed and to follow developmental pathways

Autonomy with context  
personal confidence and self-esteem, language and trust

This model enabled us to focus on notions of developing self direction and mastery, and what this embraced. We were thus able to get a sense of the structure and shape of the developmental program.

The planning and implementation was also informed by the Independent Lifelong Learner Model developed by Candy (1991). This enabled us to identify some of the values and attitudes outcomes to be achieved through the program. These included: (1) be methodological and disciplined; (2) be logical and analytical; (3) be adventurous and creative; (3) demonstrate curiosity, openness, and motivation; (4) be reflective and self aware; (5) be interdependent and interpersonally competent; (6) be persistent and not give up easily; (7) be flexible; (8) have a positive self concept; and (9) be independent and self sufficient.

Against a backdrop of transformational leadership, we thus established some key guiding principles for the process of development. These included:

• Provide a conceptual overview and understanding of conceptual frameworks.
• Have direction to focus on an area of identified need.
• Enable individuals to develop plans to achieve goals.
• Make effective use of time.
• Translate needs into a specific objectives-sequential plan based on clear objectives.
• Provide opportunities for logical and analytical problem solving.
• Allow participants to form generalisations, look for principles, provide opportunities demonstrate learning.
• Provide opportunities to own the process.
• Develop opportunities to diagnose needs.
• Predict outcomes and evaluate outcomes against expectations, identify limitations and translate these into learning needs.
• Have opportunities to talk about own strengths and weaknesses.

We also wanted participants to: be persistent; demonstrate energy and commitment; be tolerant of the frustration often associated with learning new technology skills; and have the ability to modify plans as necessary as their needs became clear and learning pathways unfolded.

Implementing the project and charting progress

The professional development was implemented through a number of stages, cognisant of the needs and progress in the school to date. In the first stage, the Learning technologies teacher capabilities survey, part of the Learning technologies teacher capabilities guide (Department of Education, Victoria, 1998) was used to identify teacher capabilities within five areas: personal skills with learning technologies; personal skills with learning technologies in specific key learning areas (KLAs); learning technologies capabilities; classroom use of learning technologies; and classroom use of learning technologies in specific KLAs.

Modifications in the original survey form were made to adjust the language to a New South Wales school context to ensure validity for the school context, before it was administered to 56 teachers.

This survey provided a detailed picture of: whole school technology skills and capabilities; a teacher-defined set of priorities for professional development in learning technology capabilities; and a set of identified priorities for learning technology skills to support this development of technology capabilities. The survey identified some key findings. For instance, personal skills with learning technologies (such as managing technology, working with basic applications, publishing and presenting information, and using multimedia applications), were very basic, with few feeling skilled and comfortable. It also defined low levels of expertise in relation to teaching and learning, classroom management of technology, and applications in curriculum planning, monitoring and reporting. There was limited use of technology in the classroom, with science, mathematics and health/physical education showing highest levels of use. While the general picture was one of low levels of personal skills, a number of staff were identified as having high levels of competencies of skills and classroom uses.

Having established a whole school skills and competencies profile, it became possible to target specified activities in direct response to the professional development priorities identified by the teachers themselves. This formed the second phase of the project implementation. Highest priorities identified were: the desire to provide opportunities for students to engage; the ability to solve...
common technical problems encountered in a classroom; the opportunity to research and develop curriculum programs to facilitate learning in a technology classroom; and the effective use of learning technologies in the classroom to support this. Teachers also prioritised a range of skills to support their developing confidence and competence in a technology classroom. These included: gaining skills in using the World Wide Web; email; use of authoring programs; and interactive multimedia programs.

The resulting professional development sessions were designed in keeping with previously identified key guiding principles for professional development of adult learners, and in the context of an information literate technology classroom (i.e., one that is responsive to the affective and cognitive demands of student learning). Also, in keeping with the notion of transformational leadership, information was sought from these teachers about their willingness to share expertise and provide mentoring for colleagues.

Using this information, teachers were identified to design and present the professional development activities, thus providing continuity in the development of technology skills and competencies by fostering group ownership of the process in order to support a climate of whole school change, and to establish a clear perception that on-site expertise was readily available on an ongoing basis.

Teachers prioritised a range of skills to support their developing confidence and competence in a technology classroom.

The rationale underpinning the strategies adopted for the professional development program was to: support teachers in changing their use of technology in the classroom by fostering opportunities to critically evaluate personal technology competencies and skills; develop a personal and/or faculty plan of action; develop willingness to take risks in a technology setting; develop teaching strategies and tools for technology integration; foster a team approach to curriculum development; and change or develop new teaching programs to reflect the use of learning technologies. The strategies adopted were designed, finally, to create real, sustained change within the classroom experience of students. It was hoped that the outcome for student learnings would then be reflected in new opportunities and experiences in engagement with technology in more than one subject and/or classroom and eventually within the whole school learning environment.

The inservice sessions

Based on the needs analysis, five inservice sessions (described below) were designed and presented. 37 teachers were involved and the activities were supported by the school administration with provision of release time to attend inservice sessions. In addition, the Staff competencies framework for professional development provided: the motivation for innovation and change; a time frame for involvement; and a personal commitment to the process by each staff member involved.

Each professional development session was embedded in an information literacy framework. The critical thinking and problem-solving skills needed to comprehend, synthesise, analyse, interpret, infer and evaluate a learning activity and the technology learning tool determined the method of delivery of the session. The specific needs were also based on the survey profiles. In particular, the cognitive and affective domains involved with each of the inservice contexts were emphasised:

- **Office and the World Wide Web email interface**

  Main points included: email context of communication in a new media; global networks; technology interface of this form of communication; language features and changes in literacy styles; use within the curriculum; specifics of *EmuMail*; key features of the software; hands on development of skills (e.g., creating a signature, sending messages, sending attachments); expressing uncertainty in a new environment; developing troubleshooting strategies to overcome difficulties.

- **Introduction to the World Wide Web**

  Literacy demands of on-screen reading with multiple frames, icons and navigation buttons; understanding the cognitive demands of using the Web; navigating with a World Wide Web browser interface; issues of information gathering and use of search engines; critical evaluation of information; surfing is not researching: the cognitive demands on students; curriculum integration; hands on development of skills; expressing uncertainty in a new environment; developing troubleshooting strategies to overcome difficulties.

- **Mathematics faculty inservice, to explore cross faculty initiatives for integration**

  World Wide Web introduction (as above); multimedia CD-ROMs and literacy demands of interface; cognitive demands for navigating structure; cognitive demands for information analysis and synthesis, as opposed to bibliographic resources; designing a research task to teach the technology interface; designing a research task to avoid plagiarism and cut and paste activities; supporting the student constructivist approach to learning: expressing uncertainty in a new environment; developing troubleshooting strategies to overcome difficulties.

- **Managing a networked classroom**

  Troubleshooting in a network environment (e.g., print queues); *Windows* 95 interface and file management; exploration of subject-based software and application of these for teaching and learning.
• Effective teaching in the Sophia Centre

Range and purpose of networked software available for classroom integration (e.g. encyclopedias, subject/theme-based software, journals, newspapers); teaching in a multipurpose environment using library resources and information technology.

Impact evaluation

A number of tools were chosen to observe and evaluate the impact of the project. Firstly, each teacher involved in a professional development session was asked to complete a survey at the beginning of the session, and at the conclusion of the session. 55 survey forms were collected. Before starting, teachers were asked to identify their expectations from the session: for the development of personal skills; for developing classroom use of the learning technology; and their level of confidence with technology. At the conclusion, teachers were asked to comment on: new skills and knowledge gained; specific needs for future development; preferred approaches for development; the degree to which expectations for personal learning were met; areas of application of skills for personal use, curriculum planning and classroom application, and their level of confidence with this learning technology. These survey forms were designed to provide preliminary material for analysis for developing guiding principles for continuing professional development programs and evaluation of current framework.

The second evaluation tool was personal interview. The subject coordinators from a number of faculty areas were interviewed to elicit information about: personal skills and competencies; leadership style; curriculum development within the faculty; the process of change and future directions for curriculum integration of electronic learning technologies; and reflection on the changes in classroom pedagogy. This included reflection about observed student behaviour in the process of learning, and use of response diaries. These were analysed by the research team using qualitative approaches, specifically a content analysis approach known as “constant comparative method” (Glaser & Strauss, 1967), an interactive process of comparing and aggregating pairs of indicators. It was important that the ‘voice’ of the teachers be heard, and that these voices not be expressed merely by sets of numerical data, rather by building a range of conceptualisations of needs, benefits, weaknesses, impacts and threats that could form a strong evidential base for further development and consolidation. This ‘grounds-up’ approach was also considered important to guide the researchers in an open ended way that was tailored to the specific voices, rather than testing preconceived assumptions and potentially narrowing the scope of endeavour and its outcomes.
supported the leadership of faculty coordinators with varying leadership styles
• made explicit a process for transformational leadership that was personally motivating
• supported their leadership by valuing teacher expertise
• fostered opportunities for teachers to work with and critically evaluate personal technology competencies and skills
• fostered opportunities to change use of technologies in the classroom
• fostered a framework for developing a faculty plan of action
• fostered a climate of investigation and willingness to take risks with technology
• fostered a setting in which constructive teaching strategies could be developed for technology innovation and integration
• fostered opportunities for a team approach to curriculum development.

This represents important progress in the complex journey of integrating learning technologies into classroom practices.

We were also able to identify some unforeseen positive effects on individuals and on the culture of the school. These included: an ongoing demand for more professional development sessions of this kind; the development of expertise in the school through the adoption of mentoring or team approaches to learning; the creation of a financially viable framework since there was no longer a need to 'buy in' expertise; and the development of personal credibility for those taking a leadership role.

In addition, some evidence was provided that indicated that teachers were trialing units of work which explicitly developed students’ literacies with the technologies; developing specific faculty based policies for computer use in classrooms; rethinking traditional teaching practices; developing a 'technology booklet' to facilitate teachers’ integration of the Internet into learning activities; and, in some faculties, employing a more team based approach to instructional design.

Reflection: guiding principles for further professional development

The understandings gained from his program have enabled us to identify some key principles for the next stage of development. These include the provision of opportunities to:
• translate identified needs into learning objectives, and developing personal developmental plans to achieve these goals
• test and practise skills, to trial and evaluate teaching and learning activities, based on authentic scenarios
• conceptualise and understand 'big picture stuff', yet provide an understanding of the specific knowledge and skills that comprise this
• make commitments (ie learning contracts based on actions and applications)

• negotiation of the specific objectives and structure of professional development
• discuss scepticism and ambivalence, exploring how these might translate into feeling confident with a technology centred future.

Other considerations would include:
• realistic assessments of time required to achieve objectives
• articulating professional development in terms of transformative learning and transformational leadership (ie modelling how professional development relates to learning processes that happen in the classroom)
• negotiating the specific objectives and structure of professional development
• exploring more actively how learning can be transferred to the classroom setting
• exploring opportunities for reflection and reflective learning
• critiquing progress and experiences in constructive ways to clarify opportunities for the future
• exploring opportunities for understanding the nature and implementation of information and critical literacies associated with Web based information.

Conclusion

The model we have established at Bethlehem College embraces the following interrelated concepts: a framework for contextual considerations; a framework for needs analysis; a construct for building of commitment; a commitment to development of responsive structures; the creation of realistic opportunities for transferring and transforming; a construct for management of personal learning dilemmas; the establishment of sharing mechanisms; and the opportunity for constructive, meaningful, cognitive and affective reflection.

The model is responsive to different leadership styles, a key element in transformational leadership. It supports individuals in a variety of ways to move forward, and it also acknowledges diversity. Having a philosophy of change does not in itself guarantee effectiveness. It is the action orientations on the part of leaders that foster school change.

We avoided the dilemma that implementing innovation often carries with it, ie the need to conjure up, or hasten to identify, learning outcomes in a superficial way to justify the process. It became clear to us early in the project that more concerted effort needed to be given to professional development in order to create a strong, committed base for ultimately achieving student learning outcomes at the whole school level.

Such an approach demands high standards which are reachable in bite sized chunks, and which does not force staff into adopting applications beyond their level of expertise and commitment. It uses a structured approach to professional program development and design, and incorporates accountability while allowing opportunities for experimentation. It fosters a collaborative spirit and open communication at faculty and school level, and it
legitimates the effort of involvement through clearly identifiable personal gains. Yes, to achieve fundamental change is complex. Professional development for the integration of electronic learning technologies must be long term, extensive, meaningful and interactive. Yet, as our experience attests, it is a richly rewarding process.

**BIBLIOGRAPHY**


**ABSTRACTS**


This article reports on the continuing research into student plagiarism undertaken by McGregor since 1993. The issue is ongoing, and has resurfaced as a key teacher and teacher-librarian concern given developments in the availability of electronic information. The study reports two qualitative field studies of Year 11 students and their information behaviours when writing research assignments. One group of students received little direction in use of information sources and the avoidance of plagiarism; the other group had some preparation in working appropriately and effectively with information sources. This preparation included some instruction that centred on an information skills framework, including analysis, organisation and presentation of information that demonstrated personal understanding and construction of information. The findings compare the behaviours of the two groups, and the resultant impact on the research tasks. This is an informative and enlightening study: a must for all teacher-librarians and classroom teachers. It raises some key questions for teacher-librarians, eg How can teacher-librarians more effectively intervene and make a difference? What is the nature of the collaboration between teacher and teacher-librarian to appropriately develop higher order information handling skills?


The electronic delivery of information has brought renewed focus on the potential for, and impacts of, information overload. Students experience the phenomena of information overload in a real way when they search for information on the Internet. For example, searching for “Birds” on Alta Vista is likely to provide over one million hits. This research examines how children experience information overload and how they endeavour to deal with the problem. The study involved 265 Year 4 and Year 8 students in two different Texas schools and data were gathered through a survey questionnaire. Students were required to document the extent and nature of overload and their strategies for managing it. The study showed that information overload is a real learning dilemma, and highlights the importance of developing students’ experience with analysis, synthesis and evaluation of information. The study in particular highlights a range of teaching and learning strategies a teacher-librarian and classroom teacher might use in dealing with information overload.

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