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**An Evidence-based Practice Approach to Practicum Supervision Using
New Information Management Technology**

by

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abstract

The roles of supervisors; their responsibilities and the nature and forms of communication between university supervisor, school cooperating teacher and student teacher, appear to be central to feelings of isolation and disconnectedness encountered by student teachers engaged on field experience in schools. In this study, new information management and communication technologies were used to support collaborative approaches to practicum supervision in a 'borderless' manner. In the learning environments created by extensive information and communications technology use, the generation and utilisation of information by student teachers and their supervisors was monitored and evaluated. It was found that by exploiting the technological convergence of a new Instructional Management Information System (IMIS), configured to support practicum experiences in an integrative fashion, the experiences of participants in the supervisory triad was enriched and the channels for professional discourse enlarged. For the technology tools to be optimally effective, however, each member of the triad, required further specialised training in the use of new information management tools, applied specifically to serve the ends of practicum supervision, than was anticipated at the outset. Difficulties in developing an appropriate electronic infrastructure for full implementation of the ICT employed in the schools settings are also reported.

Introduction

This paper presents the results of a two-year project conducted in Western Australia and reported as a multi-site case study. Data from two discrete cohorts of student teachers, undertaking graduate 'end on' initial teacher training (ITT), across two contiguous years are presented. The Project investigated the efficacy of new information management and communication technology in supporting the graduate students' professional development as teachers, and their supervisors as supervisors, while engaged in school-based teaching practice and its management. One case study school was located in a remote mining town in the Australian Outback in the first year of the Project, and the other in a central city location during the second year.

New information management and communications technology, linking each school electronically to the university, was networked as an open system. This arrangement was designed to assist collaborative practices by making information easily accessible for contemplation, sharing and decision support. Specifically, several forms of new media¹ were connected to an instructional management information system (IMIS) (Carter, 1996), and managed within the system as third party applications. The configuration thus established enabled the supervision model employed by the university to operate substantially unencumbered by temporal and geographic constraints.

The problematic nature of practicum supervision, in which student teachers are jointly supervised by school-based cooperating teachers and university-based supervisors during extended periods of 'block practice', is well recognised in the literature (Zeichner, 1990); Turney et al., 1985). It was hypothesised that the disconnectedness that many student teachers feel while engaged on teaching practice would be ameliorated by the integrated use of ICT, which would also encourage collaboration between student teachers and their supervisors. A feature of the latter would be frequent reference by practicum participants to

information routinely generated and stored within the IMIS. The latter would provide data, to inform reflective practice across each triad, thus facilitating teaching skill development easily referenced to evidence-based practice. Another consideration of the research was to ascertain how instructional information, stored in electronic form, was contemplated and used by triads for decision support.

Recurrent Problems of the Practicum

Zeichner (1990) identifies six key 'problems' with the fairly common type of practicum supervision in which student teachers are placed with a teacher supervisor in a school, with short infrequent visits from the university or college supervisor. Under this model, neophyte teachers are left little time for reflection on the processes in which they are immersed (Boydell, 1986; Thomas, Clift and Sugimoto, 1996; Ritz, Cashell and Felsen, 1981; Schlagal, Trathen and Blanton, 1996; Turney *et al*, 1985; Zeichner, 1990).

Researchers have confirmed the essential nature of the practicum to teaching skills development (May and Zimpher, 1986), but there seems to be some serious structural problems with the practicum itself. Zeichner (1990) suggests the problem lies in the "bulk of supervision left to school co-operating teachers" (p. 129). Turney *et al* note, with respect to supervisory accountability in the Australian setting, that, on the one hand, cooperating teacher-supervisors have day-to-day control over the conduct of the practicum in their school, without being publicly accountable for the summative evaluation of student teacher performance. University supervisors, on the other hand, have final responsibility for the evaluation of teaching performance, without necessarily being able to influence teacher development on a day-by-day basis.

Boydell (1986) discusses evidence which "raises serious implications for the traditional types of teaching practicum supervision" (p. 138) and both Boothroyd (in Boydell, 1986) and Ritz, Cashell and Felsen (1981) note the sometimes dramatic difference between student teacher and supervisor perceptions of the practicum, with student teachers rating the involvement of the supervisors less highly than did the supervisors themselves. Schlagal (1996), asserts that the practicum often occurs in isolation, and consequently there is not enough support for reflection, whilst Joyce and Showers (1983, p. 613) show that the perceptions of pre-service teachers of the teaching process, is that it is "individualistic" (p. 1). Schön (1983) asserts forcefully that the practicum is often in danger of "cutting the practicum situation to fit professional knowledge" (p. 44).

While structures appear to be heavily criticised in the literature, there is an underlying recognition that the practicum has a vital part to play in student teacher growth and development (May and Zimpher, 1986). There is, however, an imperative to address these problems systematically, and in particular to improve the quality of the communication and information flow between members of the triad. This, among other things, is in order to ensure that supervision when undertaken is an interactive, integrative and participatory process that occurs as a dialectic between supervisor(s) and student teacher. When this eventuates the process of supervision is likely to provide professionally expansive and educationally worthwhile experiences for student teachers who are at a highly formative (and vulnerable) stage in their careers. In an age of information, the utilisation of ICT enhancements has a part to play in the realisation of this ideal.

Exploiting Technology Convergence

Research into the use of new technologies in teacher education and training is still at an early, exploratory stage (Harrington and Hathaway, Davis, 1999). Much of the research has tended to focus on conferencing and the use of electronic mail to promote critical reflective

practice and innovatory ways of communicating (Burlbaw, 1993; Harrington and Hathaway, 1994, Carter, 1999).

One of the most valuable uses for new technologies is to support teachers, in rural or remote areas, who are often isolated from peers and lack support in their professional life (Jinks and Lord, 1990). They note that the problem lies in the "delivery, not of demonstrating that rural teachers can learn from instruction" (p. 130). Jink and Lord also assert that telecommunications technologies can be very effective in responding to problems, but that "support frameworks must also be present" (p. 131).

It is in the inherent nature of technology to provide us with tools in order to amplify human capacities. To that end the computer is a contemporary eolith. However, in areas where certain forms of social learning assume primacy, such as practicum supervision and the introduction and development of new skills, for example, it is important not to rely on ICT as a surrogate for face-to-face human interaction in a deterministic fashion. Rather, the appropriate use of these tools is to serve human agency as enablers and mediators of the many and different forms and settings in which purposeful interaction may and does occur. This was the view held by the participants in this study. Technology enhancements enabled participants across the supervisory triad to work together collaboratively, in the interest of developing student teachers' professional skills and attributes, in ways not hitherto conceived of, or deemed possible, in the absence of sophisticated information management and communications technology.

As alluded to above, a central element in the information-rich, open system, which was established in each school and between the school and university, was a new generation instructional management information system (IMIS) using Web-enabled, relational database technology (Carter, 1993; 1996. See also see Appendix 1). Its use enabled information such as curriculum, lesson plans, teaching/learning resource materials, pupil assessments and other performance data, student teacher self-reflective data, including selected lesson reconstructions using classroom generated imagery, and supervisor comments to be accessed and stored in the form of electronic portfolios.

The transparency of information thus stored and accessed has the potential to 'break the lock' of many structures and practices we have hitherto tended to take as givens, thus predisposing teachers and administrators to radically alter the beliefs and attitudes present in many schools today (Burger, 1995). The latter include, for example, attitudes, which promote "norms of independence and privacy", and where there is "no substantial body of shared and handed-down wisdom about teaching the means to accumulate it, or the means to transmit it to novices" (Colton and Sparks-Langer, 1993).

Student teacher portfolios were introduced and developed over the course of the practicum. They were unique to each student teacher, yet capable of being shared across a 'community of discourse' (Schlagal, Trathen and Blanton, 1996). While information was open to public scrutiny by supervisors, with legitimate rights of access in the system, once captured in the on-line portfolio it was retained for future use by each student teacher as his or her own personal set of teaching resources.

In addition to the IMIS other technology, including a variety of new media, were integrated with it as third party applications that further enlarged the system architecture and extended the potential range of its use. Thus configured, it provided an extended IMIS capacity for the operation of a virtual community of discourse in practicum contexts substantially free of time and space considerations. As well as establishing the external electronic infrastructure, the IMIS software was also internally configured for use by the participating student teachers. By acquiring skills in the use of the new ICT, integrating data on curriculum, instructional and

assessment processes and external standards and referents, they (and their supervisors) could begin to identify, understand and manage those relationships and patterns that contributed directly to teaching development. In this environment, student teacher learning and development became a collegially shared process, supported by a multiplicity of media forms, and including self-reflective commentaries, lesson evaluations and imagery stored within, and managed via, the IMIS.

The Theoretical Framework

Harrington and Hathaway (1994) define critical self-reflection as being:

... capable of self-criticism...[the ability to] reason at complex levels and gain greater access to their own reasoning processes....identify weaknesses in their own thinking...[be] more flexible in the application of knowledge...identify their own assumptions about that knowledge...change from a focus on self to a focus on universal ethical principles when making moral decisions (p. 544)

If reflection is an admirable process, and an ideal to which the student teacher aspires, then a suitable framework is needed that can provide a structure upon which student teachers and their mentors can engage in reflection (Turney *et al*, 1985). Schlagal, Trathen and Blanton (1996), believe that "a way to address this is to make the students full participants with teachers, university supervisors and their peers" in a conference-like situation which they call "a community of discourse" (p. 176).

However, a community of discourse can only occur when certain factors are accounted for. These factors include "non-dominated dialogue", developing "norms of collegiality", teacher "joint problem solving" and the inclusion of the "perspectives of multiple educational constituencies" (Harrington and Hathaway, 1994, p. 545). Both Harrington and Hathaway (1994) and Schlagal, Trathen and Blanton (1996) suggest the use of new communication technologies for conferencing, as a means of encouraging reflective discourse and also advise on overcoming the associated problems inherent in such procedures. With these considerations in mind the aims of the study were to:

- ascertain how teaching competence development and reflective practice could be enhanced by student teachers practising in information-rich, ICT saturated environments.
- investigate the effectiveness of instructional information management on patterns of communication across the triad of university supervisor, school supervisor and student teacher using an ICT enhanced model of practicum supervision.
- evaluate the efficacy of information management technology in supporting databased reflection by student teachers, and their supervisors, engaged in evidence-based practice.

In addition, the Project examined ways in which student teachers might be offered professional and personal assistance when situated in locations removed from their traditional support structures located in the University or College. It also evaluated how readily a similar electronic infrastructure could be utilised by student teachers and their supervisors in schools proximate to the training institution.

The School Contexts

An independent school in a mining town in the Australian Outback some 800kms from Perth, Western Australia, was selected because of the Principal's prior experience with IMIS

technology and its integrative potential for practice when supported by professional development activity. The school had a population of 380 students and 28 staff. It experienced a high turnover of staff each year, largely as a result of its remote location. This is a pervasive problem for remote area schools across all education sectors in Western Australia, given the geography and demographic characteristics of the State.

The school selected for the second round of data collection was chosen because of its inner urban metropolitan location; the Deputy Principal's prior familiarity with the technology, and the need to align teaching more closely with curriculum and standards in an outcomes-based model of education congruent with State mandates (Carter, 1998). This large comprehensive Senior High School had a population of 1400 students and over 100 staff.

Methods

This was essentially a cross sectional, evaluation-research study employing qualitative methods drawn from ethnography. The approach was interpretive and was embedded theoretically within the 'community of discourse' framework alluded to above.

The repeated pattern of the design over two years allowed for a longitudinal component to be introduced into data collection and analysis. The latter included logs and diaries, semi-structured interviews and unstructured observation. The data pool was augmented with anecdotal records, obtained by unobtrusive measures, using a log file facility within the IMIS. Data, after transcription, were entered into the NUD.IST text analysis package and analysed inductively using open coding procedures. This was in order to construct taxonomy of categories supporting the identification of emerging themes.

Procedure

The chief investigator was based at both schools for the implementation of the final six-week Assistant Teacher Practicum (ATP) during each of the two years of the Project's time-frame. A research assistant was located at the University to collect non-participant observation and unstructured interview data from the university supervisors who were engaged in supervision at a distance. In addition to maintaining a log of events, and a diary containing observations, the principal investigator collected visual data of classroom events using a laptop computer/digital camera combination. Classroom imagery was used for lesson reconstruction purposes and built into a portfolio for storage in the IMIS. Transcribed lesson reconstructions were either emailed as attachments to university supervisors, or accessed remotely in the IMIS by them, in order to elicit further feedback on student teacher classroom behaviour. Classroom imagery was used to promote critical reflection, but **not** used summatively for specific lesson evaluation purposes that might rely inordinately on these data forms.

The four student teachers at the Outback site were supervised remotely by the three University supervisors using ISDN modem links and a range of ICT. They were supervised directly by their cooperating teachers at the school site, and they all made use of the electronic infrastructure expressly for supervisory purposes. The three student teachers located at the metropolitan school were similarly supervised by three University supervisors. In the latter case, supervision via electronic media was augmented with more traditional and more familiar face-to-face supervisory visits and modes of operation. These, however, were few in number; took place on occasion as needed, and operated on a very restricted basis.

Where relatively brief communications took place between the student teachers and their supervisors these were recorded using an electronic 'sticky or flashnote' capability in the

supplementary software and stored subsequently in the IMIS. This was in addition to the detailed evaluation commentaries using a remote machine capture facility.

In addition to on-going reflective summaries captured on-line, shortly after each block teaching practice had concluded, the student teachers were asked to review longitudinally their personal reflections concerning their self-critically aware supervision experiences. These were 'captured' within their portfolios, and framed within the medium of a community of discourse. So were school and university supervisors. These reflections supplemented by intensive interviewing of the pre-service teachers, university-based supervisors and the school cooperating teachers, singly and in focus groups, was also conducted, analysed and summarised below.

Participants

The groups of student teachers who volunteered as subjects were drawn from two successive cohorts of Diploma in Education students that were being prepared to teach in high schools. Four students were involved in the first trial and three in the second. Their teaching methods areas included Business Studies, Computing, Art, Social Studies, Mathematics and Science. Three University supervisors drawn from the corresponding teaching areas became subjects, as did each of the students' cooperating teachers. A science teacher, with a part time computer support appointment, together with the chief investigator acted as non-participant observers, during the first round. During the second, the chief investigator and his research assistant acted as non-participant observers. The seven pre-service teachers, along with their university supervisors and their co-operating teachers undertook intensive training in the use of a commercially available IMIS (IMSeriesä) prior to, and during, the extended block teaching periods.

Results and Discussion

Interview data were transcribed and, along with logs and diaries and other electronic communications were entered into the NUD.IST text analysis package for detailed coding and analysis. After preliminary immersion in the raw data to discover emergent categories via visual inspection, data were subject to more detailed text analysis within the package. Initial data processing used open coding protocols in conjunction with the method of constant comparative analysis. This process took place while concurrently searching for disconfirming evidence. The latter sought to challenge emerging groupings as the NUDIST indexing system became more elaborate, and categories became enlarged and/or recombined until they became stable and saturated by the data (Glaser and Strauss, 1967). Further analysis was based on axial and selective coding (Strauss and Corbin, 1990).

Space does not permit the detailed presentation of a large volume of qualitative data even when it has been ordered, indexed and formed into a number of taxonomies. Some selectivity in the presentation of data has been necessary, and the selections for this paper were based on the extent to which certain elements were recurrent within the data set, and exemplified patterns of thinking and/or behaviour coded under emergent themes (see below). Themes connect different sub-systems of a culture, and one way to discover them is to look for relationships among categories in the taxonomies, together with a distillation of the contents of the memos connected to various nodes as a function of the indexing process. This process of analytic induction has uncovered three themes, which are:

- Social adaptations to the transfer of new information management technology.
- Information-based practice as an aspect of reflective practice.

- Supervision as a highly interactive process, involving continuity in professional discourse for thinking and acting, referenced in turn to shared information leading to evidence-based practice.

Figure 1. Selective taxonomic representations from the NUD*IST Index Tree.

A. Information Technology

1. Systems adaptations:

(a) Communications

(b) Software Tools and Packages

(i) Using IMIS

(c) Support

(i) Training

Computer Literacy

(d) Informating

(e) Computer Saturated Environments

2. Frustration

3. Technology

B. Reflective Practice

1. Reflecting

(a) Students' Reflective Practice

(b) Information (data-based practicum)

(i) Teacher as Student

(c) Professional Development

(i) Organisation

C. Supervision

1. Supervisory Triad

(a) Supervisory Process

(b) Models

(c) Remote-Area

(d) Collegiality

Around the theme of social adaptations to technology transfer, inspection of the raw data clearly showed that technology, while it brings potential benefits also has a downside adding to stress and frustration when timely support is not available and the technology is not working well - or simply not working. For example, school supervisors experienced frustration in their inability to access student teacher data in a timely manner expressed as follows:

On a personal level I am always excited by technology so I have enjoyed the opportunity to further these skills. However, I found that I have become frustrated at times because I have not been able to use the system as much as I would have liked to as much as I would like to go and find out what is happening to the student. I would like a greater wider use of it simply by having greater access to equipment. (Transcript: Co-op Teacher. Round 1: 121-128)

For one of the less computer literate student teachers it took the form of:

My supervisor hadn't got to supervise me [yet, because] my [data] file went floating off somewhere. (Transcript: Students Round 2: 73)

and,

I haven't had a very good time trying to print lessons because of all sorts of problems so it's nice to hear something positive! I'll chase up the e-mail later today...(Flashnote: 6a/10)

In interpreting these comments it is clear that in creating computer saturated environments, a measure of technology dependence ensues in which there is little room to manoeuvre when things are not working to plan. This really added to the high stress levels of student teachers on teaching practice, Thus:

I couldn't print anything for the first time, Colin [technical support person] was sick and off for the day and basically I had Margaret [university supervisor] coming in the next day, and I couldn't get my lesson plans printed, and that was really, really frustrating because you know someone is going to watch you, but you haven't got anything for them. (Transcript: Students Round 2: 27)

Partly these comments relate to the temporary de-skilling effects of any significant innovation, partly to levels of computer literacy, to equipment unreliability and availability, and to uncertainty because of the need for further training and support. This dimension however needs to be counterbalanced by the potential benefits that accrue through the use of the new IT. For instance,

I think the biggest plus [is that] all the information relating to all parts of teaching will be available on the computer for you and/or students to access any time. That is a big plus. (Transcript: Co-op.Teacher Round 1: 101)

and

You can access the program at any time on your hardware so that you can look at what the students are doing and what the students, what their plans are and their evaluation. So that is very useful...(Transcript: Co-op.Teacher Round 1: 8)

Reflective practice, as it is presented in the literature, has deep-seated philosophical connotations. With respect to the second theme centred on reflective practice, however, the evidence indicates that data captured and stored in the IMIS can assist the process of reflection, but it tends to occur in a somewhat narrower form than that expressed by Donald Schön and other theorists. With the accumulation of planning and assessment data and lesson self-evaluations in the IMIS, supplemented by co-operating teacher and (remote) university supervisor feedback and comments, all members of the triad variously made reference to this accumulating pool of data. With increasing use it rapidly became a rich store of accumulated experiences and material resources. This had immediate use in supervision as accumulating evidence to guide and inform practical knowledge skills development and as a neutral arbiter for evaluative feedback to student teachers. It had a further use as a portfolio of evidence on which to engage reflectively by all members of the community of discourse concerning their own practice as teachers and supervisors.

While the contemplation of routinely generated professional practice data is a necessary adjunct to developing a critical self-awareness by practitioners, this tended to occur in a more narrowly constructed frame of information or evidence-based practice, and was regarded as a variation of the concept of Reflective Practice in its 'pure' form. It is illustrated in the following comments:

I think the most important thing about self-reflection ... is that it enables you to filter information on your teaching practices. The advantages in using a system like the IMIS in this situation is that patterns can be picked up more easily using the system because the system is integrated. Self-reflection on individual lessons when placed on the computer also becomes a database providing information on the effectiveness of objectives, and general teaching programmes. (Transcript: Students Round 2: 51)

I think the best thing that I get out of here is that I evaluate and learn from my own mistakes and improve on my future performance and with IMIS I think it would have to be the comments that have been put in by Joan and Don [University supervisors]. (Transcript: Students Round 2: 37)

Finally, with respect to the third theme, the data suggest that accumulating information stored in the IMIS, can be, and were, contemplated and analysed at will by members of the triad in an on-going way, which is no longer temporally or geographically bound. This extended capacity has implications for the nature of the supervisory cycle when it is reconceptualised as an on-going process of professional dialogue. When it occurs collegially, it resembles Schlagal, Trathen and Blanton's (1996) view of a "community of discourse". Interview data attribute this development to the power-equalising nature of shared data utilised to guide, inform and reflect upon both the developing practical knowledge and teaching skills repertoire of the beginning teacher. It also highlights the contributory nature of supervisory processes, also captured and stored in the IMIS, in both

framing what is possible and needed for growth and development, and enabling this to occur.

There are also implications to be drawn from evidence-based practice for supervisors to reflect upon their role(s) and effectiveness as supervisors, and the need to see supervision as a process of human interaction, the effectiveness of which can be augmented, but not replaced by emergent technology. This was expressed by one of the university supervisors who stated:

I really see a lot of benefit in using this system for remote area practice supervision, the only drawback I think is the potential for supervisors at the base location to 'forget' (too strong - distance=remoteness=not thinking of them as much as those who are close) their students at the remote location and it is these students who probably need the most contact of all.... Although I think IMIS has great potential for seeing students work on-line, particularly while they are in a remote location. I still like the 'personal touch' of talking on the phone - hearing intonations and expressions in the voice. A combination of all factors would, I imagine, prove to be an effective and innovative supervision of practicum students. (Transcript: Uni.Supervisor: Round 2: 128)

In a computer networked situation this informed environment appears to foster and engender collegiality. This theme arose as a concept naturally within the data, from both the student teachers and the school co-operating teachers, when interviewed as members of different focus groups. It is expressed in the statement made by one of the co-operating teachers in the following manner:

First of all I think it is a real challenge to be able to access this sort of technology but also from the point of view of the interaction of all parties, especially on the email up front where we were able to access people in Perth and get instant results from people we know. Whether face-to-face or not. We were able to develop good rapport with everybody concerned because of this system. [INT. Is that an intellectual satisfaction?] Definitely yes! (Transcript: Co-op Teacher: Round 2: 89)

It is noteworthy however, that the pattern of communication in the conduct of the professional discourse occurred between the student teachers and their school supervisors *in situ*, and student teachers and their University supervisors remotely. There was no evidence of any pattern of communication directly between co-operating teachers and university supervisors, other than the shared access to each party's text-based feedback and comments stored within the IMIS. This finding highlights the need for supervisor training, mentoring and development in the use of this technology to realise the ideal of effective three-way communication adequacy across the triad.

Conclusions

There is now sufficient evidence from this study to support the view that new information management technologies, allied with modern communication technology, can substantially assist in improving both the effectiveness of practicum supervision and the quality of an emerging self-critical awareness on the part of student teachers, and their supervisors, as *supervisors*, too. However, part of this self-awareness on the part of cooperating teachers is their tacit acknowledgement that they need to be trained for their supervisory role in ICT enhanced environments.

Further, in order to make the most effective use of IMIS capabilities, all members of the supervisory triad need extensive training in the use of these systems. *Inter alia* this is in order to understand the nature of the changed professional relationships that occur in the move to information or evidence-based practice, which does not recognise traditional organisational boundaries. Unless this occurs in a systematic fashion at pre and in-service levels of teacher education and training, the latent power in the system remains just that - latent. The potential of the tools employed to amplify human capacities is realised through the interaction of professionally informed minds with the new, instructionally driven, information management systems.

It is also evident, in the rich pool of qualitative descriptive data that have been gathered at the school and the university sites over the course of successive practicums, that new technologies bring attendant problems as well as benefits in their wake. It is a mistake for organisations to invest in new technology and not to make a similar investment in the staff who will use it. This places a premium on time for staff training and development as well as a recurrent financial cost in the purchase of equipment and its continuous upgrade. The initial costs of setting up and ownership of computer hardware and software has to be reconciled with the maintenance costs of ownership in this regard. If these are not balanced there is no point in making the investment in hardware and infrastructure in the first place.

The efficient and effective use of new information technology is also fundamentally dependent on technical support and backup, which has to be sufficient and readily available in a timely fashion. If it is not, then technology dependence rapidly becomes a health hazard. Anecdotal evidence suggests that, for many schools, this is becoming a major issue affecting technology transfer.

It is likely that the technology infrastructure in many schools will not be as advanced as the equipment used in universities and by the developers of courseware and software. Thus leading edge programs will necessarily have to operate reliably at less than desirable levels of provision if technology enhanced practicum supervision is to become a practical possibility across the board.

Finally, we know that new ICT, when appropriately applied, can support the development of more collegially based practices and the sharing of practical knowledge and wisdom which enriches the process of education. The caveat, however is that, unless we concurrently attend to the deepening of vision and ensure that these systems are well understood it is unlikely that fundamental changes will occur regardless of the nature and form of the technologies that are in place.

End Note

1. New Media refers to new forms of digital communication and information technologies, including the use of email, the Internet, the web, multimedia, video-conferencing, desktop publishing and authoring interactive materials, digital audio, video, photography, animation ... and networked information technologies.

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Appendix 1: The Nature of IMIS Technology

Relational data base technology is employed in these systems in order to achieve the necessary linkages, for example, between curriculum development, learning process and external references such as standards and outcomes, and to be able to cross relate and examine, at will, any entity with any others contained in the system. IMISs are professionally driven and collegially oriented.

The power in a comprehensive information management system is in networking it, so that the benefits of integrated architecture can be realised in establishing a multiplicity of relationships under the control of the users. The latter include teachers, students, administrators, and significant others in education and training such as parents, mentors, supervisors and employers. When networked, information may move freely across conventional organisational boundaries, and the community of interest becomes linked ecologically and professionally in an ICT managed learning environment (Carter, 1996)

The new generation of professionally driven information management technology supports the creation of environments, in which data accumulate unobtrusively through the normal operations of the organisation, and becomes available for contemplation, analysis and reflection by users. Students, teachers, administrators can participate differentially in educative processes according to their rights and levels of access to particular types of information acquired and stored in the system. The IMIS assists students to become involved directly in their own learning and teachers and instructors to become students of their own professional practice as they study the data they routinely generate on their students' performances, teaching and learning processes and programme implementation. In particular, because of the integrative nature of the IMIS and the precise nature of data base construction and management, curriculum alignment between curriculum process, teaching/learning, student assessment, and monitoring and reporting can be readily



established. Further, these internal alignments can be linked responsively to external references such as student needs, competencies, standards and outcomes.

Good IMIS technology, based on sound educational principles, will support the individualisation of instruction and the recreation of contextually related instructional histories in which the articulation of curriculum purpose with instructional process and student performance is rendered transparent. By acquiring skills in the use of IMISs integrating data on curriculum, instructional and assessment processes and external standards and referents, practitioners can begin to identify and understand those relationships and patterns that contribute to overall system improvement in which student learning is paramount. This implies the need for practitioner training in the use of these systems leading to an extension of vision and improved understanding of underlying educational principles.