






ICT in Teacher Education

Challenging prospects





Edited by Mohamed Chaib & Ann-Katrin Svensson





Publisher:
Jönköping University Press/Encell
Box 1026
551 11 Jönköping
Phone: +46 36-101000



Mohamed Chaib & Ann-Katrin Svensson (ed)
© 2005 The authors, Jönköping University Press and Encell
Layout: Håkan Fleischer & Josef Chaib
Printed at Rydheims tryckeri AB, Jönköping, Sweden 2005
ISBN 91-974953-4-4






Table of contents

ICT AND TEACHER EDUCATION

A Lifelong Learning Perspective

Mohamed Chaib & Ann-Katrin Svensson 5

ICT AND SCHOOLS IN THE INFORMATION SOCIETY

New Positions for Teachers

Birgitte Holm Sørensen..... 21

THREE WAVES OF TEACHER EDUCATION AND DEVELOPMENT:

Paradigm Shift in Applying ICT

Yin Cheong Cheng..... 39

THE CHALLENGE OF ICT INTEGRATION IN HONG KONG TEACHER EDUCATION (AND ELSEWHERE):

SWOT as a Strategic Approach to Dialogue, Interpretation and
Encouraging Reflective Practice

Cameron Richards..... 77

LET'S THINK ABOUT IT

Considering the strengths of web-based collaboration

Tor Ahlbäck & Linda Reneland 100

PRONETT

Networking Education and Teacher Training

Ton Koenraad & John Parnell..... 112

FRAMEWORKS: BUILDING PURPOSEFUL SOCIO-TECHNICAL LEARNING NETWORKS IN TEACHER EDUCATION

Margaret Lloyd & Michael Ryan..... 132

SHARING THE DISTANCE OR A DISTANCE SHARED

Social and Individual Aspects of Participation
in ICT-Supported Distance-Based Teacher Education

Jimmy Jaldemark, Ola J Lindberg, Anders D Olofsson 142

THE ARTEACH PROJECT:

One Strategy for Integrating ICT Skills and Curriculum
Design During Pre-Service Teacher Training

Wesley Imms & Elizabeth Lloyd..... 161

COLLABORATIVE ICT LEARNING

Teachers' Experiences

Christina Chaib..... 178

SOCIAL STUDIES TEACHERS' ICT USAGE IN TURKEY

State, Barriers, and Future Recommendations

Ismail Guven & Yasemin Gulbahar..... 198

TRANSFORMING THE "CONTEXT" OF TEACHING AND LEARNING:

Issues and Directions for Planning and Implementation

Sui Ping Chan & Pui Man Jennie Wong..... 209

ICT IN THE LEARNING PROCESS

As Part of a Dialogue When Teachers Encourage
Pupils' Learning

Stefan Svedberg & Jörgen Lindh 233

ICT and Teacher Education

A Lifelong Learning Perspective

Mohamed Chaib & Ann-Katrin Svensson

Prologue

The idea behind this book was generated from two different sources. Some years ago our research group *People, Technology and Learning*, at the university of Jönköping, Sweden, came to the conclusion that any sustainable development of ICT in the field of Education should be based upon teacher education. Research concerning the use of ICT in pre-school and compulsory schools since 1992 (Svensson, 1996a; 1996b; 1998a; 1998b; 2000a; 2000b) raised questions about how teacher students should be prepared for the use of ICT during their training. From this basis, we invited colleagues from different countries to join us in a deeper reflection considering the future role of teacher education in the development of ICT and the learning process. We organized an international conference on the use of ICT in teacher education. The following texts are reviewed and selected from the papers presented at this conference.

The theme of this conference, which was held in June 2004, *The Challenge of Integrating ICT in Teacher Education – The Need for Dialogue, Change and Innovation*, centered on the role played by teacher education in the global development of ICT-based education. New waves of ICT-based learning are developing throughout the world and this conference was arranged to exchange ideas about how to improve teacher students' knowledge about ICT in educational settings. One of the main questions raised in this book is how teacher education is prepared to cope with ICT challenges. As seen repeatedly throughout the chapters in this book we are reminded that teacher education is far from being in the forefront of the global drive towards a comprehensive and pertinent application of ICT in the field of Education. Throughout the world, schools expect to recruit new teachers having the ability and aptitude to treat ICT in the teaching

context. The book focuses on how teacher education keeps in pace with these challenges, and how it will cope with them in the future.

Efforts have been made in many countries, particularly in Scandinavia, to promote ICT in schools. The purpose of this work is to merge some of the reflections concerning the strategies adopted by different countries in different demographic and cultural contexts. Experiences, gathered from some Asian countries, gave a comparison base for many of these completely different cultural and geographical contexts. This conference was also attended by many participants from European countries. This book, therefore, contains contributions from researchers from Asia, Sweden and from other European countries.

The contributions are presented in order, starting with those of the two keynote speakers, Professor Cheng from Hong Kong and Professor Holm Sørensen from Denmark. They are followed by other contributions related to the use of ICT in teacher education and ICT in the school context.

Professor Birgitte Holm Sørensen from the Danish University of Education in Copenhagen, Denmark, writes about *ICT and Schools in the Information Society – New Positions for Teachers*. She notes the fact that children's informal learning has increased as the use of ICT has increased in their leisure time. She argues that the role of teaching must change as the circumstances for learning change. Teacher education must ensure that teachers develop new strategies to teach, and handle new relationships between pupils and teachers depending on changes in society.

Holm Sørensen compares children's formal learning with their informal learning and points out critical aspects that differ between these. In school contexts, ICT is the object of learning itself, whereas in leisure time contexts it is rather seen as a play tool associated with a different learning characteristic.

Holm Sørensen also describes how a high level of ICT competence distinguishes pupils in the classroom. Pupils having a high ICT competence tend to enjoy a higher regard from their peers. According to her, teachers can be grouped into different categories, based on whether, or how, they use the computer in the classroom. According to Holm Sørensen, the school has to respond to students' new knowledge; and the challenge for teacher education is to prepare future teachers to use ICT in creative and innovative ways.

In his chapter *Three Waves of Teacher Education and Development: A Paradigm Shift in Applying ICT*, Professor Yin Cheong Cheng from the Hong

Kong Institute of Education outlines how teacher education around the world is experiencing three waves of changes. The first wave, decided from above, deals with the role of the teacher. It is related to the ways teachers can meet the changes in methods and learning processes. The objectives of the first wave are to attain a more efficient way to fulfill the achievement's goals. Teachers' competences and skills are measured by the extent to which students' tasks and goals have been achieved. ICT is used as an efficient tool of storage, transfer and delivery of knowledge to individual student teachers.

The second wave refers to teachers' effectiveness and its impact on the quality of education. The most important aspect in this wave is to improve existing structures, organizations and practices in education to meet the expectations and needs from the stakeholders. ICT in teacher education is used to deliver the necessary knowledge and professional skills for teachers to be efficient and adapt to the challenges and changes in society and the environment.

The third wave concerns lifelong learning, global networking, the international outlook, and the use of information technology. This wave emphasizes future effectiveness. The third wave is characterized by a paradigm shift, which means that learning will be individualized, local, and global and in which ICT is a prerequisite for change. Cheng describes the important role of ICT in transforming teacher education into a more local and global phenomenon. He notes the lack of systematic intentions to implement ICT in teacher education and thus to facilitate a paradigm shift in the educational system.

In his chapter *The Challenge of ICT integration in Hong Kong Education - A Case Study of SWOT*, Cameron Richards, from the University of Western Australia at Perth, gives us some ideas about the reasons behind the lack of use of ICT in schools. He describes how SWOT (Strengths, Weaknesses, Opportunities, Threats) can be used as a powerful tool to identify the local and global challenges for ICT in education. Using SWOT could lead to pedagogical and institutional cultural changes. Richards takes Hong Kong as one example showing the difficulties that occur when new theories and policies are introduced and meet the teachers' educational context. Furthermore, he analyzes how teachers' skepticism towards ICT in education increases as ICT becomes associated with new ways of teaching, learning, and educational reforms. Richards claims that through a SWOT analysis a foundation can be seen, leading to changes and progress in teaching and pedagogical research.

Tor Ahlbäck and Linda Reneland from Växjö University, Sweden, in the chapter entitled *Let's Think About it – Considering the Strengths of Web-Based Collaboration*, describe the effects that could occur when students participating in a distance education programme, use virtual learning. They also studied if the students' metacognitive abilities changed from one year to another, and if they could relate the course activities to their own learning in a critical and reflective way.

How students collaborated in problem-solving tasks was studied. The authors noted the quality of the work done, motivation, the social interaction of student groups, and how they shared experiences. The theoretical framework used in this study deals with students' thoughts and reflections about how learning is possible in the context of collaborative learning and co-operative writing. Collaborative learning means a co-operation giving an enhanced result beyond any individual study. Co-operative writing thus refers to any situation in which work is divided between the participants.

Ton Koenraad, from the University of Professional Education at Utrecht, Netherlands, writes about an EU-project, PRONETT, in his chapter *Pro-nett – Networking Education and Teacher Training*. PRONETT is a project aimed to develop a regional as well as an international learning community for pre- and in-service teachers and teacher educators. The website offers the possibility to co-operate and exchange ideas concerning teaching and learning. Koenraad has studied students' and teachers' work in the Netherlands, Belgium and Great Britain by tracing published material on the website. He found that the website was used for many purposes such as student teachers' publishing, web-based teaching material and texts, portfolios and peer group interactions, as well as guidance. The study shows that the website is very useful and should be developed and improved.

Margaret Lloyd and Michael Ryan, from the Queensland University of Technology in Australia wrote a chapter entitled *Frameworks: Building Purposeful Socio-Technical Learning Networks in Teacher Education*. They describe how ICT has successfully been used as a framework in teacher education. The project Learning Networks is performed and works as a learning environment for both content and context. By creating a virtual infrastructure to facilitate a social network, by using digital video, audio, video streaming and synchronous and asynchronous communication, discussion forums, chat rooms, and e-mail lists, students were encouraged to explore other websites. Students also made their own rules and routines as to how to behave and act on the website. The course includes theories of

group dynamics, as working in a team was a meta-activity. Great efforts were made to evaluate and reflect student's opinions about their learning experiences using ICT.

Jimmy Jaldemark, Ola Lindberg and Anders D. Olofsson, from Umeå University, Sweden, present in their contribution *Sharing the Distance or a Distance Shared – Social and Individual Aspects of Participation in ICT-Supported Distance-Based Teacher Education*, results in a study conducted on distance-based teacher education. All the students had at least two years ICT experience of teacher education.

This study was based upon the assumption that the students could create a community based on their use of ICT. The students were expected to develop an overall context in which they could support and learn from each other, despite their separation in location and time.

The authors consider how integrated ICT has become in teacher education and how it influences students' participation. They interpreted the results of their study from the students' statements about the learning process. The results were interpreted from three theoretical perspectives: social constructivism, social constructionism and sociocultural theory.

Wesley Imms and Elizabeth Lloyd from the University of Melbourne in Australia describe in their contribution, *The ArTeach Project: One Strategy for Integrating ICT Skills and Curriculum Design During Pre-Service Teacher Training*, a project, in which ICT is integrated in teacher education. During a four-year period, the authors traced a student group who developed a CD-ROM as a "survival-pack" to help them integrate ICT in their education during their first years as teachers. ArTeach is specific to visual art education, but can be used with most disciplines in teacher education. The survival-pack contains curriculum documents, plans for lessons, teaching materials etc. The survival-pack contained teaching schedules, lessons planning and teaching materials. In developing the CD-ROM survival-pack, ICT specialists as well as an ICT lecturer have participated.

In this project the students had to develop both theoretical and practical competences in ICT-supported educational settings.

Christina Chaib, from the School of Education and Communication at Jönköping University, Sweden, in her chapter *Collaborative ICT Learning – Teachers' experience* presents an evaluation-study of the most important ICT competence development programme ever undertaken in Sweden. Sweden initiated between 1999 and 2002 a vast competence development

programme, IT in Schools (ITiS). The programme was aimed not only to improve teachers' use of ICT in schools but also to help to develop new approaches to learning and teaching and extend the co-operation between teachers from different disciplines. This programme covered two thirds of the teachers in Sweden; about 60 thousand including preschool to secondary school teachers.

The qualitative evaluation-study, reported by Chaib, shows what happens when teachers having different competences and working in teams encounter ICT together with pupils. She describes the teachers' reflections upon the way they co-operated together and the positive and negative aspects of the use of ICT. She also describes how the schools' organization influenced the use of ICT.

Ismail Guven, from Ankara University, and Yasemin Gulbahar, from Bas-
kent University in Turkey write about *Social Studies Teachers' ICT Usage in Turkey: Current State, Barriers, and Future Recommendations*. They refer to a study of 127 primary school teachers using ICT in social studies. The Ministry of National Education in Turkey has made great efforts to educate teachers in the use of computers in education.

Guven and Gulbahar used Rogers's theory about the normal, bell-shaped curve as a framework to illustrate how quickly people could adopt technical innovations. According to the authors, use of computer programmes is widely spread among the studied groups of teachers.

This study examines both how and in what way ICT is used in education. The authors concentrate on the main obstacles to the use of ICT in education. They also discuss what has to be done to facilitate teachers' use of ICT in Turkish education. The authors highlight the enormous possibilities given by ICT but that these possibilities depend upon knowledge about ICT.

Sue Ping Chan and Jennie Wong from the Hong Kong Institute of Education, Hong Kong, describe in their paper *Transforming the "Context" of Teaching and Learning: Issues and Directions for Planning and Implementation*, how one through the use of ICT can create a high quality environment of learning, allowing a flexible approach to learning and teaching. Changes in the learning environment aimed to encourage self-directed learning and to allow individual differences in both teaching and learning strategies.

Chan and Wong present a study where students took courses in English with different elements of ICT, such as getting tasks through the net, using discussion forums and hypertext links.

The aim was to investigate the effects of online learning and students attitudes, habits and experiences of online learning. Other important aspects focused in the study are related to how students develop insights in the subject through discussions on the Internet. Chan and Wong also highlighted the importance of the factors to be implemented in order to satisfy the students.

Stefan Svedberg and Jörgen Lindh from the Jönköping International Business School in Jönköping, Sweden, write in their chapter *ICT in the Learning Process – As Part of a Dialogue When Teachers Encourage Pupils' Learning*, about teachers' use of ICT to support students' learning. They describe the key teaching situations in which the computer may be used to advantage. Svedberg and Lindh study how teachers can help students create meaning from the information gathered. In the theoretical background, the authors discuss learning both with and without the computer as well as the impact related to learning and knowledge when computers are used. They relate their findings to discovery learning and democratic values, problem solving and reflective discussions about pupils' work and how they solved their tasks.

Svedberg's and Lindh's paper is an attempt to show how to create environments to optimize learning with the use of computers in education. The authors raise many important questions about ICT in education, as well as giving opinions concerning learning and democratic issues.

ICT and Teacher Education: Some Swedish Experiences

The challenges of ICT in teacher education are mainly related to how teachers try to cope with children's informal learning, which occurs outside the formal school environment. Confrontation between two different ways of coping with ICT could be illustrated by the following dialogue about ICT use in school, taking part between a twelve-year-old boy and his mother.

Alexander's dialogue

Mother: How often do you use computers at school?

Alexander: We are not allowed to use them before school starts in the morning or after school finishes, and absolutely not during the day, but we can use them the rest of the time.

Mother: Why?

Alexander: Because the teachers do not want us to chat or to surf the Internet.

Mother: Why do they not want this?

Alexander: They don't think it is good for us.

Mother: Well, I know, you have had computer lessons.

Alexander: Yes, we have had these three times and could choose an easy, medium or difficult course. I took the medium course but it was far too easy for me. They taught us how to copy, cut and paste. In the third lesson they were out on the Internet but I was sick that day.

Mother: Well, you are quick on the keyboard, so I suppose you have been given typing and keyboard lessons?

Alexander: No, you learn it yourself when you are chatting.

As can be seen from this short dialogue, there is a discrepancy between the teacher's and the child's ICT world. Between these we can determine and identify the role expected from teacher's education as a bridge builder between these two aspects of learning. This is the main focus of this book.

To bring about substantial changes in ICT-based learning, teacher education would seem to be one of the optimum area and approach. And yet it has been demonstrated (Chaib & Karlsson, 2001) that teacher education has still a long way to go to respond to the rapid changes brought about by the introduction of ICT in schools.

As a result of its regular surveys, the Swedish Foundation of Knowledge and Competence Development, recently confirmed that a majority of student teachers are dissatisfied with the ICT education given by teacher education schools and institutions.

Riis (2000) identified three distinct periods covering three decades during which computers were successively introduced into Swedish education. During the 1970s, national policy makers were concerned solely with enhanced awareness about the computer as tool and its effect upon society. During the second period, in the 1980s, the focus shifted towards computing as a subject for study in upper secondary schools. The aim was to teach the techniques the computers could supply and how computers worked in different contexts. The third period, beginning in the 1990s, was concerned with how ICT, in general terms could be used to creatively enhance students' learning. Of particular importance in these developmental periods are the ideological and scientific arguments put forward by the decision makers to motivate each change in the policies, which were then implemented.

It is not difficult to postulate that the next logical stage in this development will be concerned with the worldwide enhancement of ICT in teacher education. To achieve this global ICT development, we must make the correct analysis of what constitutes the real problem, and identify the fundamental possibilities. This book intended to contribute to review the field and suggest some alternatives.

Questions have been raised about what teacher education could do leading the process of the integration of ICT in modern schooling. Teacher education institutions should normally be those first concerned with the pedagogically adapted use of ICT. Integrating ICT into teacher education courses has two aspects. The first concerns teachers in educational programmes who use ICT as a tool in their practical pedagogical activities. This means that professors use mainly ICT in the framework of a specific course, so that student teachers will be given the opportunity to gain knowledge of specific subjects. By doing so, the teacher can set an example, showing the students how ICT can be used in the optimum way when using it him/herself. However, the incorporation of ICT into teacher education can also imply that students are specifically educated in the didactics of ICT, meaning they have an opportunity to discuss the use of ICT as a tool in teaching from different aspects. A competent teacher educator can show them different perspectives and how to critically view ICT possibilities.

ICT didactics is a fundamental element in student teachers' education and practical training. Integrating ICT into teacher training programmes must reflect both these forms of action. It is not sufficient to use ICT as an instrument for student teachers' own learning. ICT requires a didactic approach of its own, and students need guidance to become competent and critical users of ICT.

Do, for example, student teachers have a right to demand as much training and didactic guidance as they are given in, say, mathematics? This question is controversial and is not easy to answer. Newly examined teachers will often meet pupils who are probably more experienced in the practical use of ICT than they are. This means that teacher education must provide training programmes so that student teachers feel confident when using ICT.

ICT as Seen and Experienced by Student Teachers

In a study conducted by Chaib and Karlsson (2001), it was found that some problems appear more than others in how ICT is shaped in teacher education. The central theme in the interviews of students focused upon the meaning, the influence and the impact of ICT. The students expressed their meaning out of two central aspects: *learning by demand* and *learning with the help of others*.

Learning by demand expresses the lack of support and specification of achievable goals expected from the students by their professors. It may be difficult for a professor to demand this from students if he or she is not fully aware of the possibilities given by ICT.

Learning with the help of others refers to the fact that students can develop their ICT skills by communicating with other students. Learning with the help of others is a very good way of learning, but is not always sufficient. Students' self learning needs to be supplemented by experienced instructors. Students want their intellectual abilities to be challenged by demands on them by someone who masters ICT better than they do themselves.

If students report being satisfied with their ICT training, they still often feel that they are missing one important element. They feel that they do not have enough time to use and reinforce the knowledge they have acquired. This is not easy to obtain within teacher education programmes. To solve this perceived problem, students would like to see ICT applications as an integrated part of each course.

Another way to establish ICT knowledge in teacher education is to instigate continuous competence development, in which the initial knowledge acquired constitutes the prime basis for career-long learning. This strategy calls for teacher education to provide and introduce an open-ended lifelong learning programme, in which new concepts and knowledge are constantly provided to both pre-service and in-service teachers.

A Lifelong Learning Perspective on ICT Education

The lifelong learning perspective suggested above could be adopted whenever ICT literacy is taken into consideration. There are obvious differences between book related knowledge and ICT-based knowledge. Book related knowledge is considered to have a longer retention period and a deeper impact on the intellectual mind. ICT-based knowledge is normally

considered as a renewable supply and to be sustained must be constantly reviewed.

Lifelong learning as a phenomenon is generally defined from two different perspectives. These are the lifelong and the lifewide learning processes. Lifewide learning is related to the different forms of learning during a person's life. They are regarded as *formal learning*, *non-formal learning*, and *informal learning*.

Generally speaking, formal learning is that which is given in formal institutions, e.g. schools and universities. Non-formal learning occurs in other institutions, such as study circles, a popular form of continuing education in Scandinavia. Both formal and non-formal learning are awarded with some form of diploma or, at least, an official recognition. Informal learning refers to the learning, which occurs in everyday life, and where the learner is not usually conscious of the learning process. This category also includes learning labeled as tacit learning or tacit knowledge. ICT learning does, in fact, occur in all these forms of learning.

These three forms of lifewide learning are not mutually exclusive. They appear in each of us during our entire life. Lifelong learning on the other hand, refers to the process by which an individual is given the opportunity to learn throughout his/her entire life, from the cradle to the grave.

Although the term lifelong learning is widely used, its practical use in the shaping of career and competence development is rarely mentioned and hitherto not really investigated. Educators have mostly concentrated on the design of the formal learning function. Relevant questions have been raised regarding the phenomenon of lifelong learning and the training of ICT-skilled teachers. As we have noted previously, ICT skills are developed not only in formal learning contexts, or limited to in-service training. Teachers' ICT skills should be developed throughout their entire career. We should seek to establish ICT training programmes based on teachers' individual abilities and real competence.

Most of the current ICT training programmes available are trainer rather than teacher centered. They focus on ICT as an information and communication device, and lack any appreciation of teacher follow-up and pedagogical support strategies. The optimal aim of ICT-based education should be the shift from, what I would like to call, a deficit-based to a competency-based approach. A deficit-based approach is the compensatory approach, the main purpose of which is to compensate for teachers' lack of competence. The competency-based approach aims to integrate teachers' knowledge, skills and experience in the building and extension of ICT skills.

This strategy could help to move teachers from their dependency on external monitoring to solve their problems, towards the growth of a professional self-reliance in instructional decision-making.

We must develop innovative forms of skills improvement among teachers. This can be done by shifting the focus from learning individuals to a learning community giving the mutual solidarity required for this form of collaborative competence development.

In her contribution to this book, Birgitte Holm Sørensen examines the evidence that children's ICT competence is mostly acquired and developed in informal settings, e.g. in leisure time activities. She concludes that the challenges are thus to enable future teachers to explore and exploit the potential of ICT connected learning. This means that teachers should have the facilities to develop learning processes based on creativity related to the subjects they teach. Holm Sørensen's observations pose a double challenge. One is the challenge ICT development constitutes towards teacher education. The second challenge is posed by the demands from pre-service teachers on teacher education to prepare them for the use of ICT in their practical training. As stated in this book by Yin Cheong Cheng, the challenge of ICT regarding education as a whole, and teacher education specifically, this constitutes a paradigm shift or, as he calls it, a Third Wave relating to the application of information sources and communication technology in modern teaching.

In one sense the way to respond to these challenges could be found in the creation of innovative and flexible forms of teacher education. In this innovative form of education the students are offered basic platform of formation that are supplemented by recurrent modules of continuing formation. The continuing modules of formation are related to the new challenges teachers have to face, e.g. ICT. Holm Sørensen concludes that teachers must function in both horizontal and vertical relationships with pupils. This exhortation calls for a lifelong learning perspective on teachers' ICT competence. They must thus learn how to work cooperatively as a "community of practice."

When teachers learn to work co-operatively, and address instructional ICT-related problems, they show a greater capacity to solve problems than they could have done individually (Chaib et al., 2004). This observation calls for the necessity of developing co-operative and collaborative approaches towards learning ICT among both in-service and pre-service teachers. If co-operation and collaboration can be seen to be vital among students, it is even more important among teachers. We are aware that organizational frames for this learning are limited, both in schools and teacher education.

The general integration of ICT in teacher education probably calls for the individual teacher not to be seen as a “finished product” when leaving teacher education, but as a lifelong learner. As such, teachers must be prepared to learn the basics of ICT, to incorporate new technology, and new pedagogical methods to improve their teaching. Educational programmes for in-service teachers should also aim to enhance not only their skills as ICT users, but also as ICT developers.

It is tempting to argue for a utopian form of teacher education in which the syllabus could be divided into two parts. Teacher education could be planned from a basic education programme together with a compulsory and recurrent programme complementing the basic one. This would mean a teacher education of e.g. four years, in which the three first years are conducted as of present, but the fourth year would be individualized. This last year could be divided into several modules containing continuing course segments, guaranteeing in-service teachers a permanent and lifelong competence development, e.g. in the use and application of ICT.

We must also consider the importance played in the organizational context, in which ICT is taught and used. The research findings of Chaib and Karlsson (2001), Chaib et al. (2004), and Svensson (1996a, 1998a), support the idea that ICT, in many situations, requires an adapted organizational context for its frictionless use. It is a lure to believe that a modern technology device such as ICT can be used within existing organizational frames developed for different educational contexts. Teacher education shows particular difficulties in the adaptation and wider use of ICT. These difficulties relate to the excessive demands on teacher education to incorporate new items into an already crowded curriculum.

The question if ICT requires new organizational forms does not only concern teacher education. This question has been widely discussed and investigated in the field of industrial production and the organization of work-place production. However, opinions diverge upon these issues. Some maintain that ICT requires not only new forms of organization, but also a new philosophical conception of labour distribution (Castells, 2002).

A metaphor could illustrate the ambiguity caused by the combination of advanced technology with obsolete organizational forms of production. Both France and Sweden have high-speed trains. In France, these trains are called TGV (Train à Grande Vitesse). In Sweden, similar trains are called X2000. Both trains aim to transport passengers rapidly with a maximum of comfort. There are, however, fundamental differences between these two technological achievements. In France, one can travel on the TGV

at a speed of about 300 km/H and a maximum of silence and stability. A similar trip in Sweden, at only 200 km/H, is a rather shaky and uncomfortable experience. And yet both the TGV and the X2000 are products of the same technological age. The Swedish X2000 is actually more recent. The differences between these two high speed trains is that the French TGV runs on a newly constructed track, specifically designed for the high speed trains, whereas the X2000 still runs on a track system built for a completely different kind of train traffic.

Integrating ICT means that we must examine the possibilities of optimizing the use of new technology so this makes the technology economically viable and pedagogically meaningful.

In order to provide a sustainable ICT-related professional teacher development, we should extend the scope of teacher education so that it becomes a more integrated part of the teacher's whole career development. We should then be able to still educate in-service teachers, and renew their skills throughout their entire career. This is particularly valid for the sustainability of competence related to new technologies.

Teacher education in relation to ICT should be seen as a solid structure provided during in-service education periods and that this solid structure will be able to sustain and support competence development during the lifelong learning process.

If ICT development is to be sustainable, it should also permeate all pedagogical activities, not only a few of them. Teachers and professionals sometimes consider ICT as being only a tool in the improvement of teaching and learning. ICT as a device should only be considered as an artefact in the new way of teaching. The teacher remains the prime mover in the teaching process.

There are, however, two misconceptions that should be noticed and avoided. The one tends to ascribe to ICT the properties of a universal medicine, able to solve all the problems of schooling. Fortunately, such concepts occur very rarely nowadays. The other misconception tends to minimize the importance of ICT, and considers it as a gadget easily used by everyone.

ICT has changed not only educational life, but also the whole of our social life. This is a fundamental challenge that we must accept and address in a responsible way. ICT in itself cannot solve the problems of education, but it can create new problems. That is why pre-service and in-service teachers need to have the best philosophical, ethical and pedagogical awareness to confront the challenges they will meet during their career. This is why our responsibilities as teacher educators are also to identify these

challenges, to cope with them and to prepare our students for their transition from students to teacher professionals, having integrity, distance and preparedness.

We must try to approach ICT-based education with our students using a humble but even critical view of modern technology and how it is reshaping our everyday life. In other words, we should scrutinize ICT not only from its pedagogical dimension, but from the philosophical and ethical bases entailed.

References

- Castells, M. (1996). *The Rise of the Network Society*. Oxford: Blackwell Pub.
- Chaib, M. & Karlsson, M. (2001). ICT and the Challenge to Teacher Training - A student perspective. In M. Chaib (Ed.), *Perspectives on Human-Computer Interactions – A multidisciplinary Approach* (pp. 141–172). Lund, Sweden: Studentlitteratur.
- Chaib, M., Bäckström, Å., & Chaib, C. (2001). "Detta är bara början" – *Nationell utvärdering av IT i Skolan* [This is just the beginning – National evaluation of IT in School – Report one]. Jönköping, Sweden: School of Education and Communication, Jönköping University.
- Chaib, C. (2003). Learning trough ICT – Students' Experiences. In *The Quality Dialogue. Integrating Quality Cultures in Flexible, Distance and E-Learning*. Conference Proceedings, (pp. 232–238). EDEN 2003 Annual Conference, Rhode, Greece. 2003.
- Chaib, C., Chaib, M., & Ludvigsson, A. (2004). *Leva med ITiS – Nationell utvärdering av IT i Skolan* [Living with ITiS – National evaluation of IT in School – Final report]. Jönköping, Sweden: School of Education and Communication, Jönköping University.
- Riis, U. (Ed.). (2000). *IT i Skolan mellan vision och praktik – en forskningsöversikt* [IT in School between Vision and Practice – A research overview]. Stockholm: Liber.
- Svensson, A.-K. (1996a). *Datoranvändning i förskolan – forskollärare och barns upplevelser* [Computers in preschool education – As experienced by teachers and children]. Ansats, 1996:1. Jönköping, Sweden: School of Education and Communication, Jönköping University.
- Svensson, A.-K. (1996b). Språkstimulering med och utan dator. Språklig medvetenhet hos barn på förskolor [Language stimulation with and without computers. Language awareness among preschool children]. *Pedagogisk-psykologiska problem* Nr 626. Malmö, Sweden: School of Teacher Education, Malmö University.

- Svensson, A.-K. (1998a). *Barnet, språket och miljön. Från ord till mening* [Children: language and environment. From words to sentences]. Lund, Sweden: Studentlitteratur.
- Svensson, A.-K. (1998b). *Tre studier av skolelevers kommunikativa samspel vid datorn* [Schoolchildren's communicative interaction in front of the computer: three studies]. *Insikt* 1998:1. Jönköping, Sweden: School of Education and Communication, Jönköping University.
- Svensson, A.-K. (2000a). Datorer i förskolan ökar barns samspel [Computers in pre-school improve childrens interaction]. *Locus. Tidskrift för forskning om barn och ungdom*. 2/00, 6–13.
- Svensson, A.-K. (2000b). Computers in school: Socially isolating or a tool to promote collaboration? *Journal of Educational Computing Research*. 22(3), 2000.

ICT and Schools in the Information Society

New Positions for Teachers

Birgitte Holm Sørensen

Introduction

Children's educational development in connection with their ICT usage has accentuated the significance of informal learning processes. The competences which they have developed in a number of areas indicate that on the basis of this informal learning many of them will be able to function in our information society's virtually based education programmes and in modern workplaces: they are accustomed to share knowledge and use ICT in communicative processes (Sørensen, 2003). According to the findings of several investigations, Danish, Northern European and international, children's principal use of media takes place outside school, and they learn media use primarily from other children and from their own experimentation (Drotner, 2001; Livingstone & Moria, 2001; SAFT, 2003; Sørensen, 2003). Children's informal learning thus plays an important role in their daily encounter with ICT; and it is important that the schools should be able to draw on the knowledge which children construct outside school and the manner in which they acquire it. Teachers must develop new skills and approaches, and this presents teacher training with new challenges.

This article will focus on the role of the teacher in relation to the use of ICT in schools, and will attempt to answer the following questions: How do children learn to use ICT? How do teachers react to children's informal learning in relation to ICT? What new challenges will teachers have to face, and what new teacher positions are relevant for schools in the information society?

There will first be a brief introduction to the empirical and methodological basis of the article, and then children's informal learning with ICT will be in focus; here, social learning theory and networking theory

will play a central role. The informal learning processes which children undergo in their use of ICT mean that they develop competences which they bring with them to school, from which a cultural encounter arises between pupils and teachers. This cultural encounter will be discussed in the article, and its significance for the relations between the school's actors will subsequently be considered. Next, the position of the teachers will be considered, with the introduction of educational knowledge management as a new challenge and strategy in the context of the school. At last the article will take up the challenges in relation to teacher training and the teachers of the future.

Empirical and Methodological Approach

The article is based on the findings of three studies: a five-year research project "Children's growing up with interactive media – in a future perspective"¹; an investigation of teachers functioning in the form of school and with the type of educational praxis characteristic of the industrial society; and an investigation of teachers functioning in the form of school and with the type of educational praxis characteristic of the information society. According to Trilling and Hood (2001), the industrial society's schools and educational praxis is characterised by time-slotted and scheduled organisation with classroom-bounded communication and with the teacher as knowledge source, whereas the schools and educational praxis of the information society are characterised by open, flexible and primarily project-based learning, where the learning and communication processes are not restricted to the physical space of the classroom but are rather a world-wide communication with the teacher co-learner, facilitator and consultant (Trilling & Hood, 2001).

All three of these studies are qualitative and inspired by the anthropological approach in their study of a social complexity where relational patterns are central. From an anthropological point of view, this complex social field is understood as the connections between social conditions and actors with their mutual involvements (Hastrup, 2003). The focus is thus not on the individual as such but on the person as part of a social system, "the individual in a community" (Hastrup, 2003). In the social field, connectivity and reciprocity are taken for granted, both when they are visible and when they are invisible. The social field also contains cultural conditions. Together with the human encounter with artefacts in the form of actions and activities, the social should be regarded as an element in the

definition and constitution of the cultural. The projects make use of a wide variety of research methods, including participant observation and interviews with individuals, groups and focus groups (Olesen & Audon, 2001; Sørensen & Olesen, 2000).

Children's Learning of ICT – Informal Learning Processes

In schools, learning is the *aim* of the activities carried out, whereas in children's spare time learning is a *means* to enable them to join in the play, to play computer games, to chat and make home pages etc. Learning is thus a precondition and an integrated part of playing where children need to be in a good situation (Huizinga, 1993).

The characteristics of informal learning are that it takes place principally outside of institutionalised education and is unpremeditated learning as a means in connection with such activities as play, computer games and chat. Formal learning takes place in educational institutions as premeditated learning, and here learning is the general aim of the activities which are carried out.

It can be observed that when children use ICT in their spare-time culture they construct various forms of learning to enable them to acquire the necessary skills. There are learning hierarchies, learning communities, learning networks and simultaneous learning, each of which functions in different contexts and which are occasionally integrated. The individual learning forms can be said to make up a set of learning strategies, and these are the procedures which children follow to enable them to carry out an activity and to acquire knowledge. The individual learning forms also describe the forms of organisation constructed to enable learning.

When several children of different ages are together, their own hierarchical organisation functions as a *learning hierarchy*, with the youngest members learning from the older children or the inexperienced from the experienced (Sørensen, 2003, 2004). Lave and Wenger use the term legitimate peripheral participation for the process by which learners are gradually integrated into the group. This term is related to the apprenticeship principle, in which learning is more or less controlled by the master and skilled worker organisation. Children's self-organisation shows some points of similarity to this legitimate peripheral participation, but with the great difference that the children's organisation takes place within their own culture where they can join in or drop out as they choose, which

would not be the case in an apprenticeship situation at a workplace since here work allocation and training are organised and controlled by the master. In the children's own organisation, one often sees that the oldest or most knowledgeable sit in front of the computer, in the next row the next oldest or next most competent, and in the back row the youngest or the least competent. These hierarchical rows express a pecking order in which age, knowledge and ability are the parameters determining how the children position themselves. Verbal participation is most pronounced among the children closest to the computer, whilst it is virtually absent among the children furthest away from the computer. In the furthest circle the basic learning strategy is observation. Children establish and connect themselves to these more or less loosely organised learning hierarchies because they discover that here is a way to learn made up of direct observation, experimentation, conversation and narration² (Sørensen, 2003, 2004).

Children's use of the computer often entails a *learning community*, for instance when they play a computer game together; learning is here a vital element in the communal activity as it is the *means* enabling them to be active in the game (Sørensen, 2003, 2004). According to Hastrup, a community should not be understood as a collection of facts but as "*a special understanding of how social life hangs together and how individual conditions, individual deeds and personal experiences interact*" (Hastrup 2003, p. 25). Etienne Wenger offers a theory for understanding a community of praxis which is relevant to children's learning communities, since they are linked to a praxis. Wenger's theory was developed in connection with the learning which takes place at workplaces (Wenger, 1998; Wenger, McDermott & Snyder, 2002) and is thus applicable to the present study, since workplace learning is also a *means* to something else, like creating a product or carrying out a project³. Attention is directed to the context and focuses on learning as an element of everyday praxis. Praxis communities are thus "... *groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis*" (Wenger, McDermott & Snyder, 2002, p. 4). Applying Wenger's theory to children's learning communities, they demonstrate an ongoing exchange of ideas in which the children develop a common understanding of the situation and of the process they are undergoing. In this exchange of ideas, participation and reification are both separate and connected processes. Participation is an active and complex process in which children combine action, speech, ideas, feelings and affiliation. Children's reification concretises the community's jointly developed ideas as terms and symbols, for instance when they construct a landscape for a

game or produce a text or another product. It can be said that reification makes praxis explicit, though Wenger points out that it is not possible to give a full account or codification of a praxis (Wenger, 1998). It is a matter of mutual engagement, as in a computer game where children draw on each other's knowledge, use it and are dependent on it to enable them to do battle against a group. They constantly discuss their common enterprise in order to establish their common goal, developing a repertoire of actions, words and routines as part of the communication within the community. These communities are often long-lasting, with participants meeting several times a week to play the same game, and learning is an integrated and necessary element, with learning processes principally connected to shared performance, experimentation, comparison, conversation and discussion.

Furthermore, in their use of ICT, children establish *learning networks* where they develop strategies for seeking out knowledge, sharing it with others and constructing new knowledge (Sørensen, 2003, 2004). A network can be described as a system of connections between units. However, children's networks should not be understood as the kind of formally established networks which are often seen in adult culture, where they are formed in relation to professional or other interests⁴. Children's networks are informal, and here the writings of the German philosopher and sociologist Norbert Elias are of interest. Elias regards people as linked via chains of units which he calls *interdependencies*⁵. Individual children or groups are understood as interdependent units in a network. Elias uses another term in his account of network: *figuration*, by which he means structures of relations between human actors who are orientated towards and dependent on each other (van Krieken, 2002). Elias's use of *figuration* as a pendant to *network* implies an understanding of figuration as a lesser system of connections constructed around interdependent people and groups where the power balance is changing and asymmetrical. He focuses on the relational nature of social existence, emphasising that the dynamic of figuration depends on the shared social complex forming the collective foundation for individual conduct (ibid.). By means of the network, the common "language" is formed which forms the basis for both the individual and the collective dynamic. Some of the figurations or networks which children participate in or construct acquire the status of learning networks with relation to the digital media, since for children they represent a way of learning which the digital media have especially emphasised⁶. These learning networks are connected to and/or based on various digital activities, and are both physical and virtual. By means of the network, children may communicate knowledge to each other which forms a stage in their learning

process; or the learning process may proceed as a reciprocal construction process to which several children on the network contribute. This is often the case in solving problems, for instance how to advance in a computer game, a multi-media programme, etc. Exchange of ideas and knowledge takes place when children are together at the computer, or via e-mail, cell-phone, in chat rooms and in different internet discussion groups. Children are very much aware of who they can draw on in the figuration for help with the problems that arise in their various digital activities: they soon get to know who is well up with what in the different figurations they are in. Here, learning processes are connected with verbal communication and narrating and with practical demonstration and imitation.

Learning hierarchies, learning communities and learning networks can be termed socially based forms of learning. A form of learning which is especially characteristic of children's spare-time culture is *simultaneous learning*. It is distinct from other forms of learning in not being particularly social, but must be seen as a form of learning especially connected these days to older children's spare-time activities. As they get older, children learn to engage in a number of simultaneous actions and different communications. Whilst they do their school homework they also carry out many parallel activities: checking e-mail, downloading music, searching the net, chatting with their friends. They have performed the same actions many times, perhaps also practising to become faster, and have thus internalised the knowledge and skills they have acquired, both physiologically and cognitively (Sørensen, 2003, 2004). In other words, repeated use has developed simultaneous competence (Sørensen, 2001), which on the one hand enables them to navigate their way through a complex situation and perform a number of parallel actions, whilst on the other new simultaneous learning strategies are constantly required to enable the children can perform new actions and communications. Simultaneous learning must thus be understood as a complex of learning strategies enabling parallel actions and communications.

These four forms of learning which can be registered in children's spare-time use are for them ways of learning to use ICT. They are effective learning forms, which it can be relevant in many contexts to integrate into the school's teaching and learning processes, and not merely in relation to ICT. Children do bring these learning forms into the schools to some extent, but they do not fit well into the fixed syllabus and teacher-directed learning of the industrial society's school organisation. They are far more suitable to the information society's school organisation with its project-based and student-directed learning.

Cultural Encounter Between Teachers and Autodidactic Pupils

The computer made a serious entry into family life during the 90s, followed around the turn of the millennium by the internet. Both have now become integrated elements in children's everyday play, entertainment and learning, and have important functions in their culture. Many children grow up in homes where the parents do not use the computer, and this has meant that they have had to teach themselves computer skills; as mentioned earlier, they learn these skills first and foremost by experimentation and with the help of other children. Some children develop ICT competence far beyond that of their teachers, and this often creates problems in school. And even though children achieve very different levels of ICT competence⁷, in general their approach to the media is simply to get going and feel their way forward. As a result of their participation in various types of informal learning forms, children are autodidactic to a high degree. And in contrast to the children, teachers have a very different approach which is largely structured by a feeling that they need formal instruction before they can make use of the computer in school. As one teacher put it: *"How can I use that machine in my teaching? I haven't been to a course yet."*

In the encounter between teachers and pupils, a social field is constructed from the relations and reciprocities which are established. With ICT as the focal point, a social encounter arises in this social field between pupils and teachers, in respect of their different media uses and the connected knowledge, meaning formations and values. This cultural encounter directs focus onto the new relations between teachers and pupils, their new positions in the school and their experience of the options available to pupils and teachers.

When pupils and teachers at schools, organised for the industrial society, were asked about their experiences with ICT at the school they included accounts and descriptions about themselves or each other.

Statements About Pupils

On the basis of the empirical material the following statements were given about the pupils in relation to ICT. They can be divided into three categories: the first deals with the pupils' learning forms, the second focuses on the pupils who achieve a special position in class, and the last deals with the pupils' non-applicable competences.

- Pupils learn together from each other
- Pupils draw on their network
- Pupils as instructors
- Pupils take responsibility for IT
- Pupils' digital media competence is not of significance for the school

The first two statements deal with the forms of learning by which the pupils learn from each other and with each other's help in the communities they establish in their spare time or have built up in class, or else drawing on networks they have formed both in and outside school. The pupils are quite aware of who knows what, and draw on both children and adults with special competences in a particular area. Many of the older children are not restricted to learning carried out in a physical space but also learn in virtual communities and networks which they establish on the internet in connection with on-line games, chat etc. (Sørensen, 2003). In general, children just get on with it. They don't remark on whether or not they have attended a course or make it a decisive factor whether they have or have not received instruction. They get on with it, just as they do with many other things they want to learn. For instance, when they play online games they soon pick up the English vocabulary needed to participate.

When children use the computer in class it is very common for them to draw on each other's competences before asking the teacher. This isn't always the case, however: some children are very positive that it is the teacher one asks when one is at school – it is an ingrained praxis form in what Trilling and Hood term the industrial society's school (Trilling & Hood, 2001), where learning relations are of a vertical character.

The next two statements deal with the fact that in learning processes with ICT some pupils acquire a special position in the class. This is particularly the case with a group of pupils with special competences, since it is them whom the other pupils very often question. Some assume the role of master in the group when the other pupils request them to demonstrate something, or when the other pupils just go and watch them and try to imitate what they are doing. In some cases the teacher asks these especially competent pupils to act as instructors to other pupils or groups of pupils, either to assist the teacher or because the teacher lacks the competences which these pupils have.

One teacher said that she deliberately makes use of such pupils since *they can understand each other's explanations more easily*. Furthermore,

there are pupils who simply “take responsibility for IT”: they take over quite quietly and without any kind of discussion, because they can see that the teacher is unable to manage. Many pupils are quite aware that their teachers are not always so good at using ICT; some of them express criticism of this, but on the whole they do not criticise. It’s just the way things are. They often have the same status at home, as the one to whom parents and siblings turn for advice (Sørensen, 2001). Many of these power users⁸ are quite aware that they are skilled in this area, and they use their skill perfectly unaffectedly as they are accustomed to helping in many different contexts.

The last statement, that the pupils’ digital competence was not significant in school, was especially made by a teacher who has attended many ICT courses. The point here is that the pupils’ spare-time use of games, chat, internet etc. does not develop competences which are useful in school, where the most usual digital activities are the use of writing programmes and goal-directed internet searches, in which the pupils are insufficiently skilled. This view of the pupils’ competences is totally in contrast to the metaphors used in the world of research: cyberkids, net generation, the digital generation, front soldiers of globalisation, net nomads (Haraway, 1991; Papert, 1999; Tapscott, 1998; Williams, 1999); it is a view which has also been expressed in other projects, where pupils are assessed on the basis of their knowledge of the text programme used by the school. In relation to such teachers, the competent pupils often adopt a policy of non-confrontation or invisibility and do not advertise their knowledge and ability (Sørensen, Olsen & Audon, 2001). The statement can thus be understood as expressing these teachers’ fear of domain loss, and also indicates an educational approach which is restricted to the traditional curriculum and teaching form. Such an approach strives to adapt ICT to the academic tradition rather than renewing professional practices on the basis of technological innovation.

Statements About the Teachers

The statements concerning teachers and ICT are listed below, divided into three categories. The first category deals with teachers who do not use ICT, and comprises two statements. The second category, also with two statements, focuses on teachers who use ICT with difficulty; and the last category deals with teachers who have different approaches to using ICT.

- The teacher plans his teaching without thinking about ICT
- The teacher needs to go on a course before using ICT in the school
- The teacher finds that ICT takes time from the teaching
- The teacher wants to use ICT, but has to be led by the hand
- The teacher gets going and makes use of the pupils' competences
- The teacher uses ICT creatively and innovatively

Many teachers plan their semester's teaching without thinking about how ICT can be integrated in their plans, whilst others assert that they cannot be expected to include these media in their teaching until they have received instruction in their use.

Some teachers find that ICT takes time away from teaching school subjects; if, for instance, the class has to use a new programme, the time taken to learn it reduces the time available to teach the syllabus. This is a statement which a number of teachers agree on, as is also shown in the Norwegian Pilot project (Lund & Almås, 2003). These teachers regard ICT as a separate concern beyond the teaching of school subjects and not as an integrated element which can bear fruit in the teaching and learning of those subjects. Another group of teachers who have picked up some knowledge of ICT at courses or by other means are actually keen to make more use of computers and the internet in their teaching, but "*they need to be led by the hand,*" as one teacher put it. If they do not make plans and book a room in good time, the project is hopeless⁹.

There are some teachers who have never been to courses and have limited competence but are aware of both the advantages and the necessity of both pupils and teachers learning to use the media. They simply get on with it and rely on the competences possessed by class members, honestly admitting to the pupils that they are no experts themselves but hope that problems will be solved if they all help each other. They meet the challenges posed by the media and also those in relation to their function and position as teachers. These teachers are open to the pupils' competences and ideas, and together they develop processes in which the teachers themselves also learn. The last group of teachers share this openness, and are creative and innovative in their media use. They investigate the existing digital teaching resources, find out how to use the internet and make use of the opportunities it presents. An example of this is a teacher who was reading a novel with a class and arranged a net-based conference so that the pupils could communicate with the author, ask questions and con-

verse about the book and experiences originating from it¹⁰. This group of teachers experiment and try out the various options and programmes to assess their educational and academic value.

On the basis of the above it seems clear that a cultural encounter is underway between a large group of pupils and teachers. Human beings are constantly exposed to changes and reinterpretations in relation to which they must create and reproduce themselves (Hastrup, 2003). The digital media are a new element in society which the school's actors need to relate to. Children don't give it much thought as the digital media have been around since before they were born, or have emerged for them later and gradually been integrated into their play culture and everyday lives. But teachers have to create and reproduce their professional stance in relation to this phenomenon. The different groups of teachers, discussed above, tackle this new situation in different ways. Some are rejecting and procrastinating, constantly putting off what they regard as a problem and continuing as they always have done. Others would like to change, but practical barriers and lack of knowledge prevent them from creating and reproducing themselves in relation to the new challenges. This is not the case with the third group, who take up the challenge and find satisfaction in doing so.

Horizontal Relations

In some situations, ICT appears to contribute to the creation of a new order, or rather a new form of complexity in the social community constituted in the class, since the media help to break down the top-down order. Pupils occasionally acquire the teacher's traditional function as the one who is asked questions and who gives help. This implies that digital artefacts are an element in the reciprocities and dynamics constructed among children, and between children and adults. Where reciprocal relations were previously vertical they have now also acquired a horizontal character. With the competences they acquire out of school, children have assumed a position which is historically unprecedented, since a group of children have competences at a higher level than those of many adults. Previously it was very common for children to acquire competences which made them important actors in their families and in their everyday lives. This was true of children from farming families, and is still the case to a certain extent: these children often acquire the necessary competences for working in the family business by learning the praxis in association with their parents and

siblings. Digital praxis learning is of a different nature as it takes place by and large in the children's culture and mutually among children but does not have the same work function in the home. But in reality it holds a great resource, which is not sufficiently exploited in school.

It is no longer possible to regard children exclusively as objects for a concept of educational-psychological development in which fixed phases are decisive for the planning of teaching, a perspective in which children are seen as to a large extent malleable. However, the focus of the last 15–20 years' research into children's culture and the new sociology of childhood has been on children as active, participatory and competent (e.g. James, Jenks & Prout, 1998; Qvortrup, 1994; Sommer, 1996). With the arrival of the digital media it has become clear that children play an active role in their own developmental and educational processes (Drotner, 2001; Sørensen & Olesen, 2000). It is however important to realise that even though it often seems that children's competence in using ICT is of such a high standard that they can have a high degree of control over their own learning processes, there is no guarantee that their grasp of the content is of the standard required, and it is here that the teacher has a position and function even though it may seem external to what the pupils are doing at the computer. One teacher has said: "*Many of the pupils say that they rarely need their teachers and sometimes forget that they're there.*" Children's handling of the new media gives then a different status at school, a status which contributes to the detraditionalisation of relations between teacher and pupil.

The nature of the cultural encounter between pupils and teachers differs depending on their respective background and attitudes, and this has an effect on how the options for acting in the social field of the class are experienced. With regard to the changed positions of teachers and pupils, one teacher in the study said:

It has been our experience that when we work with ICT the roles are sometimes reversed. The pupils' knowledge and experience are often greater than the teacher's, and when they are working at the computer we see new strengths and team relations emerge among the pupils. They are good at using each other, and quickly find out who is expert in different areas.

This implies that teachers must be ready to let go of their exclusive authority and dare to move into new areas in collaboration with their pupils. This will lead to a form of work in which the pupils are continually experimenting and building on their own experience. Another teacher puts it like this:

Development within ICT is so rapid that teachers cannot manage to acquire sufficient knowledge in all relevant areas. It is therefore important that the work is based on the pupils' individual and joint knowledge.

It is clear that teachers' use of ICT and their openness to it gives the pupils options which they value. Children want to use the digital media both in and outside school (Sørensen, Olesen and Audon, 2001) because they see it as giving them greater freedom to organise their work with respect to place and time, to organise the subject matter and to structure their learning. The relations between teachers and pupils also become more equal, with them often working together on a project and researching and learning together. In the Norwegian Pilot project¹¹ the same changes in relations are found as are described here (Lund & Almås, 2003). The pupils' competences are a "natural" and frequently vital part of the work, and this extends the options for both pupils and teachers. Conversely, if teachers are opposed to the use of digital media the pupils experience their options in school as restricted, and for some children especially, the power users, this can be a marked preclusion of possibilities which they know would facilitate their learning processes.

New Teacher Positions and Knowledge Management

In the traditional hierarchically organised schools of the industrial society the teacher is in charge of the central planning of class work, with division of tasks, surveillance of the pupils and exercises to ascertain progress. When learning processes in schools come to be organised in what Trilling and Hood (2001) term the learning praxis of the information society, the pupils often create their own projects and are more or less self-determining in carrying them out. This asks for new relations between pupils and teacher and requires the teacher to assume new positions and new forms of leadership: on the one hand, the pupils have a certain degree of freedom in their work, but on the other there is a need for structure and qualified input, and to ensure that the projects the children are working on are of sufficient value and that they work towards the prescribed aim. In other words, the teacher must both manage the pupils' greater degree of freedom and function as a leader to ensure goal-directed processes. This implies that in many circumstances the teacher's position assume a new character, for which the term *knowledge management* can be used. Knowledge management can on the one hand be described as a tool or a method which can

be used by a business for problem solving or as a strategy for organising knowledge, and on the other hand can be seen as a work culture in which time is allowed for dialogue and thereby for the sharing of knowledge among the staff as a natural element in the business (Christensen, 2002).

In an educational context where the teacher is leader in relation to a group of children, the challenge is to apply knowledge management as a means to problem solving, as a strategy for organising knowledge and in the establishment of a learning culture where knowledge management is an integrated element. When much of the teaching process is organised as projects, the pupils often create their own projects and are more or less self-determining in carrying them out. This means that the relations between pupils and teacher change and that teachers must establish new forms of leadership, since on the one hand the pupils have a certain degree of freedom to inaugurate, organise and carry out their projects, whilst on the other there is a need for qualified input to ensure that the projects are of sufficient value and that the children work towards the prescribed aim.

Pedagogical knowledge management means that the teacher becomes a manager in an organisation which is open-ended and unpredictable, and where he or she must constantly relate to many different projects and learning processes. Pupils working on different types of digitally based projects are likely to be self-organising and self-determining to a large extent, and the teacher has responsibility for these self-organising and self-determining units. The teacher is in charge of these projects at the managerial level, and also of the children who are themselves in charge of their own projects.

When the pupils function in a school organisation in which much of the time they work on projects and use ICT on a day to day basis as an integrated part of the learning process, the position of the teachers and their relations with their pupils undergo a change which can be seen as parallel to changes in workplaces at the managerial and organisational level. In these years a process of debureaucratisation is underway in many businesses and organisations, and this makes room for self-management, self-organisation and self-regulation. Debureaucratisation can be seen as a stage in a cultural change in the power structures that were prominent in traditional industry, where external control was an aspect of the managerial concept (Morgan, 1988). In the information society's schools, self-management, self-organisation and self-regulation will be integrated into the pupils' learning processes. The pupils' presentation of their projects to other groups of pupils and parents will improve the pupils' yield capacity in connection with their projects.

The Challenges

The challenge for teacher training is to enable teachers of the future to explore and exploit the learning potential connected to ICT and to equip them to facilitate the learning process by developing creativity in their use of ICT in relation to the subjects they teach. It is not only a question of using ICT as a tool in learning and teaching but of exploring it in the interest of innovative and fertile learning and teaching processes. In relation to this, there is an educational potential in children's digitally based spare time activities such as chat, games, news groups and home pages which can be developed and used in many different contexts, of which language learning is particularly prominent. Furthermore, educational knowledge management should be part of the aspiring teacher's professional stance; it will be natural in the context of the school to include and apply the ICT knowledge constructed by the pupils out of school, just as the pupils' out-of-school forms of learning and social learning theory should be part of educational praxis in the schools. This implies that aspiring teachers must enter into new relations and take up new positions in relation to their pupils. Teachers must function in both horizontal and vertical relations.

References

- Christensen, P. H. (2002). *Om vidensledelse – perspektiver til refleksion* [On knowledge management: perspectives for reflection]. Frederiksberg, Denmark: Samfundslitteratur.
- Drotner, K. (2001). *Medier for fremtiden: børn, unge og det nye medielandskab* [Media for the future: Children, youth and the New Media Landscape]. København: Høst, 2001.
- Gulløv, E. (1999). *Betydningsdannelse blandt børn* [Sense-making among children]. København: Gyldendal: Socialpedagogisk Bibliotek.
- Haraway, D. (1991). *Simians, cyborgs and woman: The reinvention of nature*. London: Free Association Books.
- Hastrup, K. (Red.). (2003). *Ind i verden. En grundbog i Antropologisk metode* [Into the world. A primer in anthropological method]. København: Hans Reitzels Forlag.
- Huizinga, J. (1993). *Homo Ludens. Om kulturens oprindelse i leg* [Homo Ludens. On the Origin of the Culture in Play]. København: Gyldendal.
- James, A., Jenks, C., & Prout, A. (1998). *Theorizing childhood*. London: Polity Press.

- Lave, J., & Wenger, E. (1991). *Situated learning – legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Livingstone, S., & Moria, B. (Eds.). (2001). *Children and their changing media environment: A European comparative study*. New York: Erlbaun.
- Lund, T., & Almås, A. G. (2003). *På vei mot god praksis? En beskrivelse og analyse på tvers av ni skoler i PILOT* [On the road to good praxis? A description and analysis across nine schools in PILOT]. Tromsø, Norway: Universitet i Tromsø.
- Morgan, G. (1988). *Riding the waves of change. Developing managerial competencies for a turbulent world*. San Francisco: Jossey-Bass Publishers.
- Olesen, B. R., & Audon, L. (2001). På feltarbejde i chatkulturen. [Doing fieldwork in chat culture] In B. H. Sørensen, (Ed.), *Chat. Leg, identitet, socialitet og læring* [Chat. Play, identity, sociality and learning]. København: Gads Forlag.
- Papert, S. (1999). *Familjen och nätet. Hur man överbygger den digitala generationsklyftan* [The family and the net. How to overcome the digital generation gap]. Göteborg, Sweden: Daidalos.
- Qvortrup, J. (1994). Nine these theses about “Childhood as a Social Phenomenon”. In *Childhood as a Social Phenomenon*. Erosocial Report 47. Wien.
- SAFT. (2003). <http://www.saftonline.org>
- Schultz Jørgensen, P. (2001). *Kompetencebegrebet er godt* [The concept of competence is good]. Folkeskolen 8.
- Silverstone, R. (1994). *Television and everyday life*. London: Routledge.
- Sommer, D. (1996). *Barndomssykologi – Udvikling i en forandret verden* [The psychology of childhood – development in a changed world]. København: Hans Reitzels Forlag.
- Stone, L. R. (1991). Will the real body please stand up? Boundary stories about virtual cultures. In M. Benedikt, (Ed.), *Cyberspace: First steps*. Cambridge, MA: MIT Press.
- Sørensen, B. H. (2001a). Børns hverdagsliv med de nye medier [Children’s Everyday Life with the New Media]. In B. H. Sørensen, B. R. Olesen, & L. Audon, (Eds.), *Det hele kører parallelt. De nye medier i børns hverdagsliv* [Everything is going parallel. The new media in children’s everyday life]. København: Gads Forlag.
- Sørensen, B.H. (2003). If spare time didn’t exist – a future perspective on children’s off-school virtual learning processes. Institute for Media Research and Media Education. Germany. *Merz Wissenschaft: Virtuelle Lebenswelten*, Nr. 5/2003.
- Sørensen, B. H. (2004). *Nye læringsformer og rum – digitale medier i videnssamfundets skole* [New learning forms and space – digital media in the school of the knowledge society]. Research Report. Copenhagen: The Danish University of Education.
- Sørensen, B.H., Olesen, B. R., & Audon, L. (Eds.). (2001). *Det hele kører parallelt. De nye medier i børns hverdagsliv* [Everything runs parallel. The new media in children’s everyday lives]. København: Gads Forlag.

- Sørensen, B. H., & Olesen, B. R. (Eds.). (2000). *Børn i en digital kultur. Forskningsperspektiver* [Children in a digital culture. Perspective of research]. København: Gads Forlag.
- Sørensen, B. H., Olesen, B. R., & Audon, L. (2000). Legekultur på chatkanalerne [Play culture in the chat channels] (Eds.), *Børn i en digital kultur. Forskningsperspektiver*. [Children in a Digital Culture. Perspective of Research] København: Gads Forlag.
- Sørensen, B. H., Jessen, C., & Olesen, B. R. (Eds.). (2002). *Børn på nettet. Kommunikation og læring* [Children on the internet. Communication and learning]. København: Gads Forlag.
- Sørensen, B. H. (2003). Nye læringsformer med digitale medier [New learning forms with digital media]. *Tilt, Mediepedagogisk Tidsskrift*, Norge, 1, marts.
- Tapscott, D. (1998). *Growing up digital. The rise of a net generation*. New York: McGraw-Hill.
- Trilling, B., & Hood, P. (2001). Learning, Technology, and Education Reform in the Knowledge Age or “We’re Wired, Webbed, and Windowed, Now What?”. In C. Paechter, R. Edwards, R. Harrison, & P. Twining, (Eds.), *Learning, space and identity*. London: Poul Clapman Publishing Ltd.
- van Krieken, R. (2002). *Norbert Elias*. København: Hans Reitzels Forlag.
- Wenger, E. (1998). *Communities of practice. Learning, meaning, and identity*. Cambridge: Cambridge University Press.
- Wenger, E. (2001). *Supporting communities of practice, A survey of community-oriented technologies. Version 1,3*. <http://www.ewenger.com/tech/index.htm>
- Wenger, E., McDermott, R., & Snyder, W. M. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Boston, MA: Harvard Business School Publishing.
- Williams, P. (1999). The net generation: the experiences, attitudes and behaviour of children using the internet for their own purposes. *Aslib Proceedings*. Vol 51(9).

Notes

¹ This project received financial support from the Humanistic Research Council, and was carried out 1997–2002 by delegates from the Danish University of Education, Roskilde University and the University of Southern Denmark. Cf. e.g. Sørensen, Jessen & Olesen, 2002; Sørensen & Olesen, 2000.

² “Narration” should here be understood as concrete occurrences put into narrative form.

³ Both at workplaces and in children’s out of school activities learning is a means, whilst at school and in other institutions of education it is an aim.

⁴ Such networks are formally constituted, with regular meetings etc.

⁵ The term implies mutual dependency.

⁶ The term learning network is used here instead of learning configuration, since network is a term in common use.

⁷ Per Schultz Jørgensen defines competence as the acquisition of knowledge and skills which enable one to act in a social situation (Schultz Jørgensen, 2001). As used in this article, the term is to be understood in much the same way, with the qualification that it can also apply to action in a non-social situation. Schultz Jørgensen also stresses that the actions performed by the surrounding group should also be seen as competent. Eva Gulløv also takes up this point in her definition of children's competences: "*They are also determined in relation to local acknowledgement of competence. It isn't enough, for instance, for a child to know about Ramadan if no-one else acknowledges this as important knowledge. To be competent is to have skills corresponding to the local criteria of competence*" (Gulløv 1999, p. 173). Competences are thus context dependent, and this often makes it difficult to generalise on the subject.

⁸ This term is taken from the project *Power Users*, U.S. Department of Education <http://www.ed.gov/programs/fipseec/applicant.html>

⁹ At some schools computer rooms can be booked for a year ahead, which means that some teachers book several regular slots each week.

¹⁰ This example is taken from a teacher presentation given in connection with the CVU teachers courses in January 2002.

¹¹ The Norwegian Pilot project is a large national initiative which is comparable to the Danish ITMF project.

Three Waves of Teacher Education and Development:

Paradigm Shift in Applying ICT

Yin Cheong Cheng

Introduction

The impacts of globalization, international competitions, and local social-political demands have induced rapid changes in many countries in different parts of the world since the turn of new millennium. In such an era of fast transformation, education reform inevitably becomes necessary and teachers and their schools have to face numerous new problems, uncertainties, and challenges rising from their internal and external environments. In addition to teaching, teachers are often required to take up expanded roles and responsibilities related to school management, curriculum planning and development, new teacher mentoring, staff development, school-based action projects, and working with parents and outside leaders and professionals (Boles & Troven, 1996; Cheng, Chow, & Tsui, 2001; Fessler & Ungaretti, 1994; Murphy, 1995).

In such a rapidly changing context, how teachers can be empowered and prepared to take up new roles and perform teaching effectively to meet the challenges and new expectations from education reforms is a crucial concern in policy making, reform and practice of teacher education and professional development in the Asia-Pacific region and its counter parts (Cheng, Chow, & Mok, in press). Particularly in a context of growing emphasis of applying and integrating information and communication technology (ICT) in education, a key issue confronting educators and leaders is how ICT should be applied in teacher education and development to enhance professional learning and support teachers effectively to perform new roles and face up to new challenges in education for the future.

According to Cheng (2001a, 2002a, 2003a, b, c, d), the worldwide education reforms are experiencing three waves since the 1970s. These wa-

ves of reforms are mainly based on different paradigms and theories of education effectiveness, and they result in employing different strategies and approaches to changing schools and education. In general, the first wave emphasizes on *internal effectiveness* with the focus on internal process improvement through external intervention or input approach. The second wave pursues the *interface effectiveness* in terms of school-based management, quality assurance, accountability and stakeholders' satisfaction. In facing the challenges of globalization, information technology, and knowledge-driven economy in the new century, the third wave is moving towards pursuit of *future effectiveness*.

Teachers are the key actors to implement educational practice and educational reform. In each wave, how teachers are effectively prepared responsive to the waves of education reforms inevitably becomes an important concern in the program implementation, policy formulation, public debate and research in teacher education and development. In particular, how the conception and practice of teacher education at different levels (including individual, site and system levels) should be changed with the support of ICT to meet the challenges of reforms is a crucial issue in ongoing policy debate, effort and research for ensuring teacher effectiveness.

This keynote speech aims to report how the worldwide efforts of teacher education and development, echoing the movements of various education reforms, are also experiencing three waves with different paradigms for conceptualizing teacher role, teaching effectiveness and practice of teacher education and development at different levels of education system. With the characteristics of these three waves, the speech highlights the implications for paradigm shift in applying ICT in teacher education and development.

It is hoped that the presented waves of teacher education and related paradigm shifts in using ICT would provide a comprehensive typology for understanding the complex and dynamic relationships among the major trends of education reform, teacher education and application of ICT and formulating effective strategies for professional development and practice with ICT for the 3rd wave education in the new century.

First Wave: Teacher Internal Effectiveness

Assuming goals and objectives of education are clear and consensus to all, the first wave of school reforms and initiatives since the 1970s focuses

mainly on *internal effectiveness*, with efforts made to improve internal performance particularly the methods and processes of teaching and learning in educational institutions. Many changes are government-directed and top-down, with the aim to improve school arrangements and education practices, thus enhancing their effectiveness in achieving the goals and objectives planned at either the site level or the system level. Improvement of teacher and student performance up to identified standards obviously had been a popular and important target for educational reform.

Following the emphasis on internal school effectiveness, the discussion of teacher education in the first wave focuses heavily on preparing teachers to ensure their effectiveness for internal school processes particularly teaching and learning. In this line of thinking, ensuring teacher effectiveness mainly refers to the teacher's achievement of planned education goals particularly in terms of students' education outcomes. The higher achievement in planned education goals implies the higher teacher effectiveness. Therefore, efforts of teacher education often focuses on developing or improving teachers' competence and performance to achieve the planned school goals often in terms of students' learning performances and other school outcomes (Cheng, 1997a). To a great extent, *teacher education of the first wave aims to ensure teacher internal effectiveness*.

First Wave Models of Teacher Internal Effectiveness

Cheng and Tsui (1999) proposed seven models for understanding and ensuring teacher effectiveness. Each model represents an important perspective that describes and emphasizes certain aspects or factors that are closely related to teachers' performance and contribution in a school organizational context. As shown in Table 1, the goal and task model, the working process model, and the absence of problems model are the first-wave models with focus mainly on teachers' internal and personal improvement for *teacher internal effectiveness*.

The goal and task model

The goal and task model is very often used in assessment of teacher effectiveness in school. It is generally believed that teachers have their planned goals and assigned tasks and they should make their best efforts to accomplish them. It assumes that a teacher is effective if he/she can accomplish the planned goals and assigned tasks in compliance with school goals. The extent to which the goals and tasks have been accomplished is often perceived

ved as the measure of teacher effectiveness. The typical examples of teacher effectiveness indicators include achievement of teaching objectives, fulfilment of job specifications and performance standards, student learning outcomes (such as academic achievements in public examinations), etc.

Therefore, teacher education and staff development should help teachers:

- to understand education aims, school goals, standards and benchmarks of professional practices;
- to have the competence to set clear, meaningful, long-term and short-term goals and standards for their teaching and professional practices;
- to communicate these goals and standards to students, colleagues, and parents and form collective forces to achieve them;
- to have the knowledge, skills, and commitment to achieve these goals and standards; and
- to have competence to monitor and assess whether they have achieved stated goals or conformed to given professional standards.

The working process model

In a system perspective, teachers' efforts are transformed to educational outcomes through their working processes. The working process model assumes that smooth teaching and working processes enable teachers to perform their teaching and assigned tasks effectively resulting in valuable and fruitful student learning outcomes or school achievements. Therefore teachers are seen as effective if they can ensure the quality of teaching and working process in discharging their duties. The important areas for monitoring teacher effectiveness are in terms of the characteristics of working process, including teaching style, teachers' job attitudes and behaviors, relationships with students and colleagues, classroom management, contribution to decision making and school planning, etc. According to this model, teacher education and development aim at helping teachers:

- to understand the meaning and contribution of educational practice or working process to the achievements of school outcomes;
- to have the competence and commitment to ensure the quality of their working process;
- to have the relevant knowledge and skills to design and strengthen the teaching process which encourages students' active participation in learning, team work, and trusting relationship;

- to monitor and evaluate the strengths and weaknesses of their working and teaching activities; and
- to develop a positive classroom culture and a high quality environment for students' learning.

The absence of problems model

Since there is often lack of a clear conception and criteria for teacher effectiveness, it is often easier to identify the weaknesses, problems, and defects (indicators of ineffectiveness) than the strengths of a teacher (indicators of effectiveness). The absence of problems model assumes that teachers are basically effective if there is absence of problems, troubles, defects, weaknesses, and misbehaviors when they are discharging their duties. Particularly, when assessing new and inexperienced teachers, the main objective would be to identify the problems and weaknesses for improvement, rather than excellence in performance. Therefore, teacher education should help teachers:

- to be aware of the existing or potential problems and defects that affect their practices;
- to have the knowledge and skills to monitor, identify, evaluate, and prevent different types of problems existing in their working and teaching processes; and
- to have positive attitudes towards problem identification and solving in their work.

Table 1. 1st wave models of teacher internal effectiveness

Model of Teacher Effectiveness	Conception of Teacher Internal Effectiveness	Teacher Education and Development for enabling teachers to....	Implications for Applying ICT in Teacher Education and Development
Goal and Task Model	<ul style="list-style-type: none"> • Achievement of planned goals and assigned tasks in work or teaching 	<ul style="list-style-type: none"> • to understand education aims, school goals, & professional standards; • to have the competence to set goals and standards for their practices; • to have the knowledge, skills, and commitment to achieve these goals and standards; and • to have competence to monitor and assess the achievements of goals & standards. 	<p>The use of ICT in teacher education is limited, mainly on improving the efficiency of delivery of planned curriculum and professional competence, particularly for:</p> <ul style="list-style-type: none"> • achieving the given goals and standards, • improving the internal process and environment of teacher work, and • avoiding potential problems and defects in teaching and professional work <p>Whether ICT can be used to facilitate paradigm shift in professional learning and teacher education is not a major concern.</p>
Working Process Model	<ul style="list-style-type: none"> • Maintenance of smooth teaching and working processes 	<ul style="list-style-type: none"> • to understand the contribution of educational practice to school outcomes; • to have the competence and commitment to ensure the quality of their working process; • to have the knowledge and skills to design teaching process for students' active learning; • to monitor and evaluate their working activities; and • to develop a positive classroom culture and a high quality environment for students' learning. 	
Absence of Problems Model	<ul style="list-style-type: none"> • Absence of problems and defects in their teaching and work 	<ul style="list-style-type: none"> • to be aware of the existing or potential problems and defects that affect their practices; • to have the knowledge and skills to monitor, identify, evaluate, and prevent problems existing in their work and teaching; and • to have positive attitudes towards problem identification and solving in their work; 	

Applying ICT in the First Wave

The use of ICT in teacher education is often limited and superficial, mainly on improving the efficiency of delivery of planned curriculum and professional competence, particularly for achieving the given goals and standards, improving the internal process and environment of teacher work, and avoiding potential problems and defects in teaching and professional work. To a great extent, ICT is mainly used as an efficient tool of storage, transfer and delivery of professional knowledge and skills from teacher educators or central sources to individual teacher learners. Whether ICT can be used to facilitate paradigm shift in professional learning and teacher education is not a major concern in the first wave.

Second Wave: Teacher Interface Effectiveness

Responding to concerns with the accountability to the public and stakeholders' expectation in the 1990s, the second wave of education reform emphasizes *interface effectiveness* in terms of education quality, stakeholders' satisfaction, and market competitiveness, with most policy efforts aim to ensure quality and accountability to the internal and external stakeholders (Coulson, 1999; Evans, 1999; Goertz & Duffy, 2001; Heading-

ton, 2000; Heller, 2001; Mahony & Hextall, 2000). Quality assurance, school monitoring and review, parental choice, student coupon, parental and community involvement in governance, school charter, and performance-based funding are some typical examples of measures to pursue and enhance effectiveness at the interface between the educational institution and the community (Cheng & Townsend, 2000). How to improve the existing structures, organizations, and practices in education at different levels to meet stakeholders' needs and expectations, is a major concern in the second wave of reforms.

Second Wave Models for Teacher Interface Effectiveness

Similar with the second wave models of school effectiveness, the resource utilization model, the school stakeholder satisfaction model, the accountability model, and the continuous learning model in Table 2 are the second-wave models of teacher effectiveness with emphasis on managing and handling the interface between teachers themselves and their working environment. These models pursue *teacher interface effectiveness*.

The resource utilization model

Facing the pressure of diverse expectations of multiple school constituencies and the challenges from the changing educational environment, teachers are often required to accomplish different tasks with diverse goals and objectives within a tight time frame. Resources (e.g. available time, high quality teaching materials, equipment, facilities, expert and technical support, new teaching methods, etc.) often become a critical factor in accomplishing the assigned tasks and meeting diverse goals and expectations. Therefore, teachers are deemed effective if they can maximize the use of allocated resources in their work processes and procure the needed support to overcome difficulties and accomplish different tasks even with diverse and competing goals. Therefore, teacher education aims at helping teachers:

- to understand the nature and importance of resource-input to working and teaching processes and achieving planned tasks and education outcomes
- to have the professional competence to procure and manage scarce resources and maximize their use for teaching and school work; and
- to have social power and skills to win the support and resources from colleagues, parents or the community for their work.

The school constituencies satisfaction model

This model is now attracting more attention of school leaders and practitioners in using it to assess teacher effectiveness. The reasons are twofold. First, in the recent school reform movements, there is a strong emphasis on educational quality. The concept of quality is closely related to the satisfaction of clients' needs or expectations. Second, the objective measurement of task achievement, job performance, or working process is often technically difficult and conceptually controversial. Therefore, the satisfaction of school's strategic constituencies (e.g. principals, school supervisors, members of school management council, the officers or inspectors of Education Department, leaders of parents association, etc.) is often used as the critical element to assess teacher effectiveness. Teachers are effective if the major school constituencies are at least minimally satisfied with their performance. Therefore teacher education programs should help teachers:

- to understand how key school constituencies can influence the goals, inputs, processes, and outcomes of their work and teaching;
- to identify and understand what are the major expectations and needs of powerful school constituencies;
- to have professional commitment, knowledge and skills to perform tasks that can meet the needs and expectations of major constituencies effectively;
- to be aware of the changes in needs and expectations of different constituencies particularly students and parents and have the ability to adapt to these changes; and
- to have the necessary social skills to work with various school constituencies.

Table 2. 2nd wave models of teacher interface effectiveness

Model of Teacher Effectiveness	Conception of Teacher Interface Effectiveness	Teacher Education and Development for enabling teachers to....	ICT in Teacher Education and Development
Resource Utilization Model	<ul style="list-style-type: none"> Utilization of allocated resources and acquisition of inputs for working processes, completing tasks and achieving outcomes 	<ul style="list-style-type: none"> to understand the nature & importance of resource-input to working and teaching processes and achieving planned tasks and education outcomes to have the professional competence to procure and manage scarce resources and maximize their use for teaching and school work; and to have social power and skills to win the support and resources from colleagues, parents or the community for their work. 	<p>The use of ICT in teacher education is limited, mainly on delivery of the necessary knowledge and skills for teacher interface effectiveness, particularly competence and skills on:</p> <ul style="list-style-type: none"> effective acquisition and use of resources for work, satisfying the key stakeholders' expectations and needs, showing accountable to the public and stakeholders, and adapting to challenges from the changing environment <p>Whether ICT can be used to facilitate paradigm shift in professional learning and teacher education is not a major concern.</p>
School Constituencies Satisfaction Model	<ul style="list-style-type: none"> Satisfaction of important school constituencies' expectations and demands 	<ul style="list-style-type: none"> to understand how key school constituencies can influence the goals, inputs, processes, and outcomes of their work and teaching; to identify and understand what are the major expectations and needs of powerful school constituencies; to have professional commitment, knowledge and skills to perform tasks that can meet the needs and expectations of major constituencies effectively; to be aware of the changes in needs and expectations of different constituencies particularly students and parents and have the ability to adapt to these changes; and to have sufficient social skills to work with different school constituencies. 	
Accountability Model	<ul style="list-style-type: none"> Demonstrating evidence of their accountability 	<ul style="list-style-type: none"> to understand the significance of their work related to community services, public relations, school image and accountability to perceptions of the public; to have the professional ethics, knowledge and skills to ensure accountability in practice and build up professional image and reputation during working process; to have competence to develop internal and external social networks to support their professional practice and status; and to maintain a good relationship with various stakeholders in the community. 	
Continuous Learning Model	<ul style="list-style-type: none"> Adaptation to the challenges from changing environment including external and internal teaching contexts. 	<ul style="list-style-type: none"> to be aware of the impacts of environmental changes, societal developments, policy trends, and community needs on their work and teaching; to have techniques to collect relevant information and perform the SWOT (strengths, weaknesses, opportunities, and threats) analysis of their professional situation and work; to have the professional competence to adapt their working process and performance to the changing needs and expectations of students, parents and the community according to the results of environmental analysis; to identify the gaps between theory and practice and change their operations or governing values; and to have regular monitoring and evaluation to provide feedback information for their continuous improvement and professional learning. 	

The accountability model

In pursuit of an open and democratic society, the public has now a greater concern with schools' performance and accountability because of the large investment into schools. Schools and teachers are required to provide educational services "worth for money" and they should be more accountable to students, parents, and other major school constituencies. The accountability model focuses on teachers' accountability and reputation in assessing teacher effectiveness. This means that teachers are required to demonstrate their competence and responsibility in discharging teaching and school activities and making related professional decisions. The current

emphasis on account-ability and quality assurance in educational reforms in both Western and Eastern societies seems to support the importance of the accountability model to understanding, assessing and monitoring teacher effectiveness. To be responsible and accountable, teachers should provide more information about their work standards, performance and consequences to school constituencies. With this model, teacher education should help teachers:

- to understand the significance of their work related to community services, public relations, school image and accountability to perceptions of the public;
- to have the professional ethics, knowledge and skills to ensure accountability and build up professional image and reputation during working process;
- to have competence to develop internal and external social networks to support their professional practice and status; and
- to maintain a good relationship with various stakeholders in the community.

The continuous learning model

Currently, the changing educational environment is producing great impacts on nearly every teacher. From the perspectives of the satisfaction model and the accountability model, teachers should meet the changing requirements and needs of multiple school constituencies and should be accountable to them. From the perspectives of the working process model and the goal and task model, teachers are required to improve the teaching and working process continuously in achieving the assigned tasks effectively in a rapidly changing teaching environment. It seems that teachers should adapt to the external and internal changes, cope with the different challenges, meet the diverse expectations, and develop themselves through continuous learning if they want to be effective.

The continuous learning model assumes that impacts of environmental changes are inevitable and therefore, a teacher is effective if he/she can learn how to make improvement and adaptation to his/her environment (Fullan, 1993; Senge, 1990). The model considers teacher effectiveness as a dynamic concept involving continuous improvement and development. Therefore, programmes of teacher education and development should help teachers:

- to be aware of the impacts of environmental changes, societal developments, policy trends, and community needs on their work and teaching;
- to have techniques to collect relevant information and perform the SWOT (strengths, weaknesses, opportunities, and threats) analysis of their professional situation and work;
- to have the professional competence to adapt their working process and performance to the changing needs and expectations of students, parents and the community according to the results of environmental analysis;
- to identify the gaps between theory and practice and change their operations or governing values; and
- to have regular monitoring and evaluation to provide feedback information for their continuous improvement and professional learning.

Applying ICT in the Second Wave

From the above 2nd wave models of teacher education, it seems that the use of ICT in teacher education is also limited as in the first wave, mainly on enhancing the delivery of the necessary knowledge and professional skills for teacher interface effectiveness, particularly technical competence on effective acquisition and use of resources for work, satisfying the key stakeholders' expectations and needs, showing accountable to the public and stakeholders, and adapting to challenges from the changing environment. Whether ICT can be used to facilitate paradigm shift in professional learning or build up a locally and globally networked environment for teacher education may not a major concern.

Third Wave: Teacher Future Effectiveness

At the turn of the new century, people began to doubt whether the second wave of education reforms can meet the challenges in a new era of globalization, information technology, and new economy. Even if the existing stakeholders may be satisfied with the quality of education services and the schools are accountable to the community, education may be still ineffective or “useless” for our new generations in the new millennium as the aims and outcomes of education are once found nothing to do with the future needs in such a rapidly changing environment.

Particularly when knowledge-driven economy and information technology are strongly emphasized in the new millennium, many people urge paradigm shift in learning and teaching and demand reforming the aims, content, practice, and management of education at different levels to ensure their relevance to the future (Burbules & Torres, 2000; Cheng, 2000a, b; Daun, 2001; Stromquist & Monkman, 2000). The emerging third wave of education reforms emphasizes strongly *future effectiveness* in terms of relevance to the new education functions in the new century as well as relevance to the new paradigm of education concerning contextualized multiple intelligences, globalization, localization and individualization (Cheng, 2002a). The pursuit of new vision and aims at different levels of education, lifelong learning, global networking, international outlook, and use of information and technological are just some emerging evidences of the third wave (Cheng, 2001c).

Paradigm Shift in Learning

The discussion of teacher effectiveness and teacher education for the third wave can be based on the following questions:

1. What paradigm shift in learning is being pursued in the new century particularly in the context of globalization?
2. What implications can be drawn for the roles of teacher and teaching in implementing the third wave reforms and the new paradigm of learning?

According to Cheng (2002a, b), the paradigm of education should be shifted from the *Traditional Site-Bounded Paradigm* to a *New Triplization Paradigm*. The new paradigm emphasizes the development of students' contextualized multiple intelligences (CMI) (including technological, economic, social, political, cultural, and learning intelligences) and the processes of triplization (including globalization, localization and individualization) in education. As shown in Table 3, the characteristics of learning of new paradigm are completely different from the traditional paradigm and summarized as follows (Cheng, 2001a):

Traditional paradigm of site-bounded learning

In the traditional thinking, students' learning is part of the reproduction and perpetuation process of the existing knowledge and manpower struc-

ture to sustain developments of the society, particularly in the social and economic aspects. Education is perceived as a process for students and their learning being “reproduced” to meet the needs of manpower structure in the society. The profiles of student and learning are clearly different from those in the new paradigm.

In education, students are the followers of their teachers. They go through standard programs of education, in which students are taught in the same way and same pace even though their ability may be different. Individualized programs seem to be unfeasible. The learning process is characterized by absorbing certain types of knowledge: students are “students” of their teachers, and they absorb knowledge from their teachers. Learning is a disciplinary, receiving, and socializing process such that close supervision and control on the learning process is necessary. The focus of learning is on how to gain some professional or academic knowledge and skills. Learning is often perceived as hard working to achieve external rewards and avoid punishment.

In the traditional paradigm, all learning activities are school-bounded and teacher-based. Students learn from a limited numbers of school teachers and their prepared materials. Therefore, teachers are the major sources of knowledge and learning. Students learn the standard curriculum from their textbooks and related materials assigned by their teachers. Students are often arranged to learn in a separated way and are kept responsible for their own learning outcomes. They have few opportunities to mutually support and learn. Their learning experiences are mainly institutional experiences alienated from the fast changing local and global communities. Learning happens only in schools within a given time frame. Graduation tends to be the end of students’ learning.

New paradigm of triplized learning

In the new paradigm, learning should be borderless and characterized by individualization, localization, and globalization.

Student is the centre of education. Students’ learning should be facilitated to meet their needs and personal characteristics, and develop their potentials particularly CMI in an optimal way. Individualized and tailor-made programs (including targets, content, methods, and schedules) for different students are necessary and feasible. Students can be self-motivated and self-learning with appropriate guidance and facilitation, and learning is a self-actualizing, discovering, experiencing, and reflecting process. Since the information and knowledge are accumulated in an unbelievable speed but outdated very quickly, it is nearly impossible to make any sense

if education is mainly to deliver skills and knowledge, particularly when students can find out the knowledge and information easily with the help of information technology and internet. Therefore, the focus of learning is on learning how to learn, research, think, and create. In order to sustain learning is lifelong, learning should be facilitated as enjoyable and self-rewarding (Mok & Cheng, 2001).

Students' learning should be facilitated in such a way such that local and global resources, support, and networks can be brought in to maximize the opportunities for their developments during learning process. Through localization and globalization, there are multiple sources of learning. Students can learn from multiple sources inside and outside their higher institutions, locally and globally, not limited to a small number of teachers in their institutions. Participation in local and international learning programs can help them achieve the related community and global outlook and experiences beyond education institutions. Now, more and more examples of such kind of programs can be found in Japan, Hong Kong, France, and USA. Also their learning is a type of networked learning. They will be grouped and networked locally and internationally. Learning groups and networks will become a major driving force to sustain the learning climate and multiply the learning effects through mutual sharing and inspiring. We can expect that each student can have a group of life long partner students in different corners of the world to share their learning experiences.

It is expected that learning happens everywhere and is lifelong. Education is just the preparation for a high-level lifelong learning and discovery (Mok & Cheng, 2001). Learning opportunities are unlimited. Students can maximize the opportunities for their learning from local and global exposures through internet, web-based learning, video-conferencing, cross-cultural sharing, and different types of interactive and multimedia materials (Education and Manpower Bureau, 1998; Ryan, Scott, Freeman, & Patel, 2000). Students can learn from world-class teachers, experts, peers, and learning materials from different parts of the world. In other words, their learning can be a world-class learning.

Table 3. Paradigm shift in learning

New Paradigm of Triplized Learning	Traditional Paradigm of Site-Bounded Learning
Individualized Learning: <ul style="list-style-type: none"> • Student is the centre of education • Individualized Programs • Self-Learning • Self-Actualizing Process • Focus on How to Learn • Self Rewarding 	Reproduced Learning: <ul style="list-style-type: none"> • Student is the follower of teacher • Standard Programs • Absorbing Knowledge • Receiving Process • Focus on How to Gain • External Rewarding
Localized and Globalized Learning: <ul style="list-style-type: none"> • Multiple Sources of Learning • Networked Learning • Lifelong and Everywhere • Unlimited Opportunities • World-Class Learning • Local and International Outlook 	Institution-Bounded Learning: <ul style="list-style-type: none"> • Teacher-Based Learning • Separated Learning • Fixed Period and Within Institution • Limited Opportunities • Site-Bounded Learning • Mainly Institution-based Experiences

Paradigm Shift in Teacher Education and Development

The paradigm shift in learning implies that the quality and role of a teacher in the new century is completely different from the traditional one, as summarized in Table 4 (Cheng, 2001b).

Table 4. Paradigm shift in teaching

New Paradigm of Triplized Teaching	Traditional Paradigm of Site-Bounded Teaching
Individualized Teaching <ul style="list-style-type: none"> • As Facilitator: Teacher is the facilitator or mentor to support students' learning • Contextualized Multiple Intelligence Teacher • Individualized Teaching Style • Arousing Curiosity • Teaching as Facilitating Process • Sharing Joy • Teaching as Lifelong Learning 	Reproduced Teaching <ul style="list-style-type: none"> • As Centre: Teacher is the centre of education • Partially Competent Teacher • Standard Teaching Style • Transferring Knowledge • Teaching as Delivery Process • Achieving Standard • Teaching as a Practice of Previous Knowledge
Localized and Globalized Teaching: <ul style="list-style-type: none"> • Multiple Sources of Teaching • Networked Teaching • World-Class Teaching • Unlimited Opportunities in Teaching • Teaching with Local and International Outlook • As World-Class and Networked Teacher 	School-bounded Teaching: <ul style="list-style-type: none"> • Limited and Bounded Teaching • Separated Teaching • Site-Bounded Teaching • Limited Opportunities in Teaching • Teaching Providing Mainly School Experiences • As School-bounded and Separated Teacher

Different from the first and second waves, teacher effectiveness of the third wave should be a type of “*Teacher Future Effectiveness*” that aims at facilitating and ensuring the aims and practices of learning effective and relevant to the future of new generations in an era of globalization, transformation and intelligence-based economy. With paradigmatic changes in the role of teacher and teaching, inevitably, there is also a similar paradigm shift in teacher education and professional development. The paradigm shift of teacher education and professional development can be summarized as follows (Cheng, 2001b) (Table 5):

Table 5. Two paradigms of teacher education

New Triplization Paradigm For Teacher Education (3rd wave)	Traditional Site-Bounded Paradigm For Teacher Education (1st wave & 2nd wave)
Aims of the New Teacher Education To develop teachers as triplized CMI and life long learning teachers who will creatively contribute <ul style="list-style-type: none"> to development of students' triplized life long self learning as a CMI citizen of a CMI society and a CMI global village with multiple developments; and to schools' triplized development as a CMI school and learning organization. 	Aims of the Traditional Teacher Education To equip teachers with the necessary competence to deliver knowledge and skills to students such that students can survive a local community or meet the manpower needs of a society in the economic and social developments
New Teacher Education Curriculum <ul style="list-style-type: none"> CMI & Triplization-Focused Curriculum Triplized Curriculum Structure The structure is often hybrid, integrative, and interactive with the support of IT, networking, local and global exposure, and field experience and virtual reality. World-Class and Globalized Curriculum Localized Curriculum Individualized Curriculum 	Traditional Teacher Education Curriculum <ul style="list-style-type: none"> Subject Focused Curriculum Standard Subject Curriculum Structure The structure is often linear, step by step, and subject dependent. Subject-Bounded Curriculum
New Teacher Education Pedagogy <ul style="list-style-type: none"> Facilitating Teachers' Life Long Self Learning Multiple Sources of Teacher Learning Globally and Locally Networked Teacher Learning ICT Pedagogical Environment including: <ol style="list-style-type: none"> World-wide networking through internet Web-site learning Interactive self learning Multi-media facilities and learning materials Video-conferencing for local and international sharing and exposure Boundless and Unlimited Opportunities for Learning Inside and Outside Teacher Education Institution Pedagogy is Based on Pentagon Theory of CMIs Development: 	Traditional Teacher Education Pedagogy <ul style="list-style-type: none"> Delivering Knowledge and Skills to Teachers Site-bounded of Teacher Learning Separated Teacher Learning Absence of IT, Classroom-Bounded Pedagogical Environment Limited Opportunities for Learning, Fixed Period, Within Teacher Education Institution Pedagogy lacks a clear linkage with CMIs development and it is often driven by the delivery of subject knowledge and external standards in examinations

Aims of the New Teacher Education

Traditionally, teacher education often aims to equip teachers with the necessary competence to deliver knowledge and skills to students such that students can survive a local community or meet the manpower needs of a society in the economic and social developments. But with the triplization

paradigm, the aims of new teacher education should be to develop teachers as a triplized life long learning teacher. They will creatively contribute to students' triplized life long self learning and development as a contextualized multiple intelligence (CMI) citizen of a CMI society and a CMI global village with multiple developments in technological, economic, social, political, cultural, and learning aspects and to schools' triplized development as a CMI school and learning organization.

New Teacher Education Curriculum

CMI/triplization-focused curriculum

In the traditional paradigm, the focus of the design of curriculum is on the content and delivery of subject knowledge. The structure of a curriculum is mainly based on the structure of subject knowledge and the needs for same standard contents and same arrangements for the same subject teacher group. Therefore, the curriculum is often linear, step-by-step, and subject dependent. Whether the teacher education curriculum is globalized (or world-class), localized and individualized is not the concern. On the contrast, the new paradigm focuses the design of curriculum on developing teachers' contextualized multiple intelligences and ability to make triplization for their own teaching and learning, students' learning and development, and school's development. Therefore, the design is based on characteristics of development of contextualized multiple intelligences and maximizing development opportunities for teachers' individualized, localized, and globalized learning and teaching. The curriculum structure is often hybrid, integrative, and interactive with the support of IT, networking, local and global exposure, and field experience and virtual reality.

World-class and globalized curriculum

The curriculum content of teacher education should be the world-class and globalized, pooling up the world-class materials and designs for learning and teaching and maximizing global relevance and exposure in different development areas. The content is also related to technological, economic, social, political, cultural, and learning globalization. Whether it is subject-based is not the major concern.

Localized curriculum

The curriculum of teacher education also includes local resources, materials and concerns to ensure the local relevance and community involvement to maximize opportunities for teachers' localized learning and teaching. School-based/community-based teacher education is one typical practice to increase the local relevance and support in the field. Technological, economic, social, political, cultural, and learning localization is also important area of new teacher education curriculum.

Individualized curriculum

The curriculum of teacher education and professional development is flexible and adaptable and can be individualized – in terms of learning targets, content, methods, and schedules – to meet the developmental needs of individual teachers, facilitate their self learning and actualization, and optimize their potentials as a triplized CMI teacher.

New Teacher Education Pedagogy

The traditional teacher education emphasizes delivering subject knowledge and professional skills to teachers. Inevitably, the pedagogy is mainly to ensure teachers' learning as a disciplinary, receiving, and socializing process and assumes that close supervision is necessary during the training process. The opportunities for traditional teacher learning are often very limited in a fixed period within an institutional bounded or site-bounded but IT-absent environment. Also, the pedagogy has no clear linkage with development of teachers' CMI, and it is often driven by the delivery of subject knowledge and external standards in examinations. Contrastingly different from the traditional paradigm, the new pedagogy has the following characteristics (see Table 5):

Facilitating teachers' life long self learning

Same as students' self learning, the new pedagogy is to ensure teachers' learning as a self-actualizing, discovering, experiencing, enjoyable, and reflecting process. Teacher educators' inspiring and teachers' own motivation and self rewarding are crucial to this self learning process.

Multiple sources of teacher learning

In addition to the teacher education institution itself, there are multiple sources of teacher learning – for example, self learning programs and

packages, interactive multimedia materials, web site learning, outside experts, community experiential programs, etc. – inside and outside the institution, locally and globally. Through different types of partnership and collaboration, schools, local, and overseas organizations, institutions and communities, including social services, business, and industry, are actively involved in in-service and pre-service teacher education and professional development programs.

Globally and locally networked teacher learning

Teacher learning is locally and globally networked through, for example, the internet, e-communications, visiting programs, local and global exchange programs, and sharing by video-conferencing. The networked learning can provide a wide spectrum of learning experiences and maximize opportunities for teachers to benefit from various settings and cultures. With the help of globalized learning, teachers can learn the world-class experiences from different parts of the world and various cultural settings. Therefore, the opportunities for teachers can be maximized to enhance the quality of their learning and teaching from local and global networking and exposure. In the new triplization paradigm, teacher education institutions are conceptualized as world-class and networked learning organizations.

Worldwide IT pedagogical environment

In order to make triplizing teacher education possible, it is necessary to build up a worldwide IT pedagogical environment for teacher learning. It should include some typical and important components such as worldwide networking through the internet, web-site learning, interactive self learning, multi-media facilities and learning materials, and video-conferencing for local and international sharing and exposure. Through the help of this environment, boundless and unlimited opportunities can be provided to teachers' learning and professional development inside and outside teacher education institutions and schools.

Based on CMI development

The pedagogy should encourage teachers' CMI development and facilitate intelligence transfer among learning, economic, political, social, cultural, and technological intelligences. Also, developing teachers' learning intelligence should be at the core part of teacher education. Teachers should be facilitated to learn how to learn, think, and create particularly in the local and global contexts. Teacher educators themselves should set a CMI model for facilitating and stimulating teachers' self learning. Teacher education

institutions and schools should become a CMI pedagogical environment, in which teachers are immersed and inspired to be self-actualizing and developing in CMI. Team/group learning, open-end learning projects, problem-based learning, and integrative and thematic learning are typical examples of pedagogic approaches in the new teacher education.

Paradigm Shift in Applying ICT in Teacher Education

Given the paradigm shift in teacher education and development and the change towards teacher future effectiveness, there is also corresponding paradigm shift in applying ICT in teacher education and development in the third wave. (Table 6)

Since the traditional paradigm in the 1st wave and 2nd wave of teacher education emphasizes the delivery of professional knowledge and skills and the satisfaction of stakeholders in educational practice, the application of ICT in teacher education is often focused on the following questions:

1. How well the use of ICT in teacher education and professional learning is organized to deliver the necessary professional knowledge and skills to teachers?
2. How well the delivery of professional knowledge and skills to teachers can be ensured through the improvement of teaching, learning and field experience of teacher education programs with the new ICT?
3. How well teacher educators' teaching can be improved through the use of ICT in a given time period?
4. How well teacher learners can arrive at given professional standards with the support of ICT in the professional qualification examination or certification?
5. How well can ICT be used to ensure the performance of teachers or student teachers satisfying the key stakeholders' expectations and needs?
6. How accountable can be the teacher education services with the use of ICT to the public and stakeholders?

Clearly, the first four questions are concerned with ensuring *teacher internal effectiveness* that focuses on the internal improvement in teaching and delivery of knowledge and skills. The last two questions come from the concern of *teacher interface effectiveness* that focuses on the stakeholders' satisfaction with teacher performance and the accountability of teacher

education services. In other words, the traditional paradigm of applying ICT in teacher education reflects the line of thinking of the first and second waves.

But the paradigm shift towards triplization in teacher education induces a new thinking of applying ICT because the aims, content, and process of teacher education are completely the traditional thinking. The application of ICT can be based on the following major questions:

1. *How well can ICT globalize, localize and individualize teachers' professional learning and development?* This question is proposed to ensure how the use of ICT effectively places teachers' professional learning in a globalized, localized, and individualized context. Teacher education only for teacher internal effectiveness at the site level is not sufficient to ensure education relevance to the globalization, localization, and individualization for the future development of students. Also teacher education satisfying stakeholders and accountability at the interface of school may contribute to localization of education but cannot promise globalization and individualization for learning and teaching.
2. *How well can the use of ICT maximize teachers' professional learning opportunities through establishing the borderless ICT environment, local and international networking, and various types of innovative learning programmes?* This question is proposed to ensure how effective is ICT in maximizing opportunities for teachers' learning and development in a triplized learning environment. The concern is not only on how much internal process can be improved and how much strategic stakeholders are satisfied, but on how large and how many opportunities can be created for teachers' professional learning and CMI.
3. *How well can the use of ICT facilitate and ensure teachers' professional learning to be sustained as potentially life long?* This question focuses on ensuring how the use of ICT can effectively facilitate and ensure professional learning sustainable to life long that is a core part of the new paradigm of teacher education. It is assumed that short-term internal improvement and short-term stakeholders' satisfaction with teacher standards or performance may not be so important and relevant to the future effectiveness of teachers if teachers themselves cannot sustain their professional learning as a life long process with the support of ICT.

4. *How well can the use of ICT ensure and facilitate the development of teachers' ability to triplize their professional learning and development?*

This question is proposed to ensure the influence of applying ICT teacher education relevant to the development of teachers' ability of triplizing their own professional learning. It is very important and necessary for teachers to achieve their own ability for maximizing learning opportunities and sustaining their professional learning through globalization, localization, and individualization.

5. *How well can the application of ICT facilitate the development of a CMI pedagogical environment, in which teachers are immersed and inspired to be self actualizing and developing CMI themselves.* The question focuses on how the use of ICT can ensure the outcomes of professional learning relevant to the development of CMI including technological, economic, social, political, cultural, and learning intelligences that are crucial for teachers and their students to meet the challenges in the future. This is one of the main concerns of the new paradigm education.

From the above discussion, the implications for paradigm shift in applying ICT in teacher education and development are substantial. *The effectiveness of applying ICT depends heavily on whether ICT can facilitate teachers develop successfully to carry out the 3rd wave of educational reforms and paradigm shift of education towards development of students' contextualized multiple intelligences and triplization in education.*

Table 6. paradigm shift in applying ICT in teacher education

New Paradigm of Applying ICT in Teacher Education (3rd Wave)	Traditional Paradigm of Applying ICT In Teacher Education (1st & 2nd Waves)
<p>The effectiveness of applying ICT in teacher education depends on:</p> <ol style="list-style-type: none"> 1. How well can ICT globalize, localize and individualize teachers' professional learning and development? 2. How well can the use of ICT maximize teachers' professional learning opportunities through establishing the borderless ICT environment, local and international networking, and various types of innovative learning programmes? 3. How well can the use of ICT facilitate and ensure teachers' professional learning to be sustained as potentially life long? 4. How well can the use of ICT ensure and facilitate the development of teachers' ability to triplize their professional learning and development? 5. How well can the application of ICT facilitate the development of a CMI pedagogical environment, in which teachers are immersed and inspired to be self-actualizing and developing CMI themselves? 	<p>The effectiveness of applying ICT in teacher education depends on:</p> <ol style="list-style-type: none"> 1. How well the use of ICT in teacher education and professional learning is organized to deliver the necessary professional knowledge and skills to teachers? 2. How well the delivery of professional knowledge and skills to teachers can be ensured through the improvement of teaching, learning and field experience of teacher education programs with the new ICT? 3. How well teacher educators' teaching can be improved through the use of ICT in a given time period? 4. How well teacher learners can arrive at given professional standards with the support of ICT in the professional qualification examination or certification? 5. How well can ICT be used to ensure the performance of teachers or student teachers satisfying the key stakeholders' expectations and needs? 6. How accountable can be the teacher education services with the use of ICT to the public and stakeholders?

Networked Human and ICT Environment for Teacher Education

Given the paradigm shift in applying ICT from the first and second waves towards the third wave in teacher education and development, how should ICT be designed and applied to provide an effective learning environment for teachers' continuous professional learning? Mok and Cheng (2001) have proposed a theory of teacher self learning in a networked human and technology environment. We can use this theory to illustrate how ICT can be integrated with human network to form a networked human and ICT environment that can powerfully support triplization (globalization, localization and individualization) of teacher education and development at both individual and group levels in the institutional, local and global contexts.

Professional learning cycle

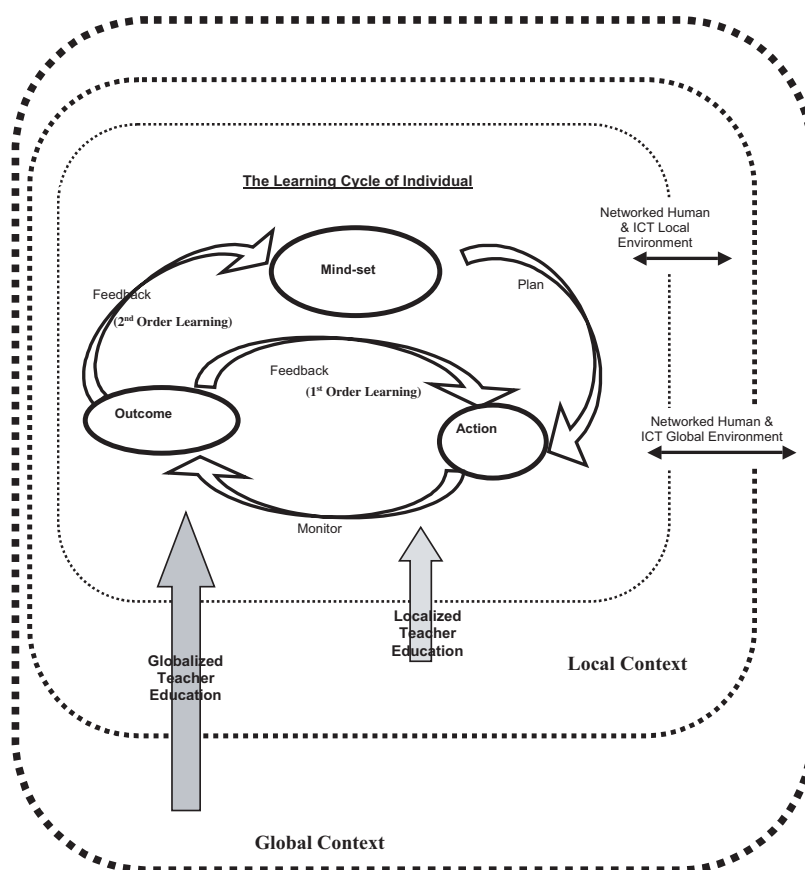
Based on the concepts of action learning (Argyris, Putnam, & Smith, 1985; Argyris & Schön, 1974; Yuen & Cheng, 1997, 2000), Mok and Cheng (2001) conceptualised the process of teacher professional learning as a cyclic process in a networked human and ICT environment as shown in Figure 1. It subdivides a learning episode into a sequence of three components such as mental condition (mind-set), action, and outcome, linked by four processes including planning, monitoring, feedback to mental condition and feedback to action. There are two types of feedback from the monitoring process and outcomes to the teacher learner: one to the mind-set and the other one directly to action. The feedback to mind-set will help the learner to reflect on and change his/her own mental models including metacognition, thinking methods, metacognition, and knowledge and then to change the planning process as well as the action of learning. The learning associated with change in mental-set or mental models is often referred to as "*the second order learning*".

The feedback directly to action of learning will help the teacher learner to adapt his/her professional learning behaviors. The learning associated with change in behaviors or actions is often referred to as "*the first order of learning*". Since this type of learning has not changed the mental conditions of the learner, it may not produce long lasting learning effects at a higher level.

As illustrated in Figure 1, teacher education & development can be globalized and localized with the support of networked human and IT

environment in both local and global contexts. In the first order learning, teachers can achieve the types of operational knowledge and skills that are directly relevant and contributive to their professional developments and practices. In the second order learning, teachers can achieve the types of high-level knowledge such as wisdom, metacognition, values and beliefs that are crucial and necessary to the long-term development of their own profession and the local and global education.

Figure 1. Triplization of teacher education and development in a networked human and ICT environment



Professional learning in networked human and ICT environment

The discussion of professional learning in a networked human and ICT environment may be related to the following clusters of literature: the literature on adult learning (e.g. Caffarella, 1993; Flannery, 1993; Merriam & Caffarella, 1999); the literature on learning psychology or motivation

psychology (e.g. Schunk, 1996); the literature on self-directed learning or self-regulated learning at a separated individual level from a psychology perspective (e.g. Boekaerts, Pintrick, & Zeidner, 2000; Brockett & Hiemstra, 1991; Caffarella, 1993; MacKeracher, 1996; Schunk & Zimmerman, 1998;); the literature on learning environment (e.g. Cheng, 1994; Tam & Cheng, 1995; Walberg, 1997); the literature on collaboration and networking in learning (Cowie & van der Aalsvoort, 2000; DuFour, 1999; Fullan, 1997; Lieberman, 1996; Saltiel, 1998; Saltiel, Sgroi, & Brockett, 1998); the literature on information and communication technology in education (e.g. Basto, 1999; Bennett, 1999; Burbules & Callister, 1999; Chung & Baker, 1997; Lu, Wan, & Liu, 1999) and the literature on life long learning and learning society (e.g. Knasel, Meed, & Rossetti, 2000).

Mok and Cheng (2001) gave a theory to explain how the human and ICT environment can be designed, developed, networked and used to facilitate such a continuous life long learning for teachers. Some key ideas are summarized as follows (for the detail, please refer to the original document):

IT environment

Due to the tremendous developments in technology, ICT makes it possible for multiple teachers to be networked and participate in the learning task, thus greatly enhancing the social interactions, sharing of learning experiences and resources in a very convenient way. ICT can also facilitate and accelerate the monitoring, assessment, and feedback processes during professional learning in a very fast and efficient way (Embretson & Hersherberger, 1999). There may be four important aspects in which ICT can contribute to the development of a powerful ICT environment that can facilitate the teachers' professional learning cycle at both individual and group levels locally or globally:

1. The computer technology revolutionized both the speed and access to information (Hallinger, 1998). Information is interpreted in its broadest sense, including resource materials for the teacher as well as feedback concerning how well the teacher has learned. With the help of internet, learners can access the best quality of web-based learning materials in different parts of the world. Also, because of the high speed of information technology, feedback can be immediately generated for each step of learning tasks and activities as well as for the overall proficiency of learning. The fast feedback to teacher's mental conditions and learning behaviors in fact accelerates the speed of learning, including cognitive changes and behavioral changes of the teacher;

2. Developments in ICT make it possible for the application of measurement theory to assessment tasks during the teacher professional learning process no matter in formal teacher education programs or not. Technology is now available for real-time scoring (Herl, Baker, & Niemi, 1996), computer adaptive testing (CAT), automated data logging (Chung & Baker, 1997), and computer item construction (Bennett, 1999). The advanced assessment methods can greatly improve the quality and accuracy of monitoring and feedback such that the quality and opportunity of learning can be ensured. Since assessment is an integral part of learning, teacher education programs can ideally expose teachers to new approaches to assessment, including new computer aided assessment methods;
3. Developments in ICT enable learning to move away from the paper-pencil format to rich imagery multimedia task presentation and submission (Bennett, 1999; Chung & Baker, 1997) that can capture richly contextualized performance in learning process (Bennett, 1999; Chung and Baker, 1997). The information would be powerful to understanding the complex nature of learning process and improving learning strategies, activities, and outcomes; and
4. ICT environment breaks down distance barriers of access to education and creates connectivity amongst teachers as learners (Mok & Cheng, 2000a). When teachers, mentors, peers, resource people, and other related experts can be networked through ICT, it will create more opportunities for social interactions, experience sharing, and information flow. With this, a networked human environment can be created to sustain and support self learning of individual teachers.

Networked human environment

It is easy to misinterpret a self-directed learner to be an isolated learner (Brockett, 1994). Learning has inevitably to be pursued by the individual: the learner has to make sense of the new learning and integrates the new learning with existing knowledge. As well, the learner has to engage in individual reflection. Notwithstanding, social interaction gives room for new insights and synergy. The importance of the social milieu to teacher self learning is acknowledged by such researchers as Garrison (1997), taking a “collaborative constructivist” perspective. The meaningfulness of teacher self learning should be constructed within a human environment that comprises the teacher as learner, peer teachers, the mentor or facilitator (if any), and such other people as the principal or even students. The human environment plays a significant role in all aspects: pedagogical, psychological, and behavioural, of self learning (Schunk, 1998).

The human environment can be designed in the learning endeavor as an important resource. The mentor, often perceived as an experienced peer or expert in the human environment of learning, can help the teacher learner to develop attitudes and skills for goal-setting, self-management, self-monitoring, and self-evaluation which are essential to the success of self learning. The teacher also learns from peers and other experts by observation and emulation (Schunk, 1987; as cited in Schunk, 1998).

Teacher self learning is a complex process and the endeavor can result in non-accomplishment, frustration or even failure. In such instances, the empathy and social support from the mentor and peers acts as an emotional safety net for the teacher. A strong social climate gives strength to the teacher in self learning to continue engagement in the task, analyse strategies and manage the failure and frustration in a positive way. A collaborative human environment is particularly important for adult self-directed learning.

Individually, locally, and globally networked human and ICT environment

With the advances in ICT and global networking, it is now much possible to establish an individually, locally and globally networked human and ICT environment for teacher learners to learn with/from mentors, peers, experts, scholars, other professionals, social leaders, various education and social agents, multiple sources of latest knowledge and resources in different parts of the local and international communities.

When teachers are networked through the networked human and ICT environment as shown in Figures 2 and 3, there may be multiplying effect on the amount of available professional knowledge and information as well as human touches and interactions that will become fruitful stimulus to teachers' professional learning. The networked teacher learners, mentors, peers, other professionals and various sources of knowledge and expertise may form a learning system to support teachers' continuous professional learning individually, locally and globally.

In a school, each teacher is self-motivated and generates a learning cycle of self-learning and self-evaluation. Teacher learners, mentors, peers, outside experts and sources of local and global resources are networked to form a learning group; learning groups are networked to form a learning community; learning groups and learning communities are networked to form a learning society; learning societies are networked across nations (Mok & Cheng, 2000b).

ICT speeds up the process of providing social and professional mes-

sages and informative feedback to the teacher learners and other members in the learning system. This speed, coupled with the massive amount of professional information and knowledge available via the informative network, not only means that this will be the information-rich era, but also, it implies that a closely networked social environment needs to be in place for promoting and supporting professional learning of teachers. Teacher learning is no longer the acquisition of knowledge and skills of teachers in an isolated context. Instead, effective teacher learning occurs in the individually, locally and globally networked human environment that can facilitate higher level of intelligence and motivation of teachers as well as other local and global members in the human network in the selection, management, transfer, creation and extension of knowledge.

Figure 2. Networked human and ICT environment (networked teacher learners and learning groups):

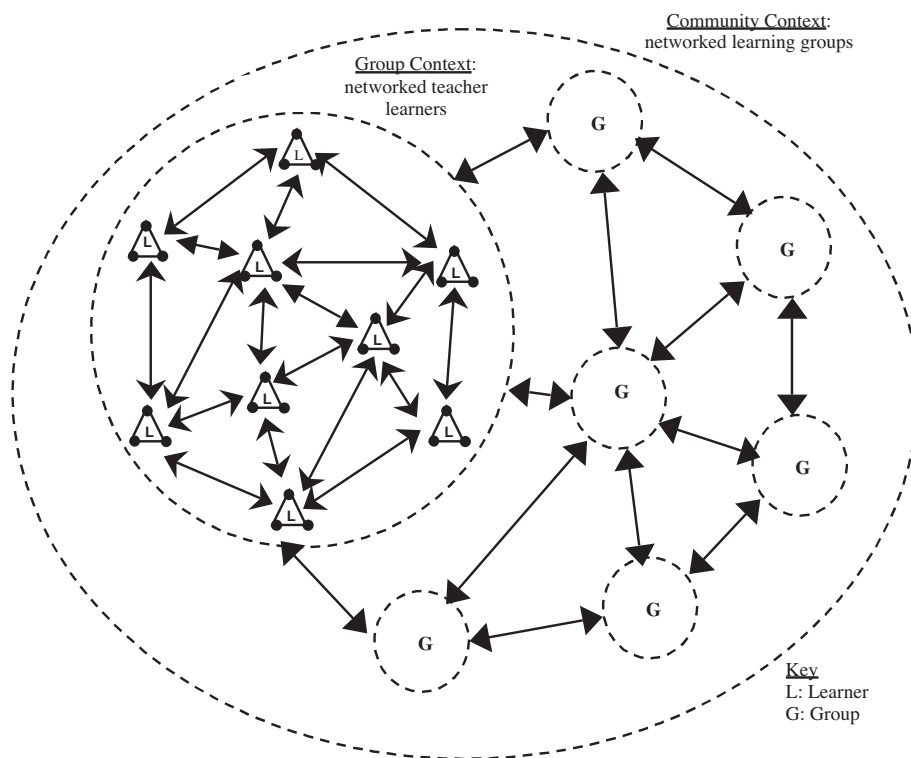
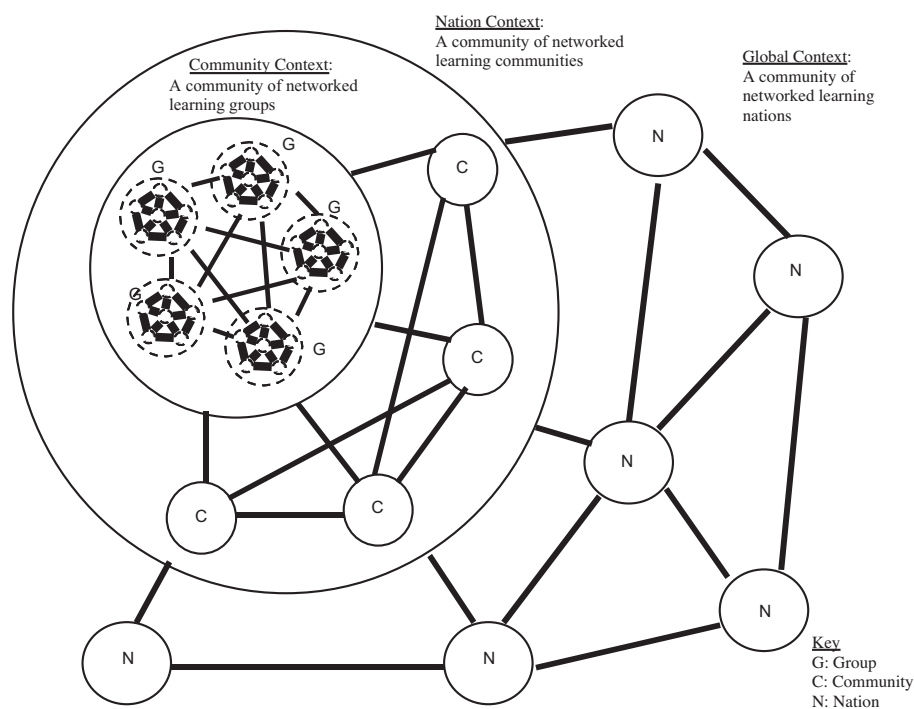


Figure 3. Networked human and ICT environment (networked learning groups, communities and nations):



Facilitating teacher learning cycle

Building up a strong and direct linkage between each stage of teacher professional learning cycle and networked learning environment should be an important issue in teacher education and development. From the above nature of learning cycle and networked human and ICT environment, Mok and Cheng (2001) further explained how each stage of teacher self learning cycle can be initiated and sustained continuously to achieve effective learning with the support of a networked human and ICT environment. The learning cycle includes the following stages:

- Stage 1: Initiating learning from mindset
- Stage 2: Planning for learning action
- Stage 3: Learning action
- Stage 4: Monitoring, evaluation and modification
- Stage 5: Outcomes
- Stage 6: Feedback to induce changes in the teacher mind-set
- Stage 7: Feedback to induce changes in learning action

For example, Tables 7 and 8 summarize the key ideas on how the networked human and ICT environment can facilitate stage 1 (mental condition for initiating learning) and stage 3 (learning action) of the learning cycle. For the detail, please refer to Mok & Cheng (2001).

Table 7. Teacher's mental condition facilitated by networked human and ICT environment to initiate professional learning

A Teacher's Mental Condition	Facilitated by Networked Human Environment	Facilitated by ICT Environment
<ul style="list-style-type: none"> • Motivation: The teacher learner is motivated to initiate the learning activity and prepared to engage in it 	<ul style="list-style-type: none"> • Inspiring: Mentor and peers provoke learning needs through challenges or identification of gap in knowledge or skill • Sustaining: supportive social environment to sustain motivation 	<ul style="list-style-type: none"> • Stimulation: ICT provides information-rich and stimulating environment to instill learning desire • Facilitation: ICT facilitates speedy and frequent correspondence between teacher learner, mentor and peer
<ul style="list-style-type: none"> • Metacognition: The teacher learner has a clear idea of one's own prior knowledge and the learning activities to be engaged in 	<ul style="list-style-type: none"> • Cognitive capacity building through social support: Mentor and peers help the teacher learner to develop: <ul style="list-style-type: none"> - clear expectation of learning outcomes - understanding about the teacher learner's level of prior knowledge - understanding on the amount of learning effort to be spent to achieve expected outcomes 	<ul style="list-style-type: none"> • Information generation: ICT provides information that facilitates the teacher learner to establish understanding: <ul style="list-style-type: none"> - Information on prior achievement recorded and stored using ICT helps teacher learner to develop a realistic expectation of learning outcomes - The teacher learner's level of knowledge can be established through self-administered tests and checklists on the web
<ul style="list-style-type: none"> • Metavolition: The teacher learner is willing to engage in learning activities and make good use of all available resources 	<ul style="list-style-type: none"> • Engendering volition: Mentor cultivates amongst teacher learners a collaborative learning culture in order to: <ul style="list-style-type: none"> - enhance the teacher learner's willingness to engage in the learning activities - increase the teacher learner's confidence in the mentor and peers as resource people to support learning 	<ul style="list-style-type: none"> • Supporting volition: User-friendly and enticing learning environment enhances volition: <ul style="list-style-type: none"> - Well designed teach-ware can reduce resistance and fear in using technology to support learning, which in turn enhance willingness of the teacher learner to participate - ICT increases the frequency of group communication, thus help build rapport amongst learners for further collaboration

Table 8. Teacher's professional learning action facilitated by networked human and ICT environment

A Teacher's Learning Action	Facilitated by Networked Human Environment	Facilitated by ICT Environment
<ul style="list-style-type: none"> • <u>Control</u>: The teacher learner chooses the best course of action, exercises self-control in continual engagement in the learning activities and regulates learning strategies to achieve learning goal 	<ul style="list-style-type: none"> • <u>Expert support</u>: Networked mentor provides expert advice on possible learning paths and scaffolding to the teacher learner and facilitates him or her to focus on learning task 	<ul style="list-style-type: none"> • <u>Knowledge accumulation</u>: ICT helps keep track of learning path, attempts, success and failures such that learning is focused and grounded on knowledge accumulated
<ul style="list-style-type: none"> • <u>Task engagement</u>: Accretion of knowledge through a series of learning activities, including assimilation, accommodation, integration, extrapolation and origination 	<ul style="list-style-type: none"> • <u>Discourse on new knowledge</u>: Mentor facilitates and promotes discourse about the learning experience among networked teacher learners such that learning of an individual learner can have a multiplicative effect on other learners through observation and emulation 	<ul style="list-style-type: none"> • <u>Plurality of learning experience</u>: Through IT, a dialogue on the learning experiences can be shared easily, thus enabling plurality of learning experience. Accumulation of knowledge through documented in e-format for later learners
<ul style="list-style-type: none"> • <u>Appreciation</u>: The teacher learner appreciates the new knowledge gained and is further motivated to continue engagement in the learning task 	<ul style="list-style-type: none"> • <u>Emotional safety net</u>: Networked mentor and peers share the joy of achievement and display empathy in case of failure, thus providing a safe environment for the teacher learner to experiment with learning 	<ul style="list-style-type: none"> • <u>Positioning against internal and external frame of reference</u>: ICT facilitates voluminous storage and speedy retrieval of previous achievement records made by this and other teacher learners such that the learner appreciates where s/he is

Conclusion

From the above discussion, we can see that the three waves of education reforms in different parts of the world require different types of teacher effectiveness including internal effectiveness, interface effectiveness and future effectiveness, that are based on completely different paradigms in education. Correspondingly, the major characteristics of three waves of teacher education and their application of ICT are contrastingly different as summarized in Table 9.

The first wave of education reforms emphasizes internal improvement and effectiveness. Therefore the paradigm of teacher education conceptualizes teacher effectiveness mainly as the internal effectiveness of teaching and work to achieve the planned goals. According to the structure of internal teaching effectiveness, there are three major strategies for teacher development: short-term strategy, long-term strategy and dynamic strategy. In practice, there are three models often used to enhance teacher internal effectiveness, including the goal and specification model, the work process model, and the absence of problem model. The efforts of teacher education and development of the first wave are often short-term orientation, related to teachers' daily practices and improvement in teaching and work particularly for the delivery of knowledge and skills to students. The use of ICT in teacher education and development is limited, mainly on improving the

efficiency of delivery of planned curriculum and professional competence. There is lack of systematic intention to apply ICT to facilitate any paradigm shift in teacher education in particular or education in general.

Table 9. Paradigm shift in teacher education and applying ICT

	First Wave	Second Wave	Third Wave
Conception of Teacher Effectiveness	Internal Effectiveness for Improving the internal environment and processes to achieve the planned goals of work	Interface Effectiveness for Ensuring education services satisfying the needs of stakeholders and accountable to the public	Future Effectiveness for Ensuring the relevance of aims, content, practices, and outcomes of education to the future of new generations in a new era of globalization, information technology, and knowledge-driven economy
Major Models of Teacher Effectiveness & Teacher Education	Internal Models: <ul style="list-style-type: none"> • Goal and specification model • Work Process model • Absence of problem model 	Interface Models: <ul style="list-style-type: none"> • Resource-input model • Constituencies satisfaction model • Accountability model • Continuous learning model 	Relevance to Paradigm in Education: <ul style="list-style-type: none"> • Development of contextualized multiple intelligences • Triplization in education: Globalization, localization and individualization
Implications for Applying ICT in Teacher Education	<ul style="list-style-type: none"> • The use of ICT in teacher education is limited, mainly on improving the efficiency of delivery of planned curriculum and professional competence. • Whether ICT can facilitate paradigm shift in teacher education is not a concern. • The effectiveness of using ICT depends on: <ol style="list-style-type: none"> 2. How well the use of ICT in teacher education and professional learning is organized to deliver the necessary professional knowledge and skills to teachers? 3. How well the delivery of professional knowledge and skills to teachers can be ensured through the improvement of teaching, learning and field experience of teacher education programs with the new ICT? 4. How well teacher educators' teaching can be improved through the use of ICT in a given time period? 5. How well teacher learners can arrive at given professional standards with the support of ICT in the professional qualification examination or certification? 	<ul style="list-style-type: none"> • The use of ICT in teacher education is limited, mainly on delivery of the necessary knowledge and skills for teacher interface effectiveness. • Whether ICT can facilitate paradigm shift in teacher education is not a concern. • The effectiveness of using ICT depends on: <ol style="list-style-type: none"> 1. How well can ICT be used to ensure the performance of teachers or student teachers satisfying the key stakeholders' expectations and needs? 2. How accountable can be the teacher education services with the use of ICT to the public and stakeholders? 	<ul style="list-style-type: none"> • The extensive application of ICT in building up a networked environment for teachers' individualized, localized and globalized professional learning and CMI development is crucial and necessary. • ICT plays a key role to facilitate paradigm shift in education & teacher education. • The effectiveness of using ICT depends on: <ol style="list-style-type: none"> 1. How well can ICT globalize, localize and individualize teachers' professional learning and development? 2. How well can the use of ICT maximize teachers' professional learning opportunities through establishing the borderless ICT environment, local and international networking, and various types of innovative learning programmes? 3. How well can the use of ICT facilitate and ensure teachers' professional learning to be sustained as potentially life long? 4. How well can the use of ICT ensure and facilitate the development of teachers' ability to triplize their professional learning and development? 5. How well can the application of ICT facilitate the development of a CMI pedagogical environment, in which teachers are immersed and inspired to be self-actualizing and developing CMI themselves?

The second wave of education reforms focuses on the interface between the school and the community. School effectiveness is interface effectiveness, mainly defined and assessed by the satisfaction of stakeholders with the education services of the school and by the accountability to the public and stakeholders. Therefore the conception of teacher interface effectiveness is to provide education services satisfying the needs of stakeholders and accountable to the public. Depending on the approaches used

to deal with interface issues and achieve interface effectiveness, there are four models for ensuring teacher interface effectiveness, including the resource utilization model, the school constituencies satisfaction model, the accountability model, and the continuous learning model. The focus of the second wave of teacher education is mainly to prepare teachers have the knowledge and skills to deal with the interface expectations and issues. Similar to the first wave, the application of ICT in the second wave of teacher education is quite limited, mainly on delivery of the necessary knowledge and skills for teacher interface effectiveness. Whether ICT can facilitate paradigm shift in teacher education and development is not a major concern in the application.

Responding to the challenges of globalization, information technology and knowledge-driven economy in the new millennium, the third wave of education reforms urges paradigm shift towards school future effectiveness relevant to the future needs of individuals, the community, and the society. Therefore, the conception of teacher future effectiveness is on ensuring the relevance of aims, content, practices, and outcomes of teacher work to the future of new generations in facing up challenges of new millennium. Correspondingly, the third wave of teacher education aims at creating unlimited opportunities for teachers' continuous lifelong learning and development with the support of individually, locally, and globally networked human and ICT environment. Contrastingly different from the first and second waves, the extensive application of ICT in building up a networked environment for teachers' individualized, localized and globalized professional learning and CMI development is crucial and necessary for the third wave of teacher education and development. ICT plays a key role to facilitate the paradigm shift in school education and teacher education.

Although teachers' internal effectiveness, interface effectiveness, and future effectiveness are based on different paradigms and they have different strengths and focuses, all of them are important and necessary to provide us a comprehensive framework to the practice of school education and teacher education in the new century. They are mutually supplementary to each other, taking internal improvement, interface satisfaction and accountability, and future relevance into consideration. We believe, if teachers can ensure internal effectiveness, interface effectiveness, and future effectiveness for their schools, they have *total teacher effectiveness*.

From this line of thinking, the efforts of research, development, and policy formulation in ongoing teacher education and ICT application should focus not only on teachers' internal and interface effectiveness but

also on their future effectiveness if total teacher effectiveness is pursued. It is hoped that the analysis and discussion in this speech can provide a new comprehensive framework for local and international educators, researchers, and policy-makers to develop teachers and apply ICT in teacher education for education effectiveness in the new century.

References

- Argyris, C., Putnam, R., & Smith, D.M. (1985). *Action science*. San Francisco: Jossey-Bass
- Argyris, C., & Schön, D. A. (1974). *Theory in practice: Increasing professional effectiveness*. San Francisco: Jossey-Bass Classics.
- Basto, J. (1999). Learning in the digital era. *Educational Media International*, 36(1), 74–76.
- Bennett, R. E. (1999). Using new technology to improve assessment. *Educational Measurement*, 18(3), 5–12.
- Boekaerts, P., Pintrich, R., & Zeidner, M. (Eds.). (2000). *Handbook of self-regulation*. San Diego, CA: Academic Press.
- Boles, K., & Troven, V. (1996). Teacher leaders and power: Achieving school reform from the classroom. In G. Moller & M. Katzenmeyer (Eds.), *Every teacher as a leader, New directions for school leadership, No. 1*, Fall 1996. San Francisco: Jossey-Bass.
- Brockett, R. G. (1994). Resistance to self-direction in adult learning: Myths and misunderstandings. In R. Hiemstra & R. G. Brockett (Eds.), *Overcoming resistance to self-direction in adult learning*. San Francisco: Jossey-Bass Publishers.
- Burbules, N. C., & Callister, T. A., Jr. (1999). The risky promises and promising risks of new information technologies for education. *Bulletin of Science, Technology & Society*, 19(2), 105–112.
- Burbules, N. C., & Torres, C. A. (Eds.). (2000). *Globalization and education: Critical perspectives*. New York: Routledge.
- Caffarella, R. S. (1993). Self-directed learning. In S. B. Merriam (Ed.), *An update on adult learning theory. New directions for adult and continuing education, no. 57*. San Francisco: Jossey-Bass.
- Cheng, Y. C., & Townsend, T. (2000). Educational change and development in the Asia-Pacific region: Trends and issues. In T. Townsend & Y. C. Cheng, (Eds.), *Educational change and development in the Asia-Pacific region: Challenges for the future* (pp. 317–344). The Netherlands: Swets and Zeitlinger Publisher.
- Cheng, Y. C., & Tsui, K. T. (1999). Multi-models of teacher effectiveness: Implications for research. *Journal of Educational Research*, 92(3), 141–150.

- Cheng, Y. C. (1994). Classroom environment and student affective performance: An effective profile. *Journal of Experimental Education*, 62(3), 221–239. (USA).
- Cheng, Y. C. (1997). Monitoring school effectiveness: Conceptual and practical dilemmas in developing a framework. In H. Meng, Y. Zhou, & Y. Fang (Eds.), *School based indicators of effectiveness: Experiences and practices in APEC members* (pp. 197–206). China: Guangxi Normal University Press.
- Cheng, Y. C. (2000a). A CMI-Triplization paradigm for reforming education in the new millennium. *International Journal of Educational Management*, 14(4), 156–174.
- Cheng, Y. C. (2000b). Educational change and development in Hong Kong: Effectiveness, quality, and relevance. In T. Townsend & Y. C. Cheng (Eds.), *Educational change and development in the Asia-Pacific region: Challenges for the future* (pp. 17–56). The Netherlands: Swets and Zeitlinger Publisher.
- Cheng, Y. C. (2001a). *Educational relevance, quality and effectiveness: Paradigm shifts*. Invited keynote speech presented at the International Congress for School Effectiveness and School Improvement held in Toronto, Canada, 2001, January, with the theme “Equity, Globalization, and Change: Education for the 21st Century”.
- Cheng, Y. C. (2001b). New education and new teacher education: A paradigm shift for the future. In Y. C. Cheng, K. W. Chow, & K. T. Tsui (Eds.), *New teacher education for the future: International perspectives* (pp. 33–88). Hong Kong & The Netherlands: Hong Kong Institute of Education & Kluwer Academic Publishers.
- Cheng, Y. C. (2001c). *Towards the third wave of education reforms in Hong Kong*. Keynote speech at the International Forum on Education Reforms in the Asia-Pacific Region, held in Hong Kong, 2001, February.
- Cheng, Y. C. (2002a). Paradigm shift in school effectiveness: Internal, interface, and future. In A. Griffith & C. Reynolds (Eds.), *Equity and globalization in education* (pp. 87–117). Calgary, Canada: Temeron Press.
- Cheng, Y. C. (2002b). *Towards the third wave of school effectiveness and improvement in Hong Kong: Internal, interface and future*. ERIC (EA031899). Eugene, OR: Clearinghouse on Educational Management.
- Cheng, Y. C. (2003a). Trends in educational reforms in the Asia-Pacific region. In J. Keeves & R. Watanabe (chief editors), *The handbook on educational research in the Asia-Pacific region* (section 1, pp. 3–16). Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Cheng, Y. C. (2003b). Challenges and research into educational reforms in the Asia-Pacific region. In J. Keeves & R. Watanabe (chief editors), *The handbook on educational research in the Asia-Pacific region* (section 8, pp. 1315–1330). Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Cheng, Y. C. (2003c). Quality assurance in education: Internal, interface, and future. *Quality Assurance in Education*, 11(4), 202–213.

- Cheng, Y. C. (2003d). School leadership and three waves of education reforms. *Cambridge Journal of Education*, 33(3), 417–439.
- Cheng, Y. C., Chow, W., & Mok, M. M. C. (Eds.). (in press). *Reform of teacher education in Asia-Pacific in the new millennium: Trends and challenges* (pp. 1–238, 14 chapters). Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Cheng, Y. C., Chow, K. W., & Tsui, K. T. (Eds.). (2000). *School curriculum change and development in Hong Kong* (pp. 1–591). Hong Kong: Hong Kong Institute of Education.
- Cheng, Y. C., Chow, K. W., & Tsui, K. T. (2001). In search of a new teacher education: International perspectives. In Y. C. Cheng, K. W. Chow, & K. T. Tsui (Eds.), *New teacher education for the future: International perspectives* (pp. 3–29). Hong Kong & The Netherlands: Hong Kong Institute of Education & Kluwer Academic Publishers.
- Chung, G. K. W. K., & Baker, E. L. (1997). Year 1 technology studies: Implications for technology in assessment. ERIC Document Reproduction Services ED 418 099.
- Coulson, A. J. (1999). *Market education: The unknown history*. New Brunswick, NJ: Transaction Publishers.
- Cowie, H., & van der Aalsvoort, G. (Eds.). (2000). *Social interaction in learning and instruction: The meaning of discourse for the construction of knowledge*. Amsterdam, Netherlands: New York: Pergamon.
- DuFour, R. P. (1999). Help wanted: Principals who can lead professional learning communities. *NASSP Bulletin*, 83(614), 12–17.
- Education and Manpower Bureau. (1998, November). *Information technology for learning in a new era: Five-year strategy 1998/99 to 2002/03*. Hong Kong: Government Printer.
- Embertson, S. E., & Hersherberger, S. L. (1999). *The new rules of measurement: What every psychologist and educator should know*. Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.
- Evans, G. R. (1999). *Calling academia to account: rights and responsibilities*. Buckingham, Great Britain: Society for Research into Higher Education & Open University Press.
- Fessler, R., & Ungaretti, A. (1994). Expanding opportunities for teacher leadership. In D. R. Walling (Ed.), *Teachers as leaders: Perspectives on the professional development of teachers*. Indiana: Phi Delta Kappa Educational Foundation.
- Flannery, D. D. (Ed.). (1993). *Applying cognitive learning theory to adult learning: New directions for adult and continuing education, no. 59*. San Francisco: Jossey-Bass Publishers.
- Fullan, M. (1993). *Change forces*. London: Falmer Press.
- Fullan, M. (Ed.). (1997). *The challenge of school change*. Arlington Heights, IL: IRI/SkyLight Training and Publishing, Inc.
- Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult Education Quarterly*, 48(1), 18–30.

- Headington, R. (2000). *Monitoring, assessment, recording, reporting and accountability: meeting the standards*. London: David Fulton.
- Heller, D. E. (Ed.). (2001). *The states and public higher education policy: affordable, access, and accountability*. Baltimore: John Hopkins University Press.
- Herl, H. E., Baker, E. L., & Niemi, D. (1996). Construct validation of an approach to modelling cognitive structure of U.S. history knowledge. *Journal of Educational Research*, 89, 206–218.
- Knasel, E., Meed, J., & Rossetti, A. (2000). *Learn for your life: A blueprint for continuous learning*. London: Pearson Educational Ltd.
- Lieberman, A. (1996). Creating intentional learning communities. *Educational Leadership*, 54(3), 51–55.
- Lu, G., Wan, H., & Liu, S. (1999). Hypermedia and its application in education. *Educational Media International*, 36(1), 41–45.
- MacKeracher, D. (1996). *Making sense of adult learning*. Toronto, Canada: Culture Concepts.
- Mahony, P., & Hextall, I. (2000). *Reconstructing teaching: standards, performance and accountability*. London: Routledge.
- Merriam, S. B., & Caffarella, R. S. (1999). *Learning in adulthood: A comprehensive guide* (2nd ed.). San Francisco: Jossey-Bass Publishers.
- Mok, M., & Cheng, Y. C. (2000b). Global knowledge, intelligence and education for a learning society. Keynote Speech presented at the 6th UNESCO-ACEID International Conference “Information Technologies in Educational Innovation for Development: Interfacing Global and Indigenous Knowledge”. The Imperial Queens Park Hotel, Bangkok, Thailand, 2000, December.
- Mok, M., & Cheng, Y. C. (2000a). Self-learning driven assessment: A new framework for assessment and evaluation. Paper presented to the 13th International Congress for School Effectiveness and Improvement (ICSEI 2000), The Hong Kong Institute of Education, Hong Kong, 2000, January.
- Mok, M. M. C., & Cheng, Y. C. (2001). Teacher self learning in a networked environment. In Y. C. Cheng, K. W. Chow, & K. T. Tsui (Eds.), *New teacher education for the future: International perspectives* (pp. 109–144). Hong Kong & The Netherlands: Hong Kong Institute of Education & Kluwer Academic Publishers.
- Murphy, J. (1995). Changing role of the teacher. In M. J. O’Hair & S. J. Odell (Eds.), *Educating teachers for leadership and change, Teacher education yearbook III*. Thousand Oak, CA: Corwin Press.
- Ryan, S., Scott, B., Freeman, H., & Patel, D. (2000). *The virtual university: The internet and resource-based learning*. London: Kogan Page.
- Saltiel, I. M. (1998). Adult students as partners in formal study. In I. M. Saltiel, A. Sgroi, & R. G. Brockett (Eds.), *The power and potential of collaborative learning partnerships* (pp. 13–22). San Francisco: Jossey-Bass Publishers.
- Saltiel, I. M., Sgroi, A., & Brockett, R. G. (Eds.). (1998). *The power and potential of collaborative learning partnerships*. San Francisco: Jossey-Bass Publishers.

- Schunk, D. H. (1996). *Learning theories* (2nd ed.). New Jersey, NJ: Prentice Hall
- Schunk, D. H. (1998). Teaching elementary students to self-regulate practice of mathematical skills with modeling. In D. H. Schunk & B. J. Zimmerman (Eds.), *Self-regulated learning and performance*. Hillsdale, NJ: Lawrence Earlbaum Associates.
- Schunk, D. H., & Zimmerman, B. J. (Eds.). (1998). *Self-regulated learning and performance*. Hillsdale, NJ: Lawrence Earlbaum Associates.
- Senge, P. (1990). *The fifth discipline: The art and practice of the learning organization*. New York: Doubleday.
- Stromquist, N. P., & Monkman, K. (2000). *Globalization and education: Integration and contestation across cultures*. Lanham, MD: Rowman & Littlefield.
- Tam, W. M., & Cheng, Y. C. (1995). School environment and student performance: A multi-level analysis. *Educational Research Journal*, 10(1), 5–21.
- Walberg, H. J. (1997). Using the learning environment inventory. *Educational Leadership*, 54(8), 45–47.
- Yuen, B. Y., & Cheng, Y. C. (2000). Leadership for Teachers' Action Learning. *International Journal of Educational Management*, 14(5), 198–209.
- Yuen, P. Y., & Cheng, Y. C. (1997). *The action learning leadership for pursuing education quality in the 21st century*. Paper presented at the Fifth International Conference on Chinese Education Towards the 21st Century: Key Issues on the Research Agenda, Hong Kong, HKSAR.
- Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation*. San Diego, CA: Academic Press.

The Challenge of ICT Integration in Hong Kong Teacher Education (and elsewhere):

SWOT as a Strategic Approach to Dialogue, Interpretation and Encouraging Reflective Practice

Cameron Richards

Our school education needs to see a paradigm shift – from a largely text-book-based teacher-centred approach to a more interactive and learner-centred approach... IT can play a catalyst role in the transformation of school education in such a direction. (Hong Kong Education and Manpower Bureau, 1998, p. 1)

We believe that the failure of schools to more effectively utilize IT has its roots in places other than inadequate teacher training... More important to the future uses of IT in schools is how [educational] **leadership** responds to the **opportunities** that IT affords. (Stallard & Cocker, 2001, p. 63, *my emphasis*)

Increasingly, ICTs (Information and Communication Technologies) have taken on an importance in formal education that is recognized around the world by governments in policies which often refer to related new learning theories and the requirements and possibilities of an emerging global economy and knowledge society (Papert & Cavallo, 2001). Ambitious policies for integrating ICTs in teacher education have generally not translated well into effective practice (Cuban, 2001; Stallard & Cocker, 2001). This is especially where such policies cite the learner-centred implications and educational reform (e.g. new pedagogical) possibilities of ICTs (DETYA, 2002; ISTE, 1999). Such a dilemma has perhaps reflected the tendency of various “missing links” between top-down theories and approaches on one hand, and local contexts of applied practice on the other at various levels of formal learning. However, schools and school teachers (and teacher educa-

tion institutions) have shouldered the central onus of harnessing the latent educational possibilities of ICTs for teaching and learning framed within the larger contexts of economic and cultural imperatives of globalization.

The general and associated dilemmas of ICT integration in education are especially acute in countries that have ambitious educational policies about this, have invested heavily in ICT infrastructure and resources, and where the larger society is relatively “wired” or makes extensive extra-curricular use of ICTs. It is for this reason that the policy situation in Hong Kong provides for an exemplary and particularly interesting case study. The inquiry reported here illustrates a strategy needed to interpret and more productively engage with some obvious dilemmas in play. It was authenticated over the course of two years experience in Hong Kong’s main teacher education institution with a view to enhancing improved links between ICT teacher education and new learning models and approaches (Richards, 2003). Although Hong Kong educational policies do keenly encourage both the integration of ICT and an associated use of new learning theories and approaches, in practice this tends to be resisted by entrenched “old” models of teaching and learning associated with an exam-based curriculum, a residual reliance on rote methods of learning and neo-Confucian values of education (Pearson, 2001; Richards, 2004).

A naïve or introductory version of SWOT is a common planning and reflection tool used by many people, included teachers. Indeed, SWOT can be adapted as part of a teaching strategy to encourage better articulation between ideas, theories and reflection to applied practice. This paper goes a step further to recognize the value of SWOT in educational contexts as a powerful tool for purposes of dialogue, interpretation, and encouraging reflective practice. In contrast to other more descriptive approaches to learning and evaluation, SWOT represents a rhetorical key to identifying and engaging with the kind of systemic ambivalences and contextual contradictions that are often missed, ignored or even rationalised by learner surveys and more descriptive approaches to educational research. This is especially where ICT and pedagogy are concerned (Richards, 2001a, 2001b). As an approach embodying connections also to grounded theory, design methodology and formative research, a dialogical application of SWOT presupposes effective “change and improvement” as a key rationale for practice, theorizing and knowledge-building with particular relevance to educational technology (e.g. Design-based Research Collective, 2003; Orrill, 2001; Reigeluth & Frick, 1999).

This paper therefore synthesises a practical dilemma with a methodological one in terms of the adaptation and use of SWOT as a “work-based”

and authentically situated approach to identifying and responding to some key systemic dilemmas. It does so in the context of the challenges presented for ICT integration in Hong Kong teacher education. The first section of the paper uses an initial “macro” version of SWOT to circumscribe these larger contextual dilemmas. The second then outlines a dialogical appropriation of SWOT for educational contexts illustrating its use as an interpretative tool for the study outlined and reported in the third section. In this way, the paper discusses the situated and “active learning” requirements for ICT-related educational “change and improvement.”

Hong Kong as an Example of Global Dilemmas about ICT in Education: Strengths, Opportunities, and the “Missing Links” behind Unfulfilled Promises

Following on from and strongly influenced by the example of Singapore IT “masterplans” for education, Hong Kong educational policies strongly encourage the integration of ICTs in teaching and learning in terms of a range of associated “new learning” initiatives such as life-long learning, learner-centred pedagogy and associated constructivist approaches such as problem-based learning, project-based learning and collaborative learning (Education and Manpower Bureau, 1998; Education Commission, 2002). Such imperatives reflect the Hong Kong government’s awareness that effective ICT integration is tied up with the educational reforms needed to ensure Hong Kong becomes a knowledge society and productively engages with imperatives of economic globalisation.

Yet, local surveys of teachers reinforce a notion that many find these new imperatives bewildering, the job of teaching increasingly stressful, and that there is never enough time to adequately prepare for new requirements (Lee, 2004). The unique pace of life and change in Hong Kong fuels the associated threats perceived by many often older teachers especially – general fears about change and the use of new technologies, specific concerns that younger learners have greater ICT skills and are less responsive to traditional teaching approaches, and increasing workloads at a time of increased job vulnerability to do as much with the state of the economy as with changing school conditions. This was exemplified by a joint “protest” about the top-down imperatives of such policymaking by many of the school principles attending a local conference focusing on leadership for educational reform in Hong Kong schools (Walker, 2004). In other

words, teachers in Hong Kong and elsewhere are caught up in larger policy imperatives which many find intimidating, confusing and not sufficiently linked to either current realities or required processes of associated “cultural change.”

At the heart of all this then is the dilemma that the challenge of ICT integration in teaching and learning can alternately be perceived as both an *opportunity* and *threat* in the Hong Kong context. Hong Kong’s ambitious policy initiatives – and how these impact on teachers – are both a strength and a weakness. This is because what is at stake is a cultural clash of different learning models, expectations, and aims which is heightened around the challenge of ICT integration. Many of the new learning theories and approaches emphasise the learner-centred implications and possibilities of ICT tools and media for innovative, applied and generally active learning (in terms of collaboration, inquiries, projects, problem-based learning, and related “active learning” approaches). At the other end of the continuum, ICTs can also be used to reinforce “old” rote-based or teacher-centred models of learning in terms of ICTs used extensively as repositories for information or to provide “drill and practice” sequences. To put this in clearer terms, more than elsewhere Hong Kong education has more quickly and strongly embraced the rhetoric and policy of new models of learning and an associated imperative for ICT integration. However, it still tends to retain old assumptions in practice such as an exam-based curriculum and rote-learning methods.

What is needed is greater recognition that technological infrastructure and visionary policies borrowed from elsewhere are not enough in themselves to encourage effective ICT integration in teaching and learning. Effective practice and innovation requires some appropriate kinds of “cultural” change, and can only come from greater recognition of the predicaments of the average teacher and how new imperatives are often undermined by “old” assumptions, habits and expectations (Fullan, 2001). Teachers attempting to employ innovative, applied or more actively learner-centred approaches often face the dual obstacles of learner expectation and administrative restraints informed by old learning assumptions. Put another way, learners often find “old” (i.e. rote and exam-based) learning models boring and irrelevant but at the same time reassuring, especially when it involves some sort of “spoon-feeding” of the right answers or skill procedures. On the other hand, administrative regimes tend to reinforce notions of learning and assessment which reflect similar assumptions, and there may be a tendency in practice if not in policy to discourage innovative new practices.

Like theories, policies and information, a focus on ICT skills or procedures is not sufficient in itself to translate into innovative applied or effective practice. Contexts of performance need to be provided to encourage this transferability of knowledge into practice as well as to evaluate the quality of design or application. This conversely requires educators to become more designers of effective learning with ICTs in order to go beyond previously held assumptions that teachers are basically transmitters of learning. On the other hand, this requirement to get learners to link their “doing” and “thinking” (or practice and reflection) can involve degrees and stages of frustration as students are challenged to be more active learners and to develop applied ICT literacy or competency.

Because of the increased pace of life and the residual transmission learning assumptions of Hong Kong education, there is perhaps less latitude than elsewhere to achieve those types of learning outcomes where learners appreciate being pushed to be achieve more active, innovative and applied knowledge. Instead many teachers prefer the easy options, merely reinforcing old expectations, and not risk upsetting students or getting adverse feedback in the great plethora of student evaluations in Hong Kong’s education system. Under these circumstances evaluations tend to be uncritically treated as indicators of quality; thus mitigating against any real effort at applied innovation, especially when it involves the potentially frustrating use of both ICTs and “new learning” methods. Notwithstanding the policy rhetoric for new and changed models of teaching and learning focused on ICT integration in particular are undermined by residual “old learning” expectations, habits, and practices.

The ultimate paradox lies in how learners tend to be ambivalent about the clash of old and new learning models just as they are about the roles and functions of ICTs. Most know and often complain about the limitations and even counter-productive assumptions and tendencies of rote learning and exam-based approaches to learning and assessment. Yet they will also often complain even more loudly about moves to introduce new approaches – especially those which challenge them to be more active or innovative learners. In short, teachers trying to proactively integrate ICTs in education can find themselves in a more difficult situation than other teachers because of the inherently challenging and often frustrating aspects of the required hands-on approaches to ICTs in learning and associated new models of knowledge.

So what to do? The good news lies in how ICTs can be such powerful and effective tools and media of new learning if this is sufficiently recognized, encouraged and framed in terms of a range of issues needing

to be addressed. Like learner thinking and doing, the improved linking of theory and policy with practice needs to be contextualized, designed and planned for. Transitional movements and stages need to be recognized and also catered for in a way that allows: (a) learners to overcome temporary frustrations and achieve confidence in their emerging ability, and (b) similarly for institutions to go from being merely reactive reinforcers of negative self-fulfilling prophecies to achieve more proactive and productive situations. What is needed is an appropriate new culture of learning which allows learners to fulfil their potentials in a way consistent with the aspirations of an emerging knowledge society – working innovatively, collaboratively and with an applied problem-solving focus.

SWOT as an Interpretative Tool for Actively Reflecting on the Challenge of ICT Integration in Education

Even “naïve” (including initial or preliminary and merely descriptive) applications of SWOT can usefully exemplify a process of more effectively linking evaluative reflection and authentically situated practice. In this section an *applied* version of SWOT is critically delineated as a basis for more critically engaging with the challenge of ICT integration in terms of the various perspectives of a large cohort of Hong Kong pre-service teachers – part of the next generation of teachers.

It begins with pointing out some of the key dilemmas involved with either teaching/learning or educational research concerned with the challenge of ICT integration. As also exemplified by the very polarized public and professional debates about the role of ICTs in education (e.g. Avirum & Tami, 2004; Cuban, 2001; Papert, 1999), the main dilemma to be confronted lies in terms of the intense ambivalence felt by many teachers and learners about the challenge of ICT integration – especially when linked to associated new learning models and educational policy reforms as is the case in Hong Kong as elsewhere. Most teachers recognize the importance and possibilities of ICTs in education yet hold latent fears that new learning technologies might be used as a substitute or replacement for the role of the teacher or, rather, a teacher-centered pedagogy focused on learning as an authoritative transmission of information or skills.

But is there sufficient formal recognition given to the ambivalences, contradictions and dilemmas felt by most educators about ICT (from the typical

teacher through to well-known critics such as Larry Cuban)? Are there any kinds of evaluative strategies or methodologies commonly available to even sufficiently recognize let alone productively respond to such ambivalences or the “self-fulfilling prophecies of failure” that polarized debates and perceptions tend to engender? For instance, a *cynically resistant* teacher with entrenched views about ICT and associated new models of learning has little if any chance of achieving let alone acting upon a balanced perspective towards new possibilities or changing requirements. On the other hand, *naively enthusiastic* teachers with unrealistic expectations are inevitably disappointed and thus feed a negative self-fulfilling prophecy of failure when it comes to ICT integration in actual contexts of teaching and learning.

There is an even more fundamental dilemma for teachers and researchers epitomized in the limitations of various efforts to survey or measure institutional degrees of “ICT integration” in teaching specifically and education generally (MacDonald, 2004; Watson, Proctor, Finger & Lang, 2004). This is that there tends to be a gap between what many teachers and learners (and also educational institutions such as schools and universities) “say” they do (or would “like” to do) and what they manifestly or actually “do” – that is, between either potential or even “wishful” ICT integration on one hand, and actual application on the other. Such a missing link between top-down imperatives and bottom-up context is, of course, magnified by the associated gaps between what younger learners do with ICT at home or in extra-curricular settings and what happens in the classroom (e.g. Somekh, 2004). However, a number of survey and related instruments of evaluation or research fail to sufficiently recognize let alone account for or effectively engage with such discrepancies, such polarisation and such ambivalence. Typical oppositions or conflicts between “old” teacher-centred pedagogies and “new” learner-centred ones is thus not unrelated to similar tensions between objectivist and relativist or subjectivist methodologies of evaluation and research.

In relation to the challenge of ICT integration in education, then, the exemplary relevance of SWOT lies in its facility to identify and engage with: (a) the latent ambivalences and preconceptions about ICT and education held by many teachers and learners; and also (b) the gaps or missing links between “top-down” theory, policy and reflection (as well as rhetoric) on one hand, and “bottom-up” contexts of actual practice on the other. Additionally, in contrast to various objectivist, descriptive and de-contextualised approaches to knowledge construction, SWOT exemplifies the kind of dialogical methodology of interpretation which is grounded in time and opens up “past” preconceptions, habits and structures to “future”

possibilities and potentials in terms of the most basic yet most important strategy of the human condition: “change and improvement.” In other words, SWOT allows more positive or “non-reinforcing” recognition of, and engagement with, the negative self-fulfilling prophecies and institutionalized resistances associated with the perceptions about ICT held by many educators.

SWOT thus represents a dialogical and actively reflective tool of rhetorical and interpretative analysis for: (a) cutting through oppositional perspectives and debates; and (b) rigorously interrogating and/or proactively engaging with both personal and institutionalized motives, habits and various kinds of “preconception” which can help or hinder the fundamental rationale of “change and improvement” in education. Such a rationale represents a relevant translation of the imperative of inquiry to sufficiently recognise or produce “a significant difference.” The “passive” orientations and decontextualised nature of much empirical or evaluative research are clearly insufficient per se to recognize the transferable principles, iterable implications and general “validity” of inquiries or studies involving any specific ICT-related tool, program, and method or idea for integration in teaching or learning.

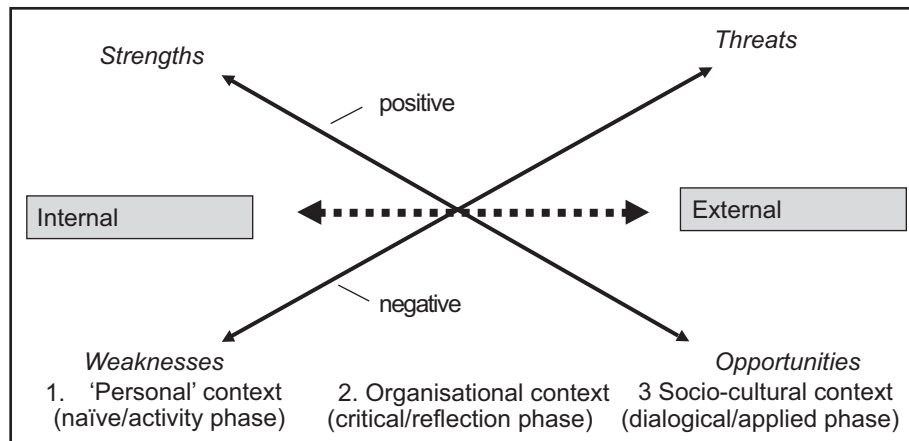
In this way, the use of a SWOT framework illustrated graphically the benefits of adopting more proactive, balanced and grounded orientations towards the challenge of ICT integration for both professional development and applied educational research purposes. It also epitomizes the importance of conversational, performative and “action-reflection” approaches to ICT-related teaching and learning (Laurillard, 2002), professional practice and development (Schon, 1987) and educational research (Richards, 2002). In contrast to merely descriptive approaches to knowledge-building, SWOT further exemplifies how the dominant preconceptions or habits of “past” knowledge and current practices can be “opened up” and transformed by new reflective or experimental strategies of “change and improvement.” Hence as outlined above and illustrated in Figure 1 below, we might distinguish between naïve, critical, and applied or dialogical uses of SWOT for different kinds of analytical purpose – uses which correspond to related introductory, analytical and synthetic or applied stages of learning as a process and activity-reflection cycle (Richards, 2004).

Figure 1. Naïve, critical and applied uses of SWOT

- **Naïve** – SWOT as “pretext” for *provisional* reflections or overviews and *initial* inquiry or discussion
- **Critical** – SWOT as a situated, evaluative context for analyzing negative vs positive links between perception and practice, and recognising implicit dilemmas, contradictions and challenges.
- **Applied/dialogical** – SWOT as “balanced” interpretive strategy for further exploring and engaging with relevant issues, new possibilities and enduring requirements for effective educational change and ICT integration

In the uses of SWOT for business planning, the distinction between personal and institutionalized contexts of relevance is typically blurred in terms of *internal* versus *external* aspects (e.g. Khurana, 2004). That is, the identification of my/our “internal” strengths and weaknesses in relation to my/our perceptions of the “external” environment is often intentionally converged where the main purpose or goal is: (a) a strategic harnessing and reorientation of energy, focus and action; in relation to (b) the survival and/or thriving of an organisation in relation to either real or imagined business competition. In this way, SWOT exemplifies the strategic distinction between *positive* (i.e. galvanizing strengths to harness opportunities) and *negative* (i.e. the perception of threats reinforcing “passive” senses of inherent, insufficient, and inadequate “weaknesses”) self-fulfilling prophecies of change and improvement. Yet in education the primary goal is arguably the enhancement (i.e. “change and improvement”) of the individual learner’s applied knowledge and metacognitive understanding in connection with larger contexts of collaborative knowledge-building and dissemination. Hence, education rather than business provides the most appropriate context for appreciating the power and possibility of SWOT’s to effectively connect up the distinct *personal*, *organizational* and wider *socio-cultural* contexts of both local and global relevance which tend to be blurred in business applications of this model [see Fig. 2].

Figure 2. SWOT as a focus for connecting distinct *personal*, *organisational*, and wider *socio-cultural* contexts of application



The specific focus questions of the study applied below were designed to recognise and engage with the participating learners' personal or individual sense of "internal" conditions and link these, in a balanced and open way, to related perceptions of "external" organisational and environmental conditions – including "top-down" imperatives of policy and implementation. Thus an initial focus on "internal" individual strengths and weaknesses was followed by and connected to the "external" perception of organizational and wider socio-cultural contexts of opportunity and threats. The inherent design of SWOT (i.e. to see different, even conflicting and ambivalent perspectives) serves to encourage more "balanced and open" reflections and responses which can then be linked to specific issues or topics in relation to the extrinsic design of specific focus questions. This is especially useful in contexts where participants routinely respond to surveys in terms of dominant preconceptions, expectations or stereotypes.

In the particular exercise below, an open and balanced context for response was reinforced by verbal introductions to the SWOT approach and course connections to the topical focus on the challenge of ICT integration. For teaching and learning (i.e. pedagogical) purposes this approach served to engage individual learners by recognizing their latent preconceptions on one hand, and the learner-centred implications, requirements and possibilities of a more hands-on and "active" approach to ICT in education. For research purposes, conversely, the SWOT protocol served to "ground" the analysis of key issues in authentic contexts for recognizing latent ambivalences and dilemmas.

The SWOT analysis of several cohorts of Hong Kong pre-service or student teachers discussed in more detail below was undertaken during the teaching semester in late 2003 and involved 97 student responses using a particular SWOT format included as an appendix at the end of this paper. About a quarter of the participating students were interested in ICT as their primary teaching area, and the rest had some other main curriculum specialization with a secondary focus in ICT. Many of the students did not respond to all questions and others made several responses, so the percentages are internally relative. More detailed and comparative analyses might have been made of both individual responses and those of specific sub-groups. However this would have been at the risk of distorting or being a distraction from the main or overall patterns of response. While the figures listed below regarding the main SWOT categories were significant enough in terms of an “internal” comparison in relation to each of the main SWOT categories, their central significance related to overall patterns and how both individual and group responses exposed the extent of ambivalence and contradictory perceptions at work. For instance, “ICT skills” were listed as one of the main strengths as well as weaknesses overall. Some individual students had listed this as a *relative* strength and yet also a weakness in *absolute* terms.

An Applied SWOT Analysis of the “Exemplary” Engagement by Hong Kong Pre-Service Teachers with the Challenge of ICT Integration in Education

In relation to a specific Hong Kong context of the challenge of ICT integration, this section will discuss the exemplifying implications of how SWOT is useful for interpreting and engaging with: (a) overall perceptions and projections of *strengths-weaknesses* and *opportunities-threats*, and (b) the distinct but interdependent relation between the *personal, organizational* and wider *socio-cultural* contexts involved.

Strengths and Weaknesses

The summary responses in Table 1 indicate the tendency in Hong Kong contexts to assume that general “technical” skills and also access to hardware are sufficient indicators per se of ICT integration. In particular the

focus on “ICT skills” was listed as both the main strength and weakness at the individual level (which the focus question here was mainly directed at) as well as at the organizational level. This finding was influenced somewhat by how just on a quarter of those who participated were undertaking “ICT” as their primary teaching focus. Whilst clearly more of the “IT specialists” listed skill levels as a strength, similar levels in both groups listed this as a weakness. The fact that some students listed this as a both a strength and weakness exemplified the relative and also quite contextualised nature of this category and this dominant perception about the challenge of ICT integration. Similarly a significant distinction could have been made between “confident” users of ICT based on technical ability alone versus those who linked their confidence to a sense of enthusiasm.

Table 1. Strengths vs weaknesses – Main points of response

Strengths
1. (43%) Skills and procedures in using different software or ICT tools/functions [usually listed by those students who had a strong ICT background]
2. (38%) Confidence and/or enthusiasm in using ICTs [especially compared to older teachers... but not younger learners]
3. (21%) Variety of new opportunities
4. (19%) Ability to make and use new resources, good/new ideas in using ICT, have an open/creative mind, want to engage students in interesting/effective way
Weaknesses
1. (58%) Skills in using different software [main “weakness” listed by “ICT specialists” as well as others]
2. (35%) Ability to plan/design and prepare effective use of ICT resources and integration in teaching/learning
3. (17%) Tendencies to avoid or respond passively to change and new ideas/opportunities

However, despite or perhaps even because of this initial sense of a selective and decontextualised pragmatism about ICT, there was also a relatively strong underlying sense that ICT skills alone were inadequate for ICT integration (see Table 2). This was reflected in the ostensibly less significant points of response under both strengths and weaknesses. Those who listed their passive tendencies and their inability to “design” for ICT integration seemed to be explicitly aware of the personal and systemic need for grounded “change and improvement” in pedagogy and assessment as

well as mere attendant skill levels. On the other hand, those who listed under “strengths” the new and exciting possibilities of ICTs for teaching and learning often tempered their comments more with a sense of what they would like to be able to do (or general attitude) rather than an existing proficiency in educational design for ICT integration. That is, some of the typical comments for strengths below emphasise notions of wanting to be “patient” and practicing “quality” and an “open mind” to be an effective teacher with ICT.

Table 2. Strengths vs weaknesses – Some typical comments

Strengths
<i>“I have good IT skills and find it easy to handle different software and computer tools”</i>
<i>“I know the teaching software and programmes such as Flash and Dreamweaver which can help me in my future teaching”</i>
<i>“I will be patient and try my best to learn IT skills and knowledge. I will use multimedia in my teaching to promote my quality in teaching”</i>
<i>“I have an open mind and know artist computer skills... to develop educational software”</i>
Weaknesses
<i>“So passive, so lazy... do not know enough software skills”</i>
<i>“I lack ideas and also the incentive to use IT extensively”</i>
<i>“There are many new software (programs) I need to learn. I think I have to learn more”</i>

The exemplary comments about “weaknesses” are particularly revealing. These are clearly examples of relevant and self-aware criticism – but also exemplify the very condition of “passivity” they refer to. This serves to highlight how a general awareness of both individual and systemic strengths and weaknesses is not in itself sufficient for the kind of “change and improvement” needed.

Opportunities and Threats

The selectively “pragmatic” view of ICT in education indicated above is linked to how a clear majority of participating students associated the acquisition of ICT skills with future jobs. This was despite the fact that much of the rhetoric of new educational policy in Hong Kong, as elsewhere, associates the learner-centred implications of ICT with the requirement of

“innovation” and such related generic skills as problem-solving, collaboration and effective communication. At the same time the future importance of ICT in every respect, but especially in terms of “getting a job,” is seen to be associated with various *negative* factors, which ultimately override the *positive* opportunities. The push for ICT integration is associated with increased stress levels in every aspect of life and particularly in relation to the teaching profession. Within school contexts ICT integration is especially associated with an already overburdened curriculum. Additionally it is associated with various cost and resourcing issues that extend and further problematise the issue of an inequity of access across and within different schools.

Table 3. Opportunities vs threats – Main points of response

Opportunities	
1. (63%) To ensure future work, employability – either as teacher or generally	
2. (45%) Upgrading of ICT skills, the use or awareness of a variety of new software especially interactive multimedia [but not usually in any applied, transferable or design-effective sense]	
3. (28%) Educational change and reform	
4. (26%) To engage new ICT literate learners more effectively, to provide interesting and even “fun” learning contexts, and to develop/apply new repertoires of teaching/learning - especially use of project work and other “innovative” approaches and new learning models	
5. (16%) Sharing resources, collaborative or even “mere repository” use of online/e-learning platforms, ICT as replacement of some aspects of face to face traditional teaching [i.e. convenient and time-saving versus collaborative or cooperative aspects of using ICTs]	
Threats	
1. (74%) Lack of time, levels of stress, and pace of life associated with wider social as well as school-related imperatives for ICT integration – especially when linked to an already overburdened curriculum	
2. (53%) Top-down imperatives and governmental/administrative policies for educational change linked to ICT integration	
• often prescriptive in a burdensome way (e.g. bureaucratic rules and procedures, licensing and copyright issues)	
• often generate resentment,	
• often cite new learning theories in a way which reinforces gap with actual practices or conventional habits	
• generally not linked to required support for effective change	
3. (37%) Cost of and access to ICT resources (e.g. equipment, software)	
4. (24%) Support issues – technical support, effective training provision, appropriate encouragement by administration	
5. (17%) Resistance to effective change by schools, older teachers (including lack of effective leadership)	
6. (14%) Younger students more confident with ICT, “loss of face” by older teachers	

As in relation to *strengths-weaknesses*, the perceived gap between *old* teacher-centred practices and *new* learning models (associated with ICT integration and educational reform in new policy initiatives) represents much more a fundamental threat than an opportunity. Clearly many student teachers held a strong sense of cynical resentment towards “top-down” mandates which do not adequately recognise or cater for the restraints and associated bottom-up requirements of specific contexts of practice. On the other hand many also listed some of the kind of more “optimistic” opportunities associated with new educational rhetoric and policy – such as educational reform, innovative pedagogies, and various aspects of learner-centred agency such as collaboration, project work, and knowledge as potentially “play” rather than necessarily “work.” One might reasonably assume that many or at least some of the student teachers were motivated by more than simply money or work to choose teaching as a profession. Yet any sense of this tended to be undercut by a general recognition already of the lack of sufficient systemic/organisational will or encouragement to overcome assumed resistances and other negative implications. Despite or perhaps because of all the new policy initiatives and efforts at pedagogical reform aimed, there was a dominant perception that teaching in Hong Kong was still entrenched in old bureaucratic regimes and hierarchical orders, and that top-down vs bottom-up gaps were still in place as much as they ever were to prevent genuine “change and improvement.”

Table 4. Opportunities vs threats – Exemplary responses

Opportunities
<p><i>“If I have good IT skills then I can get a job easier”</i></p> <p><i>“Many schools have all the equipment and software already, so we should have more tools supporting our teaching”</i></p> <p><i>“The government emphasis on IT in schools and in society”</i></p> <p><i>“My daily life is tightly related to IT”</i></p>
Threats
<p><i>“My IT knowledge is not good, so I need to spend so much time in order to try and catch up”</i></p> <p><i>“Every teacher is supposed to use IT in every lesson, but some schools still resist the trend”</i></p> <p><i>“If I can’t handle IT skills well, then it may worsen my teaching”</i></p> <p><i>“Teachers need to update and equip themselves frequently...”</i></p>

As suggested by the example responses above, the greatest sense of “threat” seems to lie in unrealistic expectations and an entrenched organisational culture despite all the pushes for reform and change. The associated imperatives for ICT “upskilling” and integration of ICT in teaching and in the curriculum tend to be seen as ends in themselves not sufficiently linked to particular “opportunities” let alone individual or organizational “strengths.”

It is no wonder then that there was such a strong equation of ICT integration with mere skill acquisition which in turn was equated with future employment. Thus this was not just *despite* but perhaps *because of* the top-down policy efforts to change mindsets and enlighten teachers and the education system generally to how *innovation, generic skills* and *applied knowledge* are the keys to future education, the development of a knowledge society and competitiveness in a global economy. Because of the general failure to connect such “visions” with the dilemmas and opportunities of grounded contexts, there remained an enduring sense that teachers and learners alike: (a) remained constrained by a dominant sense of “knowing what we know” (or need to know for the purposes of an exam-based curriculum or, alternatively, giving lip-service to policy initiatives); but (b) are generally not interested in the potentials and possibilities of exploring and learning “what we don’t know.”

Addressing Related “Missing Links”

As indicated above, the participants in this SWOT evaluation were evidently aware that new, different, and even exciting or innovative possibilities associated with the various learner-centered implications of ICTs, are contradicted in practice by transmission teaching methods, a mere skills or theory approach to ICT integration and, above all else, an exam-based curriculum. This is reflected in the conflicting and ambivalent perceptions revealed in responses to the SWOT survey. Whilst there was awareness that aspects of design, application and innovation were important, perceptions of both personal and systemic strengths and weaknesses revolved around the simplistic acquisition of technical skills (or failure to achieve this). Likewise the perception of opportunities and threats focused on the missing links implied from naïve notions that mere access and hardware provision were sufficient enablers for ICT integration on one hand, and that the acquisition of ICT skills was not only important for but could be assumed to automatically transfer into “jobs” (and related pragmatic

outcomes such as a good salary). In short, there was a core awareness of the problems and opportunities at stake but that this was overruled by an entrenched sense of cynicism and inevitability which in turn reinforced the related syndromes of “passive learners” and an idealizing of potential ICT “magic bullets” (the belief that some new technological program, tool or method will come along which will transform the situation without any real personal effort or cultural change needed).

The SWOT survey also identified the related tensions and contradictions of three central issues of teaching and learning brought to a head by the challenge of ICT integration: the process of learning, assessment, and the failure to link school and extra-curricular uses of ICT. That is, “ICT integration” – as it is generally understood with respect to the learner-centered implications of ICT – is not really possible in an intractable *exam-based curriculum* which at the same completely undermines and contradicts all the new policy initiatives for pedagogical, curriculum and systemic reform or change. Clearly there was general awareness of how the challenge of ICT integration exemplifies and presupposes the increasing importance of the process of learning grounded in applied contexts of ICT usage as distinct from the didactic transmission and reproduction of “content” (information and/or skills). Likewise, there was significant initial interest in considering and investigating the kind of new assessment as well as teaching methods and learning approaches needed to harness more effectively the learner-centered implications of ICT. However, at the end of the day most units taught with these and similar cohorts remained largely defined by the enduring and inflexible norm of an exam-based and content-focused curriculum.

The kind of gaps evidenced between theory/policy and applied contexts of practice reflects an endemic resistance to connecting, recognising and promoting the “processes” of learning and using ICTs in or as applied knowledge linked to various notions of “content.” At the learner level, the kind of gap between thinking and doing needing to be overcome to achieve applied or innovative reflective practice is similarly reinforced by a related failure to link interesting and authentic extracurricular practices and knowledge to the learning and use of ICTs in classrooms and across the curriculum. Thus there was a dominant perception that ICT learning and use in schools and formal education was generally unrelated to the exciting extra-curricular home, recreational and related “personal interest” uses on one hand, and the innovative requirements of ICT as focus for a global and future knowledge society on the other.

This case study of a Hong Kong system of pre-service teacher education has epitomized global dilemmas in education of how *top-down imperatives* (of policy, theory and reflection) so often fail to connect with *bottom-up requirements and possibilities* of applied knowledge in local contexts of practice. Where the general challenge of ICT integration is concerned especially, three interrelated spheres of dilemma in particular might be recognized. At an immediate and performative level, it is clear that a grounded “hands-on” approach to teaching and learning with ICT is needed to better connect pedagogy and technology on one hand, and ground reflection, innovation and knowledge in applied contexts of practice on the other. The dilemma of grounded and relevant practice tends to be reinforced by oppositional (as distinct from convergent and dialogical) notions of a tension between old teacher-centred and new learner-centred approaches to the use of ICT in education. Likewise, organizational and institutional responses to the challenge of ICT integration similarly tend to take an oppositional rather than convergent and dialogical relation to tensions between various conflicting senses of an underlying “cultural” context. In other words, educational “change and improvement” represents a globally relevant but locally situated cross-cultural perspective and focus for dialogue in relation to the interplay of *pedagogical, institutional* and wider *social* including international contexts on one hand, and the cultural tensions of young vs old, tradition vs modernity, East vs West, us vs them, here vs there, etc.

Again SWOT is useful in reminding us, as Fullan (2001) has pointed out, that the challenge of ICT integration is ultimately and above all else an issue of *leadership*. This is not so much in traditional, imposed “top-down” terms but rather in relation to designing, facilitating and engaging grounded contexts of dialogue, practice and “cultural” change. At the level of teaching and learning, SWOT exemplifies the timeless agency of teaching to provide an appropriate space for interaction or reflective practice yet, also where appropriate, directly engage, encourage and even challenge learners in terms of their underlying preconceptions and aspirations. Relatedly, SWOT further provides for the kind of methodological approach needed to make sense of, as well as also engage relevantly and effectively with, larger systemic and applied contexts of “change and improvement”. This is especially germane where the global yet local challenge of ICT integration in education is concerned.

Conclusion

Many teachers already use a simple or initial version of SWOT as an introductory tool or pretext for discussion and reflection linked to practice and authentic contexts. This paper has refined and developed the notion of how SWOT might be further developed and refined: (a) as part of an authentically situated, and “applied” approach or methodology of interpretation in educational technology knowledge-building and reflective practice; (b) especially in terms of the basic educational and research strategy of “change and improvement” (not merely the reproduction of passive minds); and (c) in relation to the interdependent interplay of personal/pedagogical, organisational and wider socio-cultural contexts of relevance. Where the challenge of ICT in education is concerned, a SWOT framework provides an exemplary as well as exemplifying approach for better identifying and engaging with: (a) the latent ambivalences, preconceptions and “negative self-fulfilling prophecies” about ICT held by many teachers on one hand, and also (b) the related dilemmas, tensions and missing links between “top-down” policy, theory and reflection and “bottom-up” contexts of applied practice on the other.

A Hong Kong context has provided a case study focus for both applying SWOT and investigating the global as well as local dilemmas of ICT integration in education. This is for many reasons but especially in terms of how Hong Kong education has embraced innovative policies of ICT integration and educational reform in the wider context of being one of the most wired societies in the world in extra-curricular contexts – imperatives often at odds with residual educational/social values, an entrenched institutional and bureaucratic regime resisting change, and the implications of an apparently non-negotiable exam-based curriculum. In terms of such underlying tensions, ambivalences and agendas, a Hong Kong context for exploring the global yet local challenge of ICT in education has shown how a dialogical as distinct from merely imposed function of “leadership” provides the key to overcoming missing links between top-down imperatives and local contexts of practice. In Hong Kong as elsewhere, a SWOT approach is especially useful on occasions where analysis is focused on furthering (not an end) to the fundamental imperative of “change and improvement” in teaching, learning and general educational knowledge-building.

References

- Aviram, A. & Talmi, D. (in press). ICT and education - The lacking discourse. In J. Hernandez and Goodson (Eds.), *Geographics of Educational Change*. London: Kluwer. Retrieved May 14, 2005, from http://www.elearningeuropa.info/extras/pdf/ict_impact.pdf
- Cuban, L. (2001). *Oversold and underused: Computers in the classroom*. Cambridge, MA: Harvard University Press.
- Design-based Research Collective. (2003). Design-based Research: An emerging paradigm for educational inquiry. *Educational Researcher*, 35(1), 5–8.
- DETYA. (2002). *Making better connections: models of teacher professional development for the integration of information and communication technology into classroom practice*. Retrieved June 5, 2005, from <http://www.dest.gov.au/NR/rdonlyres/3A88BB29-9798-49A1-90DB-0E46590E96BF/1593/MBC.pdf>
- Fullan, M. (2001). *The new meaning of educational change* (3rd ed.). New York: Teachers College Press, Columbia University.
- Education and Manpower Bureau. (1998). *Information Technology for learning in a new era: Five year strategy*. Hong Kong.
- Education Commission. (2000). *Education blueprint for the 21st century*. Hong Kong: Education Commission Printing Department
- ISTE. (1999). *Will New Teachers Be Prepared to Teach in a digital age?* Milken Exchange. Retrieved May 20, 2005, from <http://www.mff.org/publications/publications.taf?page=154>
- Khurana, A. (2004). *Understanding and using swot analysis*. Technical report, About, Inc., 2004. Retrieved March 17, 2005, from <http://businessmajors.about.com/cs/casestudyhelp/a/SWOT.htm>
- Laurillard, D. (2002). *Rethinking university teaching: A conversational framework for the effective use of learning technologies* (2nd ed.). New York: Routledge/Falmer.
- Lee, M. (2002). A tale of two cities: Comparing higher education policies and reforms in Hong Kong and Singapore, *Australian Journal of Education*, 46(3) 255–286.
- MacDonald, R. (2004). *What counts as ICT integration?: A new theoretical framework for levels of technology*. AARE Conference, Melbourne, 2–7 December. Retrieved April 10, 2005, from <http://www.aare.edu.au/04pap/mac04222.pdf>
- McAnear, A. (1999). *Will new teachers be prepared to teach in a digital age*. Milken Exchange & ISTE commissioned report. Retrieved March 15, 2005, from <http://www.mff.org/publications/publications.taf?page=154>
- Orrill, C. (2001). Building technology-based, learner-centered classrooms: The evolution of a professional development framework. *Educational Technology Research and Development*, 49(1), 15–34.

- Papert, S. (1999). Technology in schools - To support the system or render it obsolete? Milken Family Foundation. Retrieved May 5, 2005, from http://www.mff.org/edtech/article.taf?_function=detail&Content_uid1=106
- Papert, S. & Cavallo, D. (2002). The Learning Hub: Entry point for 20th century learning. MIT Media Lab. Retrieved May 5, 2005, from http://learning.media.mit.edu/courses/mas713/readings/ml_learning_hub_manifest.pdf
- Pearson, J. (2001). IT in Education: Policy and provision in Hong Kong schools. *Journal of Information Technology for Teacher Education*, 10(3), 271–282.
- Reigeluth, C. & Frick, T. (1999). Formative Research: A methodology for creating and improving design theories. In C. M. Reigeluth (Ed.), *Instructional-design theories and models: A new paradigm of instructional theory* (Vol. 2). Mahwah, NJ: Lawrence Erlbaum Associates.
- Richards, C. (2001a). Changing with the times: Using action research to introduce IT in classroom teaching. *REACT*, 20(2), 7–16.
- Richards, C. (2001b). Metaphor, education, and computer interaction. In M. Chaib (Ed.), *Perspectives on Computer Interactions: A multidisciplinary reader*. Lund, Sweden: Studentlitteratur.
- Richards, C. (2003). A discussion paper about ICT in teacher education: Some common misunderstandings and dilemmas. *IAT Teaching and Learning Bulletin*, No. 1, IAT Department, HKIED. Available at <http://www.cameron-richards.net/papers/ltissues.htm>
- Richards, C. (2004). From old to new learning: Global dilemmas, exemplary Asian contexts, and ICT as a key to cultural change in education. *Globalisation, Societies and Education*, 2(3), 337–353.
- Schon, D. (1987). *Educating the reflective practitioner*. American Educational Research Association Conference. Retrieved May 15, 2005, from <http://educ.queensu.ca/~ar/schon87.htm>
- Somekh, B. (2004). Children's concepts of ICT: Pointers to the impact of ICT on education within and beyond the classroom. In N. Davis & A. Brown (Eds.), *ICT and Education: World Yearbook 2004*. London: Kogan Page.
- Stallard, C., & Cocker, J. S. (2001). *The promise of technology in schools: The next twenty years*. Lanham, MD: Scarecrow.
- Walker, A. (2004). United they stand, divided they fall: Reform disconnection in Hong Kong. Proceedings of *Making Educational Reform Happen: Learning from the Asian experience and comparative perspectives*, Bangkok, September.
- Watson, G., Proctor, R., Finger, G., & Lang, W. (2004). Auditing the ICT experiences of teacher education undergraduates. *Australian Educational Computing*, 19(1), 3–10.

Appendix

Integrating ICT in a Hong Kong context of education: A SWOT survey
SWOT analysis is an effective way of identifying your Strengths and Weaknesses, and of examining the Opportunities and Threats you face. An analysis using the SWOT framework can help you to focus your activities into areas where you are strong (or want to improve areas of weakness) and where the greatest opportunities lie. Strengths and weaknesses can refer to either yourself or to some group you belong to (internal). Opportunities and Threats are seen in relation to an “external” environment or situation faced either by yourself or to some group you belong to.

As a prospective teacher who will be expected to use ICTs in your teaching (and the learning of your pupils) in Hong Kong schools, how do you see your own strengths and weaknesses?

STRENGTHS [e.g. What advantages do you have? What do you do well? What relevant resources do you have access to? What do other people see as your strengths?]:

WEAKNESSES [e.g. What could you improve? What do you do badly? What should you avoid?]:

*In Hong Kong as elsewhere, future teachers will be expected to use multimedia and ICT in their teaching in schools and in the learning of their pupils. Do you mainly see this as an opportunity or threat? **What are the main opportunities and also the main threats you see in this expectation of Hong Kong teachers?***

OPPORTUNITIES [Useful opportunities can come from changes in IT, in policy, and expectations of teachers, etc. ... Where are the good opportunities facing you? What are the interesting trends you are aware of?]:

THREATS [What obstacles do you face? Are the required requirements and expectations of teachers in HK changing? Are changing technology hardware and software a threat to teachers? Could any of your weaknesses seriously threaten your future job as a teacher?]:

Let's think about it

Considering the strengths of web-based collaboration

Tor Ahlbäck & Linda Reneland

Introduction

A worldwide lack of teachers has created an increasing amount of web-based teacher training programs (Roberts, 2002). To be able to develop and maintain quality and substance to ICT supported teacher-training programs, there is a great necessity and need to study and document learning processes and conditions for learning in these Virtual Learning Environments (VLE's). This paper is a follow-up on a study of a collaborative knowledge building process in a VLE, identifying factors and student strategies that can affect collaborative learning (Reneland & Ahlbäck, 2003).

Although assignment and design often encourage co-operation, web-based teaching still often signals a single learning process as opposed to a collaborative learning process. A collaborative process more corresponds with democratic skills and an epistemology of sharing and not owning knowledge that is represented by the Swedish curriculum. Research shows that teacher education fail in joining theory and praxis (Robinson & Latchem, 2003). It is therefore important to develop collaborative learning conditions for teachers to-be, in order for them to experience, reflect upon and consider in their own future teaching, this especially since methods used during training have an impact on teachers' professional practice (Hensvold, 2004).

The fact that knowledge is contextual and enhanced by articulation (Koschmann, 1996) gives us a challenge when it comes to applying collaborative learning to a VLE. In taking that challenge and designing a collaborative assignment for teacher students, the analysis (Reneland & Ahlbäck, 2003) showed differences between student groups in terms of results

and strategies. So we confronted a new group of students (approximately 100) with these results at their course introduction. Within a week from the course started we got spontaneous calls and mails from our teacher colleagues about the intensive interaction on the platform, not at all experienced the previous year. Both electronic and physical actions seemed to have increased from year one. But was this a fact? We saw an opportunity for an interesting follow-up study. So this paper is a comparison and a discussion around how student strategies between the two years changed and why.

Background

The course studied is part of a distance teacher-training program, aimed at practicing teachers without an exam. The overall aim of the collaborative assignment, is for students to develop an understanding and knowledge founded in theories of learning, to be able to reflect upon conditions for their own and others' learning process. The design of the assignment rests upon the infrastructure of learning as a combination of three modes: engagement, alignment and imagination (Wenger, 1999). "*As a context for learning engagement is not just a matter of activity, but for community building, inventiveness, social energy, and emergent knowledgeability*" (Wenger, 1999, p. 237). Imagination is about creating images of the world and see its possible connections. In alignment, students coordinate energy and activities in order to fit with broader structures and contribute to them.

The evaluation criteria for the whole course were discussed and agreed upon with the students at course introduction.

The results from three groups from each of the two major strategies were evaluated (a total of six groups). The result of the collaborative process showed progression in results for all groups where groups A and B came to represent outliers.

In terms of strategies these two "outliers" differed. **Group A** used all tools in the VLE. Their asynchronous discussion group was very active and the chat was used twice in reference to this particular assignment. Group A scored an average of 5,75 (of 21) for the individual paper.

Group B however, chose not to use the chat. They expressed a negative attitude towards the chat and their group strategy was characterized by presenting all their texts as attachments. Group B scored 6,5 (of 21) for the individual writing.

Figure 1. **Assignment lay-out.** Describes the different stages of the assessment where *lecturers*, course *literature* and *evaluating criteria* agreed upon by teachers and students form the base for an *individual paper*. This is followed by a *collaborative process* where students have to *respond* to each other in order to develop a group perspective presented in an final *group synthesis*.

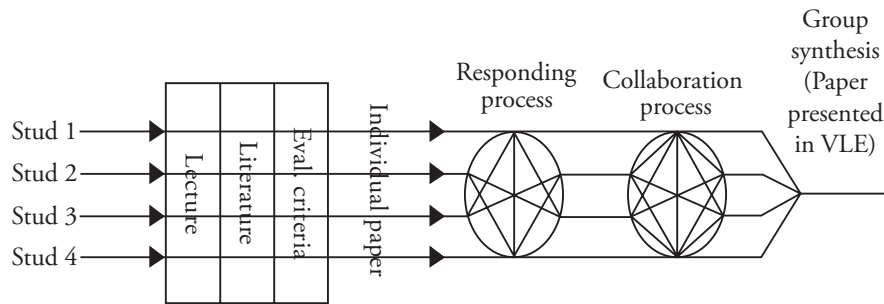
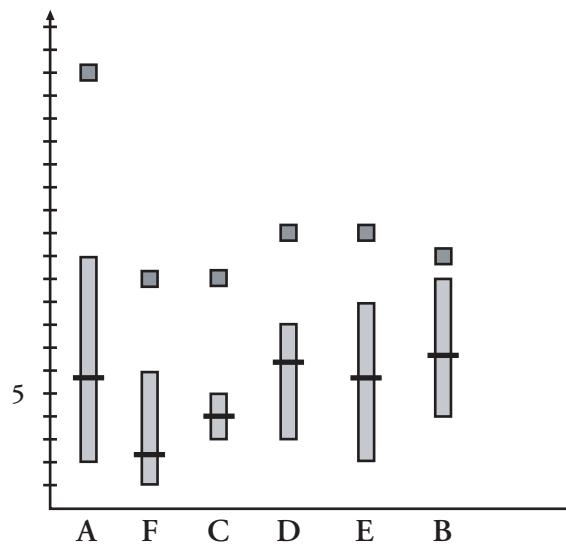


Figure 2. **Progress.** The figure shows spreading between individual results, group mean, and group synthesis arranged by size.



So two different strategies were used for commenting on each other – attached files or synchronous/asynchronous discussion. The big difference we identified as important for the result of the assignment, was how comments on individual contributions were made by the other group members. Group A commented on each other in on-line discussions. That meant that they were all synchronised in time and topics. Group B used

attached files for doing this. They read all group members contributions and then commented as attached files and to a greater extent all pursued their own discussion.

Group A produced a piece of *collaborative writing*. In using the word "collaborative" we search for a result beyond what the participating individuals themselves can achieve (Littleton & Hääkkinen, 1999) as opposed to a cooperative process where there is division of labour and power structures for instance (Dillenbourg, 1999). So in group A, reflection had developed towards a group analysis and group hypotheses. Their product presented more theoretical arguments, structure and scored high on references. Group B produced a piece of *co-operative writing* characterised by a division of labour. They did not in any case refer to course literature or lectures in their final product. Group B were still on the stage of comparing experiences within the group.

Group A managed to establish a group culture as a key-factor for their learning process. This group culture allowed them to slow down and develop a common ground for knowledge building. Group B on the other hand did not invest enough time initially. They lack a common ground for knowledge building, which means that their final "synthesis" is built on different individual contributions.

These were the results that were presented to the new students.

Table 1. Categories used for analysing group communication (synchronous and asynchronous).

Name of category	Description
I. Organisation (O)	-when and how to meet -division of labour -references to organising assignments
II. Technique (T)	-asking for help around technical matters -answering/giving help -declaration of problems
III. Peer Support (PS)	-emotional support (Acknowledges specific peer or group of peers in encouraging terms) -academical support (Acknowledges specific content by identified peer or group of peers) -teacher giving either emotional or academic support
IV. Group Culture (GC) establishing and maintaining	-group protocol (summarises actions taken outside conference, sharing, establishing roles, humour) -signalling social presence -apology (declaration of action in relation to tasks or responsibilities)
V. Knowledge Production (KP)	Content (texts, contributing to knowledge process by) divided into : 1. ECG – The establishment of a common ground means that experiences were exchanged, compared and connected. Doubts and suggestions were tried out on the other group members in a search for confirmation. This category also includes statements around personal epistemological values. 2. RP – Refers to peers . Here students acknowledged each other by referring to a specific statement in connection with the name of that student. 3. RR – Refers to reference . Here students connect to course literature, lecturers or other sources specifically. 4. A – Analysis . Introduces explanations, identifies patterns and models. 5. TC - Trying consequences . This is a category of statements where students make references to praxis by describing consequences, problemise or introduce personal hypothesis 6. C – Conflict . This is all statements that introduce a different opinion. 7. OD – By Open Doors we mean statements where students invite peers to think about to the discussion new elements or phenomenon 8. LH – Launches Hypothesis . This refers to examples of how the group tries to express hypothesis founded in their previous discussions.

Theoretical Foundation

This paper uses theories of *metacognition* to describe and analyse the collaborative processes detected. Metacognition is often popularly explained as “thinking about thinking” and suggested to differ from cognition in nature, by how information about cognitive processes are used by the individual. Metacognition thus emphasise the individuals use of his/her cognitive processes (Flavell, 1987).

Metacognition is here used pragmatically, as a tool for adding more approaches to the knowledge process, actively built into course design. A future ever changing society will demand more of student’s ability to use various media for their purpose and thus focusing on the mastering of media and methods instead of content. In mastering different methods meta-cognitive abilities become more important for students to develop (Stigmar, 2002). In order to do so further knowledge is needed around the interaction between teacher, student and medium in terms of metatraining and learning. To stage a conscious reflective activity, the learner must recount the experience, trace connections between the new information and feelings produced by a certain event (Dysthe, 2002). We have used this method for students content knowledge production but also for recounting the learner’s process in evaluating the assignment making also the gathering of data part of the metacognitive experience.

Study objectives

Our aim with this study is to track a possible enhanced metacognitive competence related to us sharing our results with the students.

How would it affect students to be confronted with year one’s results? Would they change their strategies and methods and will their knowledge processes differ?

So in studying year two’s course we have asked us the following questions:

1. How did the students handle the environment in relation to task?
2. What signs of an enhanced meta-cognitive competence did students show?
3. Could any change in attitudes towards collaborative learning processes be identified?

Method

The results described under "background" from the year 2002/2003 were presented to all new students about to experience the same course in the program. This gave us the opportunity to compare working strategies.

The dialogue between students and how they use the mediating tools that support groups of students are of course important sources to their learning. The participants own versions of how they work however, are equally important sources in trying to understand the knowledge process out of a learner's perspective (Dysthe, 2002). Students' written evaluations, individual and group evaluations and web-questionnaires (approximately a total of 100 written individual, some 40 written group evaluations and 200 web-questionnaires over a period of two years) have therefore been used as main data for this study. Comments from these evaluations were categorised in themes: *knowledge production*, *social interaction*, *internal-external control*, and *strategies* – and analysed. Course design was the same both years. Some development of the study-guide had been made from year one to two. A majority of the teachers were the same for the two years. The only major difference between the two years was that students were introduced to our results at the very early beginning (introduction weekend). The teachers were also introduced to the results. This could have affected their feedback strategies.

Results

So how did the students handle the environment in relation to task?

When working together and discussing the task and content in the VLE, students did not use the possibility to attach files to the same extent (year two). Instead they wrote their arguments directly in the discussion and in those cases where they attached their contribution, these were also pasted directly in the asynchronous discussion as a service to the reader. The amount of groups who tried to use the chat did not differ much between the two groups (years). *How* they used it and *how often* differed though.

The first year, a majority of the chats were used for organising work and for keeping in touch. Year two, all chats were used to discuss content (knowledge production). Some groups moved from the asynchronous discussion after publishing their individual contributions for a more "in-depth" discussion in the chat. No group stated that they were not going to use the chat compared to two the first year.

A new strategy where students combined the characteristics of the different tools could be seen. Some groups also expressed how they experienced and expressed different ways of communicating with different tools. Some groups used the chat for its “lively and real time advantages” but logged the chat, which meant that everything could be studied later. This conscious reflection is expressed by comments such as:

The chat is more efficient and it's easier to forward feelings when you are logged in real-time and “talk” to one another. Your personality shines through and there is a chance to explain if things turn out wrong but it is difficult to have time for reflection for more constructive contributions.

The discussion forum (asynchronous) is more for displaying of facts but also a place for reflections and comments

...a security to be able to go back and see what was said

It is easy to get an overview over the discussion

The chat is sometimes better than a f2f discussion since every little detail could be scrutinised afterwards.

One group expressed difficulties with using the chat since they thought too many parallel discussions were taking place and preferred the asynchronous discussion that they thought allowed for “thoughtfulness”. All groups used chat at least one time during the process.

There is a clear difference in how the groups express themselves around the organisation of work. First year the working process was merely associated with “division of labour.” “Work” was described in terms of “dividing task” and “summarize.” That seemed to be the students opinion of what needed to be organised. Year two students described work with more variation:

Logging of the chat was divided between us for several summaries

We communicated organisation

We experienced a dramatic change from dramatic chaos to a constructive exchange of experiences and reflections. Our common experience developed

into a synthesis

The time between the chats were used for reflecting

We had a rotating responsibility for summing up the chat

The structure for work was agreed upon early which made individual involvement easier throughout the process.

The chat was moderated to make things happen

We organised a common chat for reflecting with a clear structure

The transformation to a mutual analysis was done through chatting

What signs of an enhanced meta-cognitive competence did students show?

There was no statistically significant change in the percentage of students who found the assignment relevant for their own professional development, 94% (2003) compared to 86 % (2002). There's also an increase in numbers but no significance in percentage of students who regarded the group important for their own development 87% (2003) compared to 79% (2002).

Students expressed that they could reflect and analyse in a more qualitative way.

We have increased our competence in analysing and reflecting and can let our pupils exchange experiences for an enhanced knowledge production

We've found our own "subculture" where thoughts take new turns when confronted with what others tell about their experiences

Five groups mentioned that an inner control and motivation developed in the group.

...you work out of loyalty and feel bad when you cannot contribute the way you would like

...if someone already started the process you feel a pressure to contribute yourself.

We could also see students commenting on social interaction.

It was liberating to be able to drift into nonsense discussions but I believe that brought us closer together. I think we got to know each other better during those sessions.

It was a struggling iterate process in putting all experiences together in a synthesis [was said in combination with] we didn't get to know each other until this assignment, we learned more and different things about each other compared to the f2f meeting at the University.

The first year students mainly reflected on own personal development and how this had made them think about their own responsibilities and how their development favoured from being "pushed" by others. Year two their reflections also include a future teaching practise.

We have become better listeners and that's a good tool for a teacher isn't it

Could any change in attitudes towards collaborative processes be identified?

All groups described the collaboration in positive wording. That did not differ between the two years. No group expressed anything negative about the collaborative process. A more careful attitude towards collaboration is expressed in some groups with comments like:

...good with possibilities to discuss with others

We get more experiences from teaching this way than other teacher programs

One group expressed that it could be "uncomforting to share experiences." They could also be critical to how tutors handle specific situations when group members left for instance, but are in general positive to the design.

Both years show examples of how the assignment has influenced and inspired to future work with pupils. More groups refer to a pupil perspective and the students learning process year 2 though. Students talk about "better," "broader," and "deeper" understanding due to the sharing and collaboration.

We dared to be more critical due to a better and broader understanding.

Our experience is that you together almost always create something better than what you could have produced yourself

Discussion

Students were definitely more experimental in the ways in which they used the tools. We think this is related to taking part of results on a possible connection between student strategies, use of tools and results. We saw students using chat and asynchronous discussions more deliberately according to how they experienced the tools' characteristics. And yes, students showed signs of an increased metacognitive competence by more qualitatively expressing themselves around their own evaluations and describing their working process. Year one we sometimes experienced a discrepancy between how students themselves described their working process and how we experienced it, probably due to an inability to reflect around process and results. Year two the students identified, connected and related course-activities to their knowledge process in a more reflective and critical manner.

The first year meta-cognition was a *result* of the process/course. Students could express thoughts about their learning. Year two, students were given some reflective tools by being presented year one's results, which probably meant that they discovered and used meta-cognitive thinking as a *tool* in reflecting upon learning and consequences for their future teaching praxis. We have not compared students' results for these to years so we cannot say anything about the possible effect of enhanced metacognitive thinking on student results. However we would like to point out the different processes identified. By making student working strategies part of the open agenda for the course, we witnessed the development of a *learning process* as well as a *knowledge process*.

When it comes to changes in attitudes towards collaboration, no such change could be detected. But the same phenomenon accounts for here; students expressed thoughts about using collaboration in relation to pupils more frequently year two.

By giving students some reflective tools prior to their assignment, we have tried to use metacognitive thinking as "a way to teach" and not as a "subject" itself. Teachers representing other disciplines than pedagogy can be reluctant to bring questions of how student learn into their courses

since they experience it as taking time from subject matters and the “pay-off” is too unsure. But if we argue that there are special conditions for learning connected to different disciplines and environments, shouldn’t we also address the issue of learning strategies through methods in a course?

References

- Dysthe, O. (2002). The learning potential of a web-mediated discussion in a university course. *Studies in Higher Education*, 2002(25), 339–352.
- Flavell, J. H. (1987). Speculations about the nature and development of metacognition. In F. E. Weinert & R. H. Kluwe (Eds.), *Metacognition, motivation and understanding* (pp. 21–29). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Hensvold, I. (2004). *Fyra år efter examen. Hur förskollärare erfar pedagogiskt arbete och lärarutbildningens spår* [Four years beyond the examination - how preschool teachers experience their education and traces of teachers education]. Dissemination Paper (Summary in English). Stockholm: HLS förlag.
- Koschmann, T. (1996). Paradigm shift and instructional technology. In T. Koschmann (Ed.), *CSCL: Theory and practise of an emerging paradigm*. NJ: Lawrence Erlbaum Ass, Inc.
- Littleton, K., & Hääkkinen, P. (1999). Learning together: Understanding the process of computer-based collaborative learning. In *Collaborative learning. Cognitive and computational approach*. Oxford, UK: Elsevier Science Ltd.
- Reneland, L., & Ahlbäck, T. (2003). *Quality interaction and collaboration in web-based learning – A study of a teacher training course*. Paper presented at the Learning for an unknown future, HERDSA Annual, Christchurch, NZ, 2003, July.
- Roberts, B. (2002). *Interaction, reflection and learning at a distance* (Vol. 17). Carfax Publishing.
- Robinson, B., & Latchem, C. (2003). Teacher education: Challenge and change. In R. A. Latchem (Ed.), *Teacher education through open and distance learning*. (Vol. 3, pp. 1–27). London and New York: Routledge Farmer.
- Stigmar, M. (2002). Metacognition and the Internet – A study of high-school students’ use of information. *Acta Wexionesia No 15/2002*, 307. Växjö University Press.
- Wenger, E. (1999). *Communities of practise – Learning, meaning, and identity*. Cambridge: Cambridge University Press.

Pronett

Networking Education and Teacher Training

Ton Koenraad & John Parnell

Introduction

The PRONETT project was initiated by Archimedes Lerarenopleiding, the department of the Faculty of Education in Utrecht, the Netherlands, responsible for the regional initial teacher training and continuing professional development for vocational and secondary education. For a better understanding of the motives for the project a closer look at the context in time and place is called for.

The PRONETT project definition was inspired by recent changes in Teacher Education Provision in Europe (Furlong et al., 2000) and in the Netherlands (Willems et al., 2000) and in particular by the state funded, Dutch Educational Partnership Project (EPS, 1999–2002). This national project was targeted at innovation of teacher education, provision of a solution to the shortage of teachers (expected to grow to some 15.000 vacancies in 2006) and the delivery of teachers with qualifications required by the changes taking place in (Dutch) schools and society. The competence to apply ICT in designing powerful learning arrangements was considered highly relevant in this respect.

At Archimedes Lerarenopleiding the EPS project has contributed to the development of the current curriculum model based on close collaboration with regional schools. The model integrates subject studies and professional preparation and is nationally known as “The Utrecht Model.” Its key elements are: educational partnership with schools; competence based learning and training; customized study programmes; dual mode approach; and action research support from lectureships.

It aims to meet the requirements of modern higher education as defined locally as:

...education in which students develop into starting professionals and which takes place in interaction with the professional field. The professional field is involved in formulating competences, formulating and providing (study) assignments, giving feedback on students' results and in the assessment and development of knowledge. Students carry out assignments in the role of the starting professional, which means that they produce work of a high level and that they can demonstrate that their work meets relevant current standards. ICT is an important tool in creating a rich learning environment as well as in creating the necessary conditions: the use of ICT makes it possible to organise educational processes differently. (HvU Education & ICT Knowledge Platform 2003, p.5)

Monitoring of ICT Developments in (Teacher) Education in the Netherlands

For the evaluation of its ICT policies (Ministerie van Onderwijs, Cultuur & Wetenschappen, 1999) the Dutch Ministry of Education commissions various studies, among which the ICT-Education Monitor (Kral et al., 2002). Some trends in the monitoring reports which are applicable both to teachers and teacher educators are:

- Use of VLEs¹ occurs in teacher education but is only in an experimental stage in secondary education; scarce presence of ICT-use for pedagogically innovative approaches; secondary schools rate their use of ICT for learning as “beginning,” half of the Teacher Training-providers consider themselves advanced in this respect (Braam, 2001; Inspectie van het Onderwijs, 2001a).
- Despite the fact that ICT increasingly forms an integral part of school policy there is still a lack of competence and confidence among staff to integrate ICT in teaching (Vreugdenhil et al., 2003).

Teacher Education organisations' potential role in school development is also reported in independent studies initiated by the “ICT op School” Foundation²:

For a further implementation of ICT in education most school boards are in need of support for the instrumentation of professional development and educational innovation. There is also a need for concrete help with the integration of ICT in daily lesson practice. (Stegers, 2002)

The EPS-project, being a major national project, was subject to an additional, dedicated monitoring procedure carried out by the Inspectorate. The first interim report was highly critical of the developments in the ICT domain of the EPS project.

The main points of criticism can be summarised as: ICT as a didactic tool has not been adequately integrated in the teacher training pedagogy. Trainers' ICT expertise is at the level of basic skills, excepting those involved in expert centres. Student teachers are not adequately prepared to apply ICT in their future careers. Forms of professional development considered to be effective such as collaboration with schools and (international) collegial networking are scarce. Teacher education providers are explicitly summoned to support regional experiments necessary for innovation and help the develop knowledge building involved (Inspectie van het Onderwijs, 2001b).

A Dutch Benchmark for ILT³/ICT-Rich Teacher Education Provision

Confronted with the monitoring results a national working party of teacher educators (the ICT-Network, one of the results of the EPS-collaboration between Teacher Training providers), focusing on ICT issues in teacher education, decided to develop a description of features defining what is called an "ICT rich" Teacher Education programme. For a description of this instrument and a number of illustrative practices see Koenraad et al. (2004).

The EU-Project PRONETT

Project goals

The publications (Parnell, 1998, 1999) on some of the functional uses made of ICT at the University of Cardiff led to an exchange of ideas and a partnership to develop a project proposal. Coalition to define an EU-project with international partners was triggered by the urgency for action emanating from the various monitoring reports and the developing (ideas for) national benchmarks for ICT-rich Teacher Education (Kirshner &

Wopereis, 2002) on the one hand and the lack of local educational leadership in the ICT domain on the other.

The project's aim is to develop a regional and cross national networked learning community of pre- and in-service teachers and teacher educators in Primary, Secondary and Vocational Education. A web portal offering a virtual infrastructure that supports the (co)production, execution and evaluation of practice based ILT-rich learning is seen as a facilitating instrument. In line with the participatory model of modern higher education (Collis & Moonen, 2001) the portal is expected to help the student teacher to realise her role as a starting professional (HvU Education & ICT Knowledge Platform, 2003) in the domain of information and learning technology.

Literature study

As comparable problems with the integration of ICT were experienced by the other core project partners (Cardiff University, University of Gent, Autonomous University of Barcelona) a literature study was called for to define the needs at a European level. The assumptions below were largely corroborated by the available data.

- The use of ICT in schools is on the increase but many teachers do not exploit the use of ICT skills into new methodologies of learning and teaching in curriculum practice.
- The potential of ICT as an educational medium for changing the pedagogy of teaching and learning has yet to be fully exploited.
- New web portal software provides exciting instruments for the realisation of constructivist principles and related forms of collaborative learning, problem solving and the creation of collective new knowledge (Koenraad et al., 2002).

PRONETT Web Portal

The multilingual PRONETT portal is a customised version of *Plone*, the Zope-based Content Management System (CMS). The inspiration for the initial design of the portal has come from an analysis of the local needs observed by the project partners and the project's literature study (Koenraad et al., 2002) on relevant project related issues in Europe such as ICT

training and tools in schools, teacher education, virtual community development and school needs. Other considerations refer to critical features of successful continuing professional development approaches in the ICT-E domain such as: needs based, learning by doing, enabling “design & try-out & evaluate”-sequences, on-the-job elements promoting reflection and feedback (also in networks of teachers) (van Eck et al., 2001).

Members have access to personal workspaces to which all sorts of content-types (file, picture, document, forum tool, etc.) can be added and published. Contents developed in a so-called project folder can be published into a database which is searchable with a dedicated search-engine.

Access to these learning objects is meant to facilitate reuse of educational content and stimulate the dialogue between educational organisations and actors (teacher educator, teacher trainee, school based coaches, and in-service teachers). This dialogue is seen as preconditional for the development and sharing of knowledge related to ICT-related pedagogy in (subject) teaching.

Schematically the main ideas in the design philosophy can summarised as seen in Figure 1 below:

Figure 1. PRONETT portal design principles

PRONETT design principles	Web Portal Element	Functionality
<i>Empowerment</i> of individual (student) teachers.	Personal Workspace	Web-based virtual project room, building blocks for designing flexible learning.
<i>Enabling</i> the production of innovative and customized learning materials and environments.	Edu-Tools	Educational engines and templates (e.g. WebQuest-editor).
<i>Support</i> for communication and collaboration by professionals.	Forum	Help and advice, knowledge sharing, offer and demand of products and services.
<i>Access</i> to and re-use of learning objects. Resource for ICT-E curriculum (e.g. metaevaluation)	Published Projects Catalogue	Show and Share results of course assignments and work related projects. Quality assessment.

Exchange and communication between individuals, project teams and organisations is supported by a “public” forum. Its file sharing and decentralised user management facilities make it very suitable for CSCL⁴ approaches and project- and case-based learning, the usefulness of which is widely recognised in higher education (Simons et al., 2000).

The automated registration feature of this Open Source software is considered important in this respect as it makes students and individual teachers less dependent on the software provision of their Teacher Training

provider and/or at their placement and workplace schools. Especially in a competence based curriculum model this independence is essential as it offers users possibilities to experiment with web-based teaching regardless of the presence of (or access to!) a local VLE.

It also opens up possibilities for individuals to solicit for alternative ways of help or coaching in the event of the (not so unlikely) absence of adequate local support, specific expertise or tutoring. It will also help to disseminate the project as there are no administrative obstacles for teachers and student teachers of other organisations in the European member states to start participating.

PRONETT Portal Implementation Pilots

The Utrecht Implementation of PRONETT

Next to contributing to the general PRONETT Project objectives the Utrecht based project partner defined targets to support the further development of The Utrecht Curriculum Model and in this way also contribute to the realisation of the ICT-rich Teacher Education Provision as benchmarked by the Dutch national EPS-ICT-network (Koenraad et al., 2004) and as adopted by ADEF, the federation of Dutch TT-providers.

In this view workplace and school practice related activities are seen as the best part of the curriculum through which the teacher education institute can contribute to developments in the ICT-E domain at regional schools. Consequently workplace based learning is expected to be ICT-rich and to facilitate the student teacher in bringing innovative practices to the school and contributing to school defined needs.

Implementation goals and strategy

Expected results of the pilot implementation phase were:

- An evaluation of the feasibility of using school-based defined needs as input for curriculum activities.
- A scenario and materials for the full implementation of a demand driven curriculum where ICT-rich education is concerned.
- A contribution to the evaluation of the Graphical User Interface of the PRONETT Portal: data collection of user experiences.

A plan for the pilot implementation phase was developed in line with the guidelines: (1) Don't forget the road map, (2) Follow the leader, (3) Be just in time, and (4) Watch the 4 Es. This advice (Collis & Moonen 2001) has been adopted as a generic PRONETT implementation approach. A combination of top down and bottom up strategies was applied.

Management as initiator of the full implementation and middle management (ICT-coordinator) to function as leader of the pilot implementation. And involvement of specific, potentially successful teams (Modern Languages, Internationalisation Office) and individual teachers (advanced ICT-users). To reach the goals mentioned two types of activities were carried out:

- a) experiments by teacher educators
- b) activities by a working party to operationalise regional collaboration

Results

Pilots at Archimedes Lerarenopleiding

Eight teacher educators in 6 different teams were approached. After having been introduced to the portal functionality by PRONETT team members in individual sessions four teacher educators in 3 different teams (English, French and Spanish) decided to participate in the pilot implementation. Foreign language methodology courses (n=4) involving the production of web-based materials by student teachers (n=73) were selected as the context for experimentation.

One teacher in the Internationalisation Office decided to experiment with the provision of virtual support for a two-day, live conference event for student teachers in the Netherlands (n=75). Typical course activities and tasks are:

- motivated selection of authentic resources (paper/multimedia) on the basis of instructional criteria,
- presentation of educational reviews of course book materials and URLs,
- design of communicative activities and task based activities such as WebQuests for a specific target group of learners in the 12–16-age range by dyad project teams.

An important motivation for the trainers' participation was the provision of facilities for computer supported collaborative production of materials

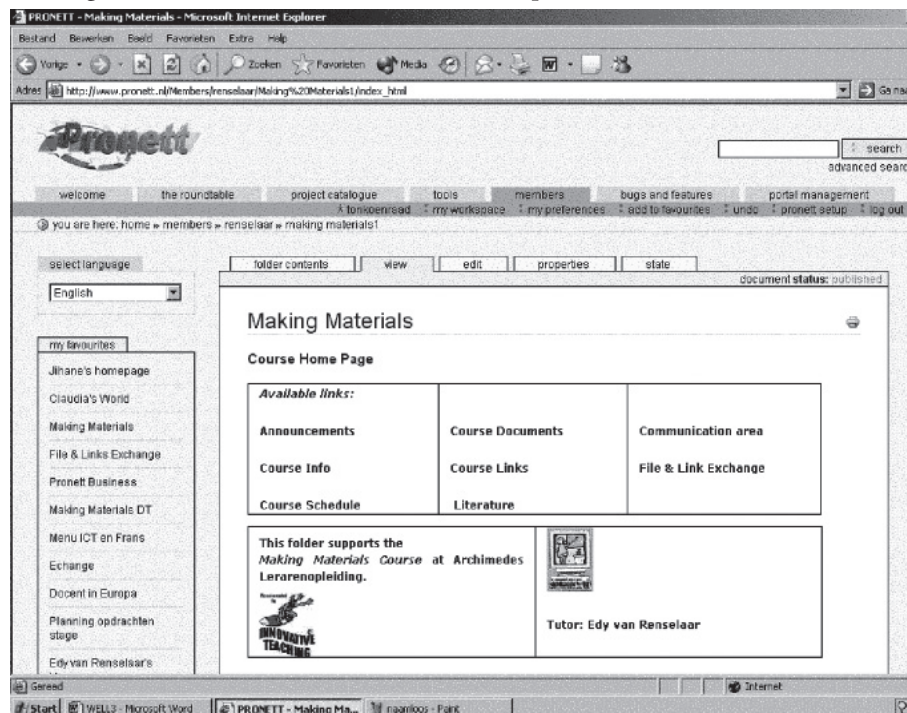
and the opportunity for students to actually publish their results⁵. The trainers, with a view to their personal professional development, also welcomed the chance of experimenting with virtual environments and blended⁶ learning.

On the basis of the available, paper based course syllabus the teacher educators and the PRONETT coach collaboratively developed ideas and defined the related functional specifications for the online support of the courses.

Some training was given to develop vital skills for the realisation of their role as e-moderator (e.g. uploading relevant documents, presentation of links, placing last minute messages, allocating rights to individual students for specific folders).

The technical realisation of the support structure was then realised by the PRONETT team. Figure 2 below shows a workspace-folder of one of the participating teacher trainers to support her methodology course “Making Materials.”

Figure 2. Course folder in teacher’s workspace



For those courses that required students to develop web-based materials, specific templates (WebQuest, E-zine format) were developed. Partly to

avoid the need for training students in the use of yet another piece of software beside PRONETT (e.g. FrontPage) and partly to facilitate the publishing process of those materials within the PRONETT environment.

For more information on the implementation pilots in the Modern Language Department see Koenraad et al. (2003).

Regional Collaboration

With the aim to further operationalise the ICT-rich workplace-based learning concept a working party consisting of the Archimedes implementation team and ICT co-ordinators from 4 regional, affiliate schools has explored the feasibility of using school based defined needs as input for curriculum activities. This has resulted in an inventory of (pre)conditions for the implementation of school defined curriculum tasks, a (concept) list of school defined ICT-needs⁷ and a description of the tasks and responsibilities for the actors involved in the task definition and coaching of the developmental work by student teachers.

Utrecht pilots evaluation

In the foreign language course groups all students met the course requirements and produced web based educational materials. No formal assessment procedure was followed for publication of course products in the PRONETT materials database.

The teacher trainers involved required compliance with course requirements and the related criteria set for final products. For the students of French this meant applying the LanguageQuest design principles and the related evaluation rubric developed by the TalenQuest project (Koenraad & Westhoff, 2003). Products were shown and results reported and discussed (peer and tutor feedback) during a final plenary session.

Most student collaboration seem to take place during the f2f-meetings and work sessions at the institute. Student dyads usually sat together in front of PCs adding or editing content in one of the partner's folders.

The Spanish workgroups appointed one of them as web-master so that one folder in this student's workspace could be used as a virtual editorial boardroom and for the hosting of the final product.

Contrary to expectation (especially where the language students were concerned) no overt attempts to make international contacts have been registered. Hardly any observable⁸ computer-mediated communication took place beyond course or project groups, even within the same language community, let alone trans-nationally.

From the After Action Reviews (AARs) with the teacher educators it appeared that a course period of 7 weeks dedicated to the production of web-based materials can only foster such communications if the production teams are international and/or explicit tasks for this domain are set. Existing courses need to be redesigned if an integrated approach to competence development in the areas of e-learning and CALL-methodology and its related ICT-skills is to be realised. Besides, trainers also reported lack of time to use the course support site provided in their workspaces to actively experiment with e-learning and online moderating.

A general conclusion was that to really benefit from the functionality for virtual collaboration offered in the PRONETT portal teacher educators and students alike will have to be explicitly introduced to some of the available features to become confident and independent users. For similar findings see van Vliet et al. (2003).

Implementation Pilots at Cardiff University

PRONETT members in Cardiff included PGCE pre- and in-service and BEd Voc. students. In the pilot implementation a focus group and volunteer users participated.

Main activities included:

- Folders for web publishing and creation of quest templates (In-service teachers).
- Reflective and periodic journal accounts whilst on placement (PGCE).
- In-service peer group interactions in developing teaching resources.
- BEd voc degree students for conferencing and writing collaborative papers ~ an initial trials with power point presentations.

All products processed within PRONETT were part of the formal assessment process in the course programmes at Cardiff. Work was evaluated to the criteria stated for the assignments.

Collaboration

Member workspaces have been effectively used for projects which encouraged collaborative use of shared folders. An example is the development of and preparation for art work over a period of time and other approaches to learning. (Constructing paper assembled landscapes as a design brief for

a landscape project.) Here, the front web page format of the topic folder was used to display the class results at the end of the workshop session by hosting and editing digital photographs. Project information could be beamed directly to the whiteboard from portal workspaces to illustrate construction and overlay techniques etc.

The portal demonstrated functions here which were both virtual and real time in application. The portal appeared to be an effective classroom instrument for learning as well as a collaborative platform for preparation and delivery. Such workshops can be either student group led or teacher centred depending on context or topic. Results, and other information etc. are always accessible to all students if work is published in a project folder item within the portal: as non members can access this interface menu area in the portal.

Learning journals and placement portfolios

Many students kept comprehensive placement portfolios including their fortnightly learning journals in their workspaces. These were shared with given roles assigned to tutors and peers alike in terms of editorial access. Tutors could access and examine files from home or at work whilst trainees could complete and update portfolios as required.

Lesson folders and home work project folders could be published and accessed by class groups in the catalogue section of the portal as non-members. Workspaces and PRONETT were thoroughly appreciated by students who were placed at distance from the University, e.g. the Channel Islands-Jersey.

Cardiff pilots evaluation

Access to personal workspaces and the functionality provided by the portal was appreciated and used well. Editing within the PRONETT workspace was effective once the system was learnt: as was the case in the trial group but not in the uncontrolled group.

PRONETT following the pilot evaluation, meets user's expectations as a useful collaborative "workbench". At least this is the perceived view. It is seen as a web tool which facilitates working together on assignments and events. Both questionnaire and focus group outcomes highlight the portal role in this respect. PRONETT is not seen as a resource database partly because there is a reluctance to place work in a domain where there is varying quality and no "interface" monitoring function. Besides, lack of understanding about metadata and classification does not help. Given the nature of current assessment and the high focus on individual performance

against course criteria it is difficult to see students showing their work in the catalogue for fear of plagiarism and or ridicule if they fall below par or expectation.

Ironically there was reluctance therefore to publish work as students were conscientious of their work being peer reviewed and subsequent correlation with grades received. Current course approaches, audit trails and practice and its associated ethos for measuring everything against FENTO standards apparently goes against collaborative working methodologies and the employment of new approaches to networking and learning.

An older paradigm of training and central agency control over the ITT curriculum in terms of policy and practice is in many ways thwarting new patterns of innovative working and expectation. PRONETT nevertheless functions well when used in given focused and driven contexts in parallel to existing audit and curriculum processes. It is an effective generic tool which can be applied imaginatively.

Students appreciated that a homepage could be constructed using the web format and embody live links and pictures. Once realised, lesson plans and events followed which exploited the potential of posting other web objects and assessment scripts on the front page of various work folders. In this case the student made links to Finland. WebQuests likewise can be constructed using project folders from the item list and published to the catalogue for students to complete or undertake as an assignment.

Others report on opportunities the portal offers to experiment with web-based teaching and learning while on placement.

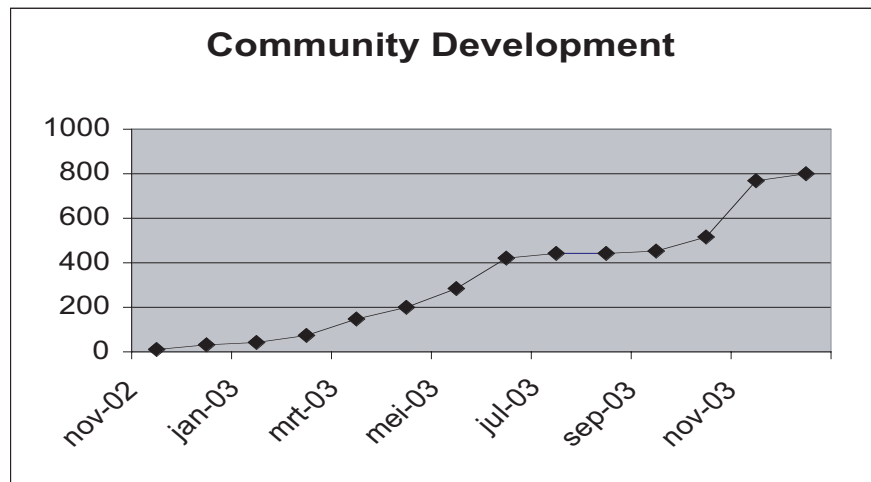
Discussion

Portal Membership Development

In the first 12 months since its first publication in November 2002 some 750 students and teachers have taken out an account on the portal. After a gentle take off in December 2002 when a number of Cardiff students began using the portal a growth spurt in the period between March and June 2003 marks the start of the pilots by the partners in Belgium and Holland. With the holidays approaching membership growth stopped at 455 in July. Then in October 2003, with academic life picking up speed again, an international cohort of some 250 new arrivals came on board. As

system maintenance has been carried out over time in terms of removing double or dead accounts (due to failed registrations) this graph gives some idea of the quantitative scope of the project in its first online year.

Figure 4. Portal membership growth



Usability Research

The experiments so far have shown that it is possible, with very limited developmental work, to use the portal to support such diverse contexts of use as:

- an online support for “traditional” courses (blended learning)
- the provision of tools and publication facilities for educational design courses
- the collaborative production of web-based materials by teams
- a stimulating environment for task-based and autonomous language learning activities
- virtual facilities to prepare and support a (student) f2f conference
- web publication of educational material
- coaching at a distance (learning journals)
- student portfolio

This flexibility is seen as an advantage over standard VLEs and is well appreciated by the competent ICT-users. For a similar conclusion also see van Vliet et al. (2003). This very feature, however, also causes problems

for less sophisticated users. Some of whom – in the context of a particular course – felt that the options offered were not in balance with the tasks required or even frustrated an efficient realisation.

Graphical User Interface (GUI)

One of the targets of the piloting phase of the project was to test the portal's design and interface. With the help of various instruments (online questionnaire, interviews, written evaluation forms, observations) data has been collected about user experiences with the environment. Data received has usefully been incorporated into the new and latest version of the portal. Overall, student reactions can be characterised as fairly positive. Critical remarks, most frequently found in the Dutch cohort, seem to carry the message that the site offered more functionality than users felt they can cope with.

The project's team general conclusion as to the overall design philosophy for the portal was that future development should be rather on the improvement of the individual workspaces and increase the ease of collaboration roles in content production and publication.

Among the new features and adaptations are the use of colour schemes to support the user's sense of location, a further structuring of the search facilities for members and projects and the use of more communicative interface terms and tab-labels to name but a few.

Furthermore we concluded that next to an improved user interface more is needed to promote the actual adoption and active use of the portal. Prospect users should be inspired by more and detailed documentation of "innovative practice." And that explicit training is needed for all concerned on how to use the workspaces.

The main changes have been based on the results of the pilots by the project core partners and the accompanying user evaluation research. Next to points of improvement this research has also revealed needs for additional features such as more facilities for member grouping, a facility to enable any Pronett member to invite attention for or participation in his/her project and an Online WebQuest Editor.

The Trans-National Dimension

At this stage of development (limited number of materials and curriculum driven activities; no moderating activities at portal level) students nor teachers, after being informed of its existence, apparently start using the

portal of their own accord. We assume that as yet things will only get going through curriculum based impulses: i.e. teacher educators who take the initiative to embed use of the portal in their teaching and define explicit tasks and activities for students to do.

Based on observations of the publicly shared areas of the portal we must conclude that there is still great reluctance on the part of the current member population to make use of the asynchronous communication facilities beyond their own course or project groups. Further evaluative research should focus on the workspaces owned by individuals and project groups. Additional user surveys and server data analysis will be needed to assess the size and form of activities, collaboration and knowledge-sharing that takes place in individual workspaces.

This does bring home, however, the complexities involved in developing a distributed community of practice across organisations. As similar observations have been made by other project partners, development of local community cells will be given priority, as the existence of active local groups is seen as preconditional for the germination of an international dimension. “*The differences in time-zones, affiliation and culture combined with size and a heavy reliance on technology make distributed communities different from local ones in several important ways*” (Wenger, 2002, pp. 119–120)⁹.

On the other hand, now that some of the educators, after the pilot runs, realised the chances offered for international collaboration and educational projects, internationalisation and authentic use of foreign languages for language learning existing courses are expected to be adapted to include these goals. This suggests another strategy to be explored at project level: “e-twinning,” the teaming up between partner-based teacher educators involved in comparable curriculum activities.

Conclusions

The evaluative data collected during the pilot phase has led to the following points for improvement and recommendations for future development:

- The portal is not a “traditional” VLE. The CMS-basis supports a participatory model of education (student = starting professional). But for full exploitation new forms and levels of literacy are needed for all actors involved.

- The portal should be introduced to students and educators to promote conceptual understanding and improve ease of use of the personal workspaces.
- Training should include practice in procedures for collaboration and the technical realisation of vital e-moderating functions and knowledge sharing options.
- More detailed documentation is needed of the variety in professional use (possible applications and innovative practices).
- The use of a second language for international communication or exchange of experience does not develop spontaneously. Explicit interventions (e.g. course redesign, special projects) are needed to promote it.
- Introduction of the portal as one of the available standard study tools at an early stage is recommendable. Preferably the portal is used as a standard component in the ICT-E curriculum line to support the development of collaborative competences.
- Participation of teacher educators in this type of project should be facilitated by integrating the activities in their individual professional development plans.

Although the portal could compensate for the absence of a local VLE, and supports the realisation of educational ICT-based design projects, full implementation is not likely to occur if the prospective users are not convinced of its added value over installed ICT-facilities for students, teachers and educators. In this context the possibility of developing the learning object database for local and international support for knowledge sharing on the instructional design process (making professional feedback visible) and facilitating resource based teaching (metaevaluation of final products) should be more explicitly highlighted.

Another argument that can be put forward relates to professional competence development. Anticipating the further (local) development of competence descriptions for teacher educators and teachers (Simons, 2002; van Eck 2002), possibly also at a European level (Admiraal et al., 2003) the portal offers opportunities for autonomy in the development of attitudes and competencies relevant in the near future for both students and educators.

Examples are:

- functioning in or monitoring local communities of learning,
- e-moderating students/pupils projects,

- using the portal for personal professional development,
- designing learning activities using Learning Objects,
- practising resource-based teaching,
- preparation for contributing to and using Learning Object Repositories (Cohere Group, 2002).

Another challenge will be to grow from being an unrecognized activity (invisible to the organization and sometimes even to members themselves) to institutionalized (= fully implemented), i.e. given an official status and function in (the partnership of) organization(s) (Wenger et al., 2002).

The PRONETT consortium will proceed to develop the portal offering local and regional opportunities for ICT-E competence development in areas such as virtual co-operation, instructional design, blended learning, e-moderating, and a shared infrastructure for e-twinning organisations, international activities and curriculum projects.

Other Teacher Education provision organisations or individual (student) teachers and teacher educators are cordially invited to freely use the portal and its tools, share experiences and/or join our initiative at www.pronett.org.

References

- Admiraal, W., et al. (2003). *The European Syllabus for pioneer teachers. EU-Project "Ulearn."* Document available at: <http://ulearn.itd.ge.cnr.it/documents/report2.doc>
- Braam, H., Gennip, H. van, Kral, M., Sontag, L., Neut, I. van der, & Kools, Q. (2001). *ICT in Vogelvlucht. Stand van zaken 2000/2001. Onderwijsmonitor* [A bird's eye view of ICT. State of affairs. ICT-Education Monitor 2000–2001]. Tilburg/Nijmegen: IVA/ITS. Retrieved June 17, 2003, from <http://www.ict-onderwijsmonitor.nl/pdf/pdf-lijsten%202000-2001/vogelvlucht.pdf> (For a summary in English see <http://www.ict-onderwijsmonitor.nl/pdf/EngelsV4.pdf>).
- Cohere Group. (2002). The learning object economy: Implications for faculty expertise. *Canadian Journal of Learning and Technology*, 28(3). Retrieved May 10, 2003, from <http://www.cjlt.ca/content/vol28.3/cohere.html>
- Collis, B., Moonen, J. (2001). *Flexible learning in a digital world: Experiences and expectations*. London: Kogan Page. Retrieved June 10, 2003, from <http://education1.edte.utwente.nl/00FlexibleLearning.nsf/FramesForm?ReadForm>
- Eck, E. van., Volman, M., Kraan, A., & Dijk, E. (2002). *Ontwikkeling van ICT-competenties van docenten. Een reviewstudie* [Development of teachers' ICT-competences. A review study]. Amsterdam: SCO-Kohnstamm Instituut.

- Furlong, J., Barton, L., Miles, S., Whiting, C., & Whitty, G. (2000). *Teacher education in transition. Re-forming professionalism?* Buckingham: Open University Press.
- HvU Education & ICT knowledge platform. (2003). Educational innovation & ICT (Giving direction to policy at the University of Professional Education Utrecht). Position Paper. Available at: <http://www.koenraad.info/PRONETT>
- Inspectie van het Onderwijs (2001a). *Onderwijsverslag 2001* [Education Report, section ICT]. Retrieved June 12, 2003, from http://www.owinsp.nl/producten/onderwijsverslag_2001/ov2001.html
- Inspectie van het Onderwijs (2001b). *Resultaten van 4 jaar ICT-beleid in het onderwijs* [Results of four years of ICT-policies in education]. Retrieved June 12, 2003, from <http://www.owinsp.nl/producten/rapporten/resultatenictbeleid.pdf>
- Kirschner, P. A., Wopereis, I. G. J. H. (2002). *ICT3. Information and communication technology for teacher training. Pedagogic benchmarks for teacher education*. Heerlen: Open Universiteit. Retrieved June 12, 2003, from http://www.owinsp.nl/producten/rapporten/deel_ICT3.pdf
- Koenraad, A. L. M., Parnell, J. D., Quintana-Trias, L., Dooly, M. A., & Ander-ton, B. (2002). *Support for teachers and trainees in promoting ICT with web learning technologies: From 'learn to use' to 'use to learn'* (PRONETT Project Document). Available at: <http://publications.PRONETT.nl>
- Koenraad, A. L. M., Haan, K., Marcilla y Sevilla, A., Renselaar, E. van., & Soudoyer, A. (2003). *Learning to design WELL in a multilingual community of practice: A pilot implementation of the EU-Project PRONETT*. (Paper for the EuroCALL 2003 Conference.) Available at: <http://www.koenraad.info/PRONETT>
- Koenraad, A. L. M., & Westhoff, G. J. (2003). *Can you tell a LanguageQuest when you see one? Design criteria for TalenQuests*. Paper presented at the Euro-call Conference, 2003. Document available at: <http://www.koenraad.info/CALL>
- Koenraad, A. L. M., Jongejan, J. I., Klijn, C., Schoot, H. W., & Tomson, A. M. (2004). *Benchmark development for the ICT-domain in Dutch teacher education provision*. Paper presented at the Minerva Dissemination 2004 Conference: "ICT in Education and Professional Development of Teachers." Document available at: <http://www.koenraad.info/publications>
- Kral, M., Mooren, A. van der., Neut, I. van der., Poppel, J. van., & Uerz, D. (2002). *ICT education monitor: 4 years of education & ICT*. IVA/ITS. Retrieved June 16, 2003, from <http://www.ict-onderwijsmonitor.nl/pdf/pdflijsten%202001-2002/ICTMonitor%20ENG.pdf>
- Ministerie van Onderwijs, Cultuur & Wetenschappen. (1999). *Onderwijs On Line, Verbindingen naar de toekomst* [Education On Line, links to the future]. Den Haag: SDU. Retrieved June 14, 2003, from <http://www.ictonderwijs.nl/archief.htm>

- Parnell, J. D. (1998). *An action research approach to implementing ICT in teacher training with particular reference to the effectiveness of CGI scripts in the utilisation of electronic portfolios*. ITTE. Information Technology for Teacher Education. University of Amsterdam ITTE Annual Conference. Printed Paper.
- Parnell, J. D. (1999). A Manikin without clothes. In R. Lewis (Ed.), *Integrating information and communication technology in higher education*. ELECTRA, University of Maastricht. Holland. Kluwer Press.
- Simons, P. R.-J., Linden, J. van der, & Duffy, T. M. (Eds.). (2000). *New Learning*. Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Simons, P. R. -J. (2002). *Digitale Didactiek: hoe (kunnen) academici leren ICT te gebruiken in hun onderwijs* [How (can) academics learn to use ICT in their teaching] (Inaugural speech). Utrecht, The Netherlands: University of Utrecht. Retrieved June 14, 2003, from <http://www.uu.nl/content/INAUGURATIEROBERTEJANDEF.pdf>
- Stegers, E. (2002). *Schoolbesturen over ICT in het onderwijs* [Schoolboards on ICT in Education] Amsterdam: NIPO. Retrieved June 14, 2003, from www.ict-topschool.net/files/Nipo-bestuur-en-ICT-2002.pdf
- Vliet, R. van, Graaff, R. de, Pilot, A., & Scheltinga, H. (2003). Virtuele projectruimten voor leren ontwerpen en onderzoeken. *Velon, Tijdschrift voor Lerarenopleiders*, 24(1). (Also available as *Virtual Project Rooms for Education in Design and Research*. Proceedings from the International Conference on Information and Communication Technologies in Education ICTE 2002, November. Badajoz, Spain). Retrieved September 18, 2003, from <http://www.uu.nl/content/ICTEpaper%20deGraaff%20Pilot%20vanVliet.pdf>
- Vreugdenhil-Tolsma, B., Pluijm, J. van der, Sontag, L., Haaf, J. van, Neut, I. van der, Kools, Q., Hoogenberg, I., Wijk, B. van. (2003). *ICT-onderwijsmonitor/voortgezet onderwijs 2001–2002* [ICT-Education Monitor secondary education 2001–2002]. Retrieved June 14, 2003, from http://www.ict-onderwijs-monitor.nl/pdf/pdf-lijsten%202001-2002/VOrapport_19_februari_2003.pdf
- Wenger, E., McDermott, R., & Snyder, W. M. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Boston: Harvard Business School Press.
- Willems, G. M., Stakenborg, J. H. J., & Veugelers, W. (Eds.). (2000). *Trends in Dutch teacher education. VELON*. Garant:Leuven-Apeldoorn.

Notes

¹ Virtual Learning Environment (e.g. Blackboard, WebCT, Moodle)

² The “ICT op School” Foundation is a state subsidised organisation founded by the Association of Dutch SchoolBoards. Its main goal is to stimulate effective and efficient integration of ICT in primary and secondary education.

³ ILT = Information and Learning Technologies

⁴ Computer Supported Collaborative Learning

⁵ Up to 2002 individual trainers and students did not have access to local web publication facilities.

⁶ We adopt the definition of “blended learning” as: the combination of online learning and classroom training; it consists of a mix of ICT-supported learning activities combined with some traditional classroom activities.

⁷ Within the categories ‘generic’ and ‘subject specific’ three types have been defined: (a) Developmental tasks, (b) Coaching tasks, and (c) Research tasks.

Examples are:

- contributing to the development of the school web site, designing subsites for specific school subjects, developing pages for these sites, designing (a series of) lessons or web quests, developing worksheets for use with professional tools in vocational education (a)
- advising a subject team on the purchase and/or implementation of specific tools or courseware, coach students/pupils in self access centres (b)
- mapping needs and competence levels of staff as input for professional development planning (c)

⁸ In the pilot implementation phase the evaluation research has been restricted to the, for members, publicly accessible portal areas.

⁹ Besides, it should be noticed that Wenger’s work is based on observations and experiences in the profit sector and within individual, multinational firms, where the need for networking and knowledge sharing is a more integral part of professional life, also considering the competitive (and possibly personal) advantages involved.

Frameworks: Building Purposeful Socio-Technical Learning Networks in Teacher Education

Margaret Lloyd & Michael Ryan

Introduction

In 2003, a new core undergraduate subject entitled *Learning Networks* was offered for the first time within the reconceptualised Bachelor of Education degree at the Queensland University of Technology (Ryan & Lloyd, 2003). Our brief had been to design and conduct a face-to-face foundation information and communication technology (ICT) subject which also encompassed many of the understandings needed by beginning tertiary students. In its first iteration, the subject had a cohort of approximately 700 students (which, in 2004, had risen to an enrolment of 1200). The program was delivered within a 13-week semester with 3 hours of contact each week (with one hour each of lecture, tutorial and computer laboratory session). The lectures were presented three times in a given week and made use of large lecture theatres and extensive ICT support (<https://olt.qut.edu.au/edb006>). Regular weekly meetings were held with tutors and these were conducted as structured discussions rather than broadcast or information sessions.

The formal evaluation of the subject at the end of the first semester in 2003 (using a simple 5-point Likert scale and surveying 350 students) showed that 93% of surveyed students registered satisfaction with the subject. The subject scored an average of 4.02 (on a scale of 5) over a range of dimensions concerned with the aims and outcomes of the subject. All items ($n=20$) scored highly and showed surprisingly low standard deviation measures. It can therefore be assumed that the subject under review in this paper has been well received by its student audience and perceived to be effective in meeting their learning needs. The data for this paper is taken from such formal evaluations and also from anonymous online eva-

uations, interviews with selected students and from critical observations made through the conduct of the subject. It is too early to discern what, if any, impact the study of *Learning Networks* will have on its current students following their graduation, specifically on the adoption of ICT in their yet unknown classrooms.

Learning Networks

The “learning networks” of the title were enacted by the mediation of social networks by the technical while the technical was humanised and made purposeful by the social (see also Ryan & Lloyd, 2003). This paper will adopt the metaphor of a skyscraper to describe the design of this subject and contend that positioning ICT “within” a subject should metaphorically mirror how the skeleton frame of a skyscraper provides a robust structure while simultaneously allowing freedom for expression or expansion.

When the skyscraper emerged in the late 19th Century, it had no precedent form or function to guide it. Similarly teaching with ICT in tertiary contexts and preparing teachers to work in technology-rich environments also has little precedent and few clear models to follow (Downes et al., 2001; Oliver, 1994; Sherry, 2001). This means that whatever is done with ICTs in teacher education is effectively an experiment and the challenge is to have the prescience to choose appropriate strategies to prepare teachers for an unknown future. In the absence of proven models or the gift of clairvoyance, we took our belief (after Lechner, 1998) that learning happens in the spaces between people as the underlying premise in our design of *Learning Networks*. We also accepted the corollary that these spaces are primarily social but may be enhanced by technological mediation. We were also informed by current definitions of knowledge work (Kemp, 2000), and more importantly, of current teacher practice in the use of ICT in the classroom (Dexter, Anderson, & Becker, 1999; Downes et al., 2001).

Constructing the Technical and Social Spaces

Turkle (1995) suggested that “*we construct our technologies, and our technologies construct us and our times.*” (p. 46). When teaching within a university, particularly a large institution such as Queensland University of Technology (QUT) with a regulated network infrastructure, you cannot “construct” your

technologies. You can however appropriate what is offered and form it into a system which suits your needs. At QUT, teaching and learning is supported by a comprehensive online system called OLT (Online Learning and Teaching) which streamlines the posting of resources and the hosting of discussion forums, chat rooms and email lists. There is also the facility for video and audio streaming and for students to post text and images to the site. It is controlled by a hierarchy of administration which, in certain instances, allows students the rights to edit text, add images and add selected web tools to “their” section of the site.

In *Learning Networks*, we appropriated elements and functions of the OLT infrastructure with the specific purpose of facilitating social networks. We made wide-ranging use of digital video, audio and video streaming, and synchronous and asynchronous communication. We asked students to read online texts and to reflect on the differences between the experience of print and pixel. We set assignments which required digital submission by both individuals and groups, that is, where students submitted/uploaded their work directly to a secure server. We manufactured instances where students could share working spaces asking them to trust others but left up to them the levels of critique or peer review permitted between team members. We “constructed” the technological spaces and in so doing, constructed the framework, the central core of our subject/skyscraper. We “constructed” the conditions for the social networks but allowed individuals to negotiate their own rules and mores of behaviour. They were to be builders rather than merely occupants of a previously constructed space.

At the conclusion of the semester, students were invited to provide anonymous feedback on the subject through a web form. This was done in addition to the more formal evaluation processes reported on earlier in this paper. The online feedback generates rich data but tends to be polarised into highly positive or negative as only those who wish to make a comment actively seek out the form and complete it. Within these online comments, however, can be found genuine responses to the learning experiences offered within a subject. It is valuable in giving subject designers a rare glimpse at misunderstandings and misconceptions or to receive some genuinely heartfelt praise.

Two excerpts of note from the anonymous online feedback which showed a generally positive response were:

- a) where a mature-age student offered that “*Not being of the ‘wired generation’ but having to become a part of it, I was amazed at how much*

is ‘out there’ and exactly what is out there. For me, I think that is what I learnt the most, it opened my eyes to the possibilities of potential.”; and, b) a school leaver posted the comment that “I was in with a great group of people which made the learning experience all the more pleasant.”

The former comment was about the discovery of learning and the potential for personal growth – it also was indicative of the confidence with which this student now approached the task of learning. There was no technophobia, no foregrounding of the task of operating a computer or mastering specific skills to get “out there”. This comment reassured us that the technical infrastructure we had appropriated was a comfortable place to be. The latter comment was about the effectiveness of the social networks we had manufactured and scaffolded. A related comment was from a student who thanked us for the subject, and added that involvement had “helped me develop a personal learning network of friends which has been beneficial in all aspects of uni [university] life.”

In *Learning Networks*, we treated the group work in a purposeful way and included the theory of group dynamics in the subject content. Working in a team was to be a meta-activity in this subject not an incidental or imposed operational structure. We had similarly and deliberately included discussions of the social construction of knowledge and problematised the concept of information within the content of the subject and made these the focus of subject tutorials. There was nothing incidental or implicit in our subject/skyscraper.

New Problems Demand New Solutions

The skyscraper as a structural system was the outcome of design where the new form was developed from the very nature of “new” problems. The new problems in teacher education are concerned with changing workplaces, new cultures of collaboration and collective sense-making, and heightened political and community pressure to use ICT in productive and creative ways. How courses are designed in teacher education has much to do with how the “problem” of ICT, or more specifically, digital or technological literacy is deconstructed. In some instances, it is deemed to be a problem of deficiency and the solution proffered is to design a course which is based on skill-development or the demonstration of literacy through the creation or re-creation of products. In the instance of *Learning Networks*, we had deconstructed the problem to being one of alienation. The solution, we believed, lay in immersion in purposeful socio-technical networks. We

accepted the finding that, for teams working in technology-rich environments:

Technology quickly becomes not an exogenous force acting on groups, but rather a web of interpersonal and task interactions. Over time the tools are in fact “enacted” by those who use them, shaping and shaped by the experiences of the group participants without a high degree of self-consciousness. (Bikson & Eveland, 1990, p. 285)

People are generally unaware of or oblivious to the framework of the buildings they are in. Similarly, in *Learning Networks*, students became so immersed in the context of online forums and other interactions that they engaged with them effortlessly. The teaching of skills was embedded in the context of tasks adopting a minimalist and non-interventionist approach (Lazonder, 2001) which provided ‘just-in-time’ contextualised support. One student offered (in the online feedback) that “*by the end of the semester I was really enjoying the on-line resources. The more I got involved in them the more I got out of them.*” Others made reference (in the same online forum) to their repeated, sometimes daily, visits to the subject website to review the subject content or to add to the threads of discussion forums. The subject website had 55,000 hits during the semester which was the highest in the university. The delimiter to participation appeared to be technical and was of particular relevance for those students who were accessing the website from home using dial-up connections with “older” computer hardware.

New Spaces Demand New Problems

We believed that the optimum way to enact our particular deconstruction of the “problem” of ICT was to assess the students through their engagement in a modified webquest. In this way, assessment was not seen as being “outside” of learning but its natural concomitant.

Webquests were first developed at San Diego University in 1995 (see Dodge, 1998; Molebash, Dodge, Bell, Mason & Irving, n.d.; Shrock, 2000). In its first conception, a webquest was a structured inquiry based primarily on resources from the Internet and conducted by a team in which each member adopted the role of an expert. The purpose of a webquest inquiry is to investigate an open-ended topic or contemporary issue. In this it mirrors the real-world function of expert groups, advisory teams or “think tanks”. Its underlying learning skills are concerned with criti-

cal literacy, negotiation of meaning and social construction of knowledge (Fiedler, 2002; Taylor, 2001). It is an exemplar of a socio-technical network in that its social interactions are mediated by technology and technological interactions are mediated by human processes of critique and evaluation. It is a skyscraper whose central core is a definable structure but its design and expression knows few boundaries. It is a student assessment with a low entry and high ceiling in that it can elicit responses ranging from simple information gathering to critical synthesis. The analogy to the central lift shaft of the skyscraper is further substantiation of the metaphor of this paper.

In our modified webquest, the students were asked to choose one (from a list of nine) broad themes such as alternative energy, cyborgs, Antarctica, and consumerism. Teams were formed and were required (a) to develop their own research question or dilemma within that theme, and (b) to specify (with some constraints) the nature of the expert advice needed to deal with that question or dilemma. In their final submission, they were asked to justify both their refinement of the topic and the composition of their expert team. Once established, the teams began to simultaneously design and participate in their webquest.

The webquest reports the teams presented were digital texts with embedded links and illustrative images. Spaces were provided on the OLT server for students to directly upload their submissions and a template had been built to replicate an interconnected web ring. The “home page” for each team was where an overview was given, individual roles were described (and justified) and a key image was provided. Links were made from this page to the pages hosting the various expert reports where individuals presented their findings in an appropriate voice and tenor. There was a further link from each expert report to a page where individuals could use their own voices to reflect on their learning experiences and to respond to given guide questions. At an operational level, this activity was about working with digital texts, images and with writing in different voices and in differing collaborations. Conceptually, it was about making the working within a socio-technical network an explicit or metacognitive activity.

While they were “questing”, the only individuals who could access a team’s working space on OLT were the team members themselves, the tutorial lecturer and the subject co-ordinators. The OLT system allows differing levels of access and security and this allowed teams to work in a partially closed environment. Many appropriated this space as a de facto discussion board while others took it to be an invitation for peer review and tutoring. The rules of engagement within teams were negotiated or

tacitly adopted between team members. In an interview (June 15, 2003), one member of a successful webquest team explained how their space was quickly taken over for ad hoc reviews and peer encouragement. They developed trust in each other and their shared commitment to the learning challenge they had set themselves. Changes in 2004 have added new communication tools to the group work areas in OLT and it remains of interest to see how these will be adopted by the student cohort.

A skyscraper has a mechanical core and complex systems of cellular space enclosed by a thin curtain wall. It was made possible by technology particularly the skeleton frame first used in 1885 (Home Insurance Building, Chicago). In *Learning Networks*, the OLT system provided us with a “skeleton frame” of template pages and file upload facilities which we appropriated for our own purposes. Some felt it was a constraining influence as they wanted a free hand to build their own web pages. They did not like the “vanilla” appearance of the pages generated through uploading text and images to OLT or the restriction in length to just three pages. For us, it was a way to retain the focus on the content rather than the appearance and to avoid the “bells and whistles” and experimentation often seen in naïve web design. It was also a way to put a level playing field in place. Some students arrived in the course with highly developed computing skills while others had little experience outside of word processing or the use of other simple applications. Working in a new environment meant that all were at the same starting point and faced the same technical constraints.

While the skeleton frame is fixed, the external appearance of the building is not. Curtain walls can be of glass or other materials and there is real diversity in how these walls can be angled or positioned. Levels can be cantilevered from the central core in almost infinite ways. The skyscraper can appear in the most barren functional form or be almost sculptural in its elegance and aesthetic appeal. What was of interest (and affirmation of the metaphor) was the diversity of responses from the 122 webquest groups in the subject. No two were the same and we saw the metaphorical equivalents of both barren functional forms and soaring wonders within the student submissions. Individuals were given scope for expression and the skeleton frame, rather than being restrictive, supported highly creative and diverse responses.

The designers of the first skyscrapers took a new look at classical principles of science particularly of gravity and pressure and rephrased these principles in the terms of new or re-appropriated technologies. In *Learning Networks*, we reviewed the classic principles of teaching as a social construction of knowledge and shifted into a new environment. Perhaps

all that we have done is hybridise the elements of open or flexible learning into more traditional face-to-face structures.

We have looked at the new “spaces” and designed new problems or learning challenges for students to make best use of them. Having the structure or skeleton inside the building meant that there were almost limitless variations and extensions possible. Having the ICT structure inside the learning experiences of *Learning Networks* meant that ICT was here both the content and context in which learning occurs.

Conclusion

When first built, skyscrapers caused some public disquiet. There is an apocryphal tale that the people of Chicago would avoid passing the twelve-storey Tacoma Building (1889) for fear of its imminent collapse due to its seemingly unsubstantial walls. Skyscrapers changed psychological dimensions of space, volume, weight and support. Changing the way we teach has also changed conceptions of teachers, learners and learning and the dynamic interactions between them. Some students were initially concerned about this change and were unsure of their own roles within this. It was a matter of time before an element of trust emerged – a realisation that the building was not going to fall.

Inventions and innovations often have unintended consequences. As skyscrapers – originally called “cloud scrapers” – grew higher, they also literally began casting larger shadows. Zoning laws in New York were changed in 1915 after the construction of the forty-storey inappropriately named Equitable Building and the measurement of its 7.5 acre (3.2 hectare) shadow. The unintended consequences of the positioning of ICT in *Learning Networks* are yet to emerge either within the faculty or in the broader construct of schooling.

Learning Networks took advantage of the available ICT structures to provide the context for learning and for the mediation of student communication. Positioning ICT in the centre gave the subject a robust structure while simultaneously allowing freedom of expression. *Learning Networks* also took advantage of the paradigm shift of a new degree course to be bold. At their finest, such as in the soaring glass towers designed by Mies van der Rohe, the basic structure of the skyscraper represents a radical departure from traditional architecture and a movement to pure structures. At its best, a subject like *Learning Networks* is a radical departure from traditional pre-service ICT courses and a movement to a transparency of

processes. *Learning Networks* does not espouse potentially obsolete skills or focus on products. It looks to potential not deficit. It looks to be as functional and robust as the building it is metaphorically representing. It attempts to immerse students in purposeful socio-technical networks and above all else, to enact our beliefs about the role of ICT in teaching and learning.

References

- Bikson, T., & Eveland, J. (1990). The interplay of work group structures and computer support. In J. Galegher, R. Kraut, & C. Egidio (Eds.), *Intellectual teamwork: Social and technological foundations of co-operative work* (pp. 245–290). Hillsdale, NJ: Lawrence Erlbaum.
- Dexter, S., Anderson, R., & Becker, H. (1999). Teachers' views of computers as catalysts for changes in their teaching practice. *Journal of Research on Computing in Education*, 31(3), 221–240.
- Dodge, B. (1998). *Webquests: A strategy for scaffolding higher level learning*. Retrieved August 18, 2003, from <http://edweb.sdsu.edu/webquests/necc98.html>
- Downes, T., Fluck, A., Gibbons, P., Leonard, R., Matthews, C., Oliver, R., et al. (2001). *Making better connections: Models of teacher professional development for the integration of information and communication technology into classroom practice*. Canberra, ACT: Department of Education, Science and Training (DEST).
- Downes, T., Fluck, A., Gibbons, P., Leonard, R., Matthews, C., Oliver, R., et al. (2002). *Making better connections: Teacher professional development for the integration of information and communication technology into classroom practice*. Canberra, Australia: Department of Education, Science and Training (DEST).
- Fiedler, R. (2002). *Webquests: A critical examination in light of selected learning theories*. Retrieved August 17, 2003, from <http://www.msfieldler.com/wq/fiedler.pdf>
- Kemp, D. (2000). *Learning for the Knowledge Society: An education and training action plan for the information economy*. Retrieved May 23, 2002, from <http://www.detya.gov.au/school/publication/2002/learning.htm>
- Lazonder, A. (2001). Minimalist instruction for learning to search the World Wide Web. *Education and Information Technologies*, 6(1), 161–176.
- Lechner, S. (1998). Teachers of the N-Gen need reflective commsubjecties (and so do the teachers of teachers). *Journal of Online Teaching*, 9(3), 20–24.
- Molebash, P., Dodge, B., Bell, R., Mason, C., & Irving, K. (n.d.). *Promoting student inquiry: Webquests to web inquiry projects (WIPS)*. Retrieved August 18, 2003, from http://edweb.sdsu.edu/wip/wip_intro.html

- Oliver, R. (1994). Information technology courses in teacher education: The need for integration. *Journal of Information Technology for Teacher Education*, 3(2), 135–146.
- Ryan, M., & Lloyd, M. (2003). On-line, off-line, teaching in between the lines. Paper presented at the OLT 2003 Conference, Brisbane, November.
- Shrock, K. (2000). *Webquests in our future: The teacher's role in cyberspace*. Retrieved August 18, 2003, from <http://www.discoveryschool.com/schrockguide/webquest/webquest.html>
- Sherry, A. (2000). Expanding the view of preservice teachers – Computer literacy: Implications from written and verbal data and metaphors as freehand drawings. *Journal of Technology and Teacher Education*, 8(3), p. 187.
- Taylor, H. (2001). The webquest model for inquiry-based learning using resources of the World Wide Web. In D. Watson & J. Andersen (Eds.), *Networking the Learner: Computers in Education* (pp. 319–328). Boston, MA: Kluwer Academic.
- Turkle, S. (1995). *Life on the screen: Identity in the age of the Internet*. London: Weidenfeld & Nicolson.
- Van Boxel, P., Draaijer, S., De Graaff, R., & Los, G.-J. (2001). On-line collaboration in a face-to-face educational setting: Myth or challenge? Retrieved March 26, 2004, from <http://www.educause.edu/ir/library/pdf/EDU0129.pdf>

Sharing the Distance or a Distance Shared

Social and Individual Aspects of Participation in ICT-Supported Distance-Based Teacher Education

Jimmy Jaldemark, Ola J Lindberg, Anders D Olofsson

Introduction

Information and communication technology (ICT) has been used within the education system for teaching and learning for quite some time. The choice of technology and its use has changed over the years, but the trend seems to be that the deployment of the technology has changed from one of teaching students how to use the technology to that of different ways of integrating ICT in teaching and learning. The deployment of ICT has thus expanded from just being about content to being included as an integrated part of the program. ICT may be used to make it possible to learn by participation in web-based learning environments. The introduction of the Internet has contributed to changes in the organising and designing of education. This allows expanded conditions for the completion of and participation in a program. Traditional campus based programs are complemented with programs where the learning environment does not have to be physically located on campus. In general, our interest is in the deployment of web-based learning environments. However, of particular interest is the possibility of participation in a teacher education program with an integrated web-based learning environment. Using the changed conditions of the education system as our point of departure our purpose in this chapter is to interpret and understand the participation of the student in a distance-based teacher education, in which web-based learning environments are deployed for collaboration, learning, teaching, and sharing resources. This study will focus on aspects concerning the students' relationships with each other. Participation as a condition for learning will

be analysed from three perspectives of learning; the social constructivism, social constructionism, and sociocultural theories.

Trends in Swedish Teacher Education Today

Since 1977, teacher education has been a part of the Swedish university system and since then the education has been reorganised several times. The latest reform (SOU1999:63) gives the local university greater opportunities to organise the program based on local conditions. Not only does this mean that students have a greater influence over the choice of course content but there is also an increased possibility to adapt the teacher education to students who rarely or never have an opportunity to be physically present at the program location.

In Sweden it has been possible to study at a distance-based teacher education since approximately the beginning of the nineties (Johansson, 1999). The uncertainty of the start date is due to the problem of deciding what should and should not be defined as distance education. Most of the programs offered as distance education in the beginning of the 1990s were organised in a mode that, within the realms of distance education, used to be called intensive studies. The courses consisted of physical meetings at the university with duration of one week each time. Work in smaller study groups, which were administrated and governed through study guides, complemented the lectures on campus. In the intervals between the meetings at the university the students mostly communicated with the other students and with the university via letters and telephone.

The development of ICT during recent years implicates that distance education now may be completed under fundamentally different conditions with respect to teaching and learning. In Sweden the aim of flexible education in university level is described as:

The control of where, when and how the study may be completed shall as much as possible be placed with the student. This means that the organisation of the semester, the schedule and other teacher controlled aspects can be questioned. At the same time this makes it possible to study from a variety of locations such as a workplace or from home. The interplay between students and between the students and the teachers may be adjusted to very different circumstances and to different places and times as well as to different media. (SOU1998:83, p. 87)

Teacher education programs, which are organised in terms of flexibility, may under these conditions allow opportunities to meet many of the needs different students may have due to their various individual circumstances. Furthermore, as argued by Dukom, the Commission on Distance Methods within Education, because no one can be forced to learn, a substantial responsibility may be placed on the student if flexible education on a distance basis is to work well. It is "*principally the one who intends to study who must decide the curriculum by choosing from a variety of alternatives, but she must also take the responsibility to choose the right courses*" (SOU1998:84, p. 28). The promised flexibility of the program's content is expected to be realised by the students individually.

That which is typical in Swedish distance-based teacher education today however, is first and foremost that there is an element of flexibility in the organisation of the programs. Flexibility mainly in the sense that the deployment of ICT, as computer conference systems or websites, offers a variety of possibilities for communication between students, between students and content as well as between students and the university (see for example The Swedish Net University, 2004). These systems are constructed with the intention of being a web-based learning environment for collaboration and learning. The flexibility in the systems means above all that synchronous communication bridges place and that asynchronous communication bridges both place and time.

Because communication may be performed both asynchronously and synchronously the student attending the teacher education program may participate in a learning environment via ICT. It is assumed that, through participation, the students form a community. A community which in turn is assumed to develop conditions in which students support each other as well as learn with and from each other despite the fact that they are separated as regards place and time. From the point of view of the university the ICT-based systems work as a learning environment to which the distance students constantly have access and which works as a substitute for and a complement to the meetings that are typical of campus-based teacher education. To deploy a learning environment is one way of integrating ICT in the program. The question is how to understand student participation?

The Web-Based Learning Environment – Application of ICT in Education

In web-based learning environments different technical solutions may be deployed in order to allow for participation (see for example Renninger & Shumar, 2002; Stephenson, 2001). Within these systems are functions that include chat, computer conferencing, e-mail, threaded discussions, and video conferencing. These functions offer, to a varying degree, flexible opportunities to participate independently of place and time. In a context of education these functions can make collaboration, teaching and sharing of resources possible. The participation in a web-based learning environment may however be understood in different ways.

Some researchers (Jobring, 2004; Palloff & Pratt, 2003; Seufert, Lechner, & Stanoevska, 2002) described the participation in a web-based learning environment as belonging to an online learning community (OLC). According to Seufert, Lechner, and Stanoevska (2002, p. 47) an OLC may be described as

... ensembles of agents, who share a common language, world, values in terms of pedagogical approach and knowledge to be acquired and pursue a common learning goal by communicating and co-operating through electronic media in the learning process. The common interest of this type of community is the common interest in learning.

With a starting point in the concept OLC, the understanding of participation is then expanded to incorporating the social dimension.

Anderson and Garrison (1998) point out that participation in a web-based learning environment occurs through interaction and communication in a social context and that learning includes a complex interplay between teacher, student and content. An interplay in which aspects of collaboration, communication and control co-operate with every possible combination of teacher, student and content. Participation in a web-based learning environment is thus a total participation in which the students learn. The students are online not only with the purpose of sharing files but also with the purpose of learning. Similar, and in some parts further developed, thoughts are found in Paulsen (2003), particularly as regards the different kinds of online teaching. Paulsen means that communication can be performed in the following ways. Included here are examples of practical application.

- one-alone (online databases, online publications)
- one-to-one (learning contracts, apprenticeships, correspondence)
- one-to-many (lectures, symposiums)
- many-to-many (debates, role plays, case studies)

In addition to teaching, Paulsen suggests a dimension of steering or control, that is, who initiates or who maintains the communication. He makes a distinction between two systems, that is, the push system and the pull system. In the push system, for example e-mail, the sender has control whereas in the pull system, for example computer conferencing, it is the receiver who has control by being active in searching for information.

Another way of describing and understanding participation in a web-based learning environment is possible via the concept of virtual learning environments (VLE) (Schwier, 2002). Typical for such learning environments is that learning processes are assumed to take place without face-to-face interaction and that instead interaction takes place online in a web-based learning environment. A further development of VLE is the Virtual Learning Community (VLC) (Kowch & Schwier, 1997; Schwier, 2002). In order for a VLC to be initiated, developed and sustained it is essential that the students who are part of the VLC continuously participate in a process of sharing new and innovative ideas, that meaning and content is negotiated jointly, and that students learn together within the VLC. In a context of education, in order for the web-based learning environment to be qualified as a VLC, it is not sufficient that a certain material is presented nor that the students interact in accordance with certain given instructions or that students interact with the teacher with the objective of improving their understanding of the content. Rather, collaboration and a continuous process of participation is required in order to create a mutual or common understanding of the content in question.

With this as a point of departure it is interesting to investigate what kind of influence participation in distance-based teacher education might have on students. How can the students' possibilities to learn through each other when they are physically separated be understood? Should the meetings conducted with the help of ICT be viewed as a substitute for, or a complement to, the physical meetings that participation in campus education entail? Is it possible to understand a learning environment as a means, in which communities might evolve? Do we have grounds to believe that the students develop a view or perspective of learning as a social phenomenon? To put it another way, how well integrated is the use of ICT in teacher education and how does this effect the students' participation?

Methodology and Theoretical Framework

Theoretical Position – A Philosophical Hermeneutical Approach

A philosophical hermeneutical approach is based on thoughts formulated by Heidegger (1962), which gives an ontological understanding of being. One of the central assumptions of this theory is about being as thrown. The implication is that man and world could only be understood with reference to each other as a whole. In other words, man and world are one and as such man is always thrown into an already existing web of linguistically, timely, and worldly relations. It follows that man comes into being, is shaped, and is changed in a being-together-with, always in relation to others.

Managing tradition, prejudice and effective history...

The heideggerian understanding of being is, in philosophical hermeneutics, closely related to the concepts of prejudice, tradition and effective history, as they are formulated by Gadamer (1989). Prejudice or pre-understanding is a judgement always made in advance and as such determines the possibilities of understanding. For man as being thrown, this possible understanding is always determined by an already decided understanding. Instead of being subjective views, prejudices are therefore to be understood as a part of the linguistically, worldly, and historical situation of which man is part. Prejudices are prerequisites for making understanding possible (Bernstein, 1983). Prejudices make up the tradition in which man as thrown is part of and tradition contains specific dimensions of being that is already invested with significant meaning. Risser (1997) argues that what was and what is, is part of a dynamic repetition of re-creation, and that which comes into being cannot therefore be understood as a result of either determinism or traditionalism but rather, is to be viewed as part of the historicity and temporality of man. Through the process of effective history, man becomes part of the tradition and the prejudices, which are socially and relationally invested with meaning. This implies that the researcher interprets from a position of already interpreted meaning, rather than from a position based on interpretations originating in a sense of rationality or reason.

The understanding that can be claimed through the use of a philosophical hermeneutical approach is therefore built upon interpretation (Gadamer, 1989; Warnke, 1987). Facts are inevitably always interpretations (Vattimo, 1997), and in order to avoid making interpretations based solely on the researcher's assumed subjectivity, a systematic and transparent manner must always be applied. To be able to conduct research based on a controlled interpretation implies the need for a theoretically generated interpretational frame within which the researcher's prejudices of the subject matter in question can be addressed.

... by using an interpretational framework

To be able to claim understanding we use a theoretically generated interpretational frame. The interpretational frame limits the influence of prejudices thereby avoiding making interpretations based solely on prejudices. As opposed to building interpretations on subjective grounds, data is interpreted against an already fixed theoretical content. As a process, interpretation is thus both more controlled and at the same time more openly accounted for. This implies that interpretations become more transparent and are thereby more accessible to critical examination.

The approach ensures the opening of a productive gap between the interpretational frame and the data. Interpretation of the subject matter is made possible because the interpretational frame and data contribute various horizons. Interpretations and understanding is in this sense always indebted to and conditioned by initial assumptions. The meaning of the assumptions that enable interpretations must therefore be accounted for. The interpretational frame must, in line with this argument, always be explicated.

From the Horizon of Theory – The Interpretational Frame...

To be able to reach an understanding of the meanings of participation in a distance-based teacher education supported by the use of ICT, an interpretational frame is used which contains three perspectives on learning that all view learning as conditioned by participation. The three perspectives on learning contained within the interpretational frame are social constructivist, social constructionist, and a sociocultural. These perspectives could, at first glance, seem to contain an almost common understanding of participation. Shotter (1995) claims that they have, apart from a focus

on social processes, other themes in common. Instead of things and substances, the perspectives direct themselves to formative, creative and constructive activities. Learning is more about participation than finding, and knowledge can only be related to the activities in which participation is a part of. Furthermore, interest is directed at creating understanding rather than implementing in an external world. Finally, they contain a view that participation is that which makes understanding possible. The perspectives do, however, contain quite different views on learning depending on the view of social processes within each perspective.

A social constructivist perspective on learning

Advocates of a social constructivist perspective (Barlebo Wenneberg, 2001; Jonassen, 2004; Searle, 1995) stress the importance of social context, but they also give the knowledge-constructing individual a certain importance. By participating in different contexts and by being confronted by others' views of the world, individuals position these different views in contrast to each other, which give way to new constructions or views (Searle, 1995). The socially negotiated meaning that participation gives way to become valid in other contexts. It can, for example, be a socially determined meaning of a phenomenon or that certain learning strategies are not independent on situation or context in order to be successful.

A social constructionist perspective on learning

Within a social constructionist perspective language is a central theme (Burr, 2003; Gergen, 1995; Parker, 1998). Language is a determining factor for constituting both man and knowledge (Burr, 2003). Through language man is provided with the symbols and codes that classifies both experience and man, and in this way meaning is created and conditioned by discourse. According to Gergen (1995) the world is thereby socially constructed and important questions arise as to how historically, culturally, and socially determined conditions affect human interaction and how various actors and their contexts interact. Gergen points out that the various discourses that arise in different practices are determined by as well as determine participation. Discourse and participation are therefore mutually constitutive.

A sociocultural perspective on learning

The sociocultural perspective has its roots in the Russian cultural historical school and a central theme is that man becomes aware of the world through a constant interaction with the world (Säljö, 1999; van der Veer &

Valsiner, 1994; Vygotsky, 1978). The surrounding world is both the guiding principle and that which initiates human existence. Man, though, is not a passive receiver of influences from the surrounding society. Material conditions affect human consciousness, but at the same time man creates culture in such a way that change is always possible through practical action, that is, through participation. It is through the social life of man we can understand the mental processes that social life brings about, a social life already conditioned by its history and culture. Participation through argumentation and action precedes the construction of knowledge for individuals. In other words, knowledge is brought about by human interaction and only thereafter becomes part of the thinking and actions of man (Vygotsky, 1978). For man, knowledge can be seen as a language tool (Säljö, 1999).

Conclusions within the frame

As a concluding remark, we can add, that although the three perspectives all focus on participation as a condition for learning, they differ regarding the assumptions made about and the meaning of participation. The assumptions made determine the possible meaning of participation, and an interpretation of participation for learning is therefore possible to conceive in different ways depending on what perspective or what assumption the interpretation arises from.

From the Horizon of Practice – The Empirical Frame...

Participating in this study is a group of students enrolled in a distance-based teacher education supported by the use of ICT, which primarily is used for collaboration between teacher and students and between students and students. The students had been using ICT for their studies throughout the entire program, which meant a period of at least two years. The students belong to different study groups and they have the possibility to collaborate both through the use of ICT and when meeting at the university. Initially the students were part of a questionnaire study, after which a group of 22 students volunteered for follow-up semi-structured interviews with some additional questions. Out of these 22 students, 3 declined to be interviewed when they were contacted, and therefore the interview study was made with the remaining 19 interviewees. The students thereby represented approximately 25% of the population. The students were in the range of 20–50 years old, 13 being female and 6 being male.

Using an interview guide the interviews were conducted either by phone or when meeting physically in a group room at the university library. Time spent on each interview varied, from approximately 30 to up to 75 minutes. The interview guide contained 15 questions divided in 4 different themes. The themes represented included questions about the future, working life, society, and education. The interview guide was constructed by using questions with open answers from earlier studies. In order to be able to prepare for the interview the interviewees received, either by e-mail or letter, the questions prior to the interview. During the interview the answers were recorded on tape and then later transcribed. The interviews were then sent out to each interviewee who was asked to comment on, correct or just approve the transcriptions for analysis. Some interviewees made a few changes in the transcriptions before approving and returning the transcriptions. The theme chosen for analysis in this chapter is education.

Findings – When the Frames as Fixed Horizons Meet

A productive gap is now established. Data (the interviews) and the interpretational frame (the three theoretical perspectives on learning) are two horizons that are invested with meaning. These represent two ways of understanding the study object. By positioning the horizons in relation to each other it is possible to arrive at different understandings of the study object in question. An understanding that is more complex and contains more meaning thereby being, in a way, a better understanding. This is at the same time an understanding characterised by both a systematic and a controlled interpretation, which thereby differs from interpretations made exclusively on subjective grounds. In short, a naive interpretation with a starting point in uncontrolled prejudices.

Below is a presentation of those interpretations made from the two horizons. The interpretations are enabled by positioning the three perspectives on learning in relation to the statements made by the students interviewed. At first the focus is solely on participation but later in the discussion it will be more explicitly placed in relation to ICT and web-based learning environments. The quotations used are not to be viewed as proof but are instead examples of statements of the interpretations made (From & Holmgren, 2003)¹.

Interpretation from a Social Constructivist Perspective on Learning

If we interpret from a social constructivist perspective on learning (Barlebo Wenneberg, 2001; Jonassen, 2004; Searle, 1995), the starting point will be the importance of the social context. But we have also seen that central to this perspective is that a certain importance is assigned to the knowledge-constructing individual. In the students' answers there are several examples of how the individual person is seen to be central in order for learning to take place. There are, for example, many students who claim that it is impossible to learn for someone else and that the responsibility one has for successful studies is one's own. One student states: *"it is that student's own responsibility if it [the studies] are going to work out or not, it is something that I can't take over."* Knowledge is in this case individually constructed, even though the student is a part of a context with others. Knowledge is therefore viewed as being constant and fixed, something that in the students' answers is expressed in terms of the possibility to correctly or incorrectly understand the educational content. According to the interview material it would seem that the students are above all learning, helping and supporting each other and that those students who, for whatever reason, are not successful in their studies can be given aid in order to help themselves. This help and support is, however, in line with certain conditions. A student can't expect to get as much help as he or she wants. One student says, for example: *"... if it was someone in the [study] group who didn't understand, the others tried to explain. That is something I think works well. However, to be the one who tries to help all those who have a problem in understanding could mean that you don't have enough time to manage your own studies and instead, like Florence Nightingale, you flutter around and try to help everyone..."* However, when learning is recognised as above all an individual affair, helping others is almost considered to be cheating.

That which we have found difficult to interpret in the students answers is an understanding of learning in which various ways of understanding are placed in relation to one another thereby making multiple understandings possible. Rather, the students are of the opinion that quite an obvious goal for the learning process exists. This is apparent in the interview material in references made to both a right and a wrong way of understanding. This is possible to interpret as an expression of an individualistic understanding of the concept of knowledge, which would imply difficulties in legitimising other students' understanding of the educational content.

In other words, interpretation of the interview material in regard to a social constructivist perspective on learning, does not allow a view of learning as a social negotiation of meaning that is made possible through participation. The closest we can get to such an understanding of learning where the knowledge constructed is legitimate in other contexts is when students express a positive view of helping other students. The meaning of this could be that the students are then practising explaining what they know and are thereby practising their future role as teachers. This can be viewed as an example of the students' understanding that the success of this learning strategy as being independent of context or situation but, at the same time, the students treat her or his co-students in an instrumental manner. One student states that: *"If I can help someone who isn't quite keeping up with [the co-students] or who does not understand, if I can share my own knowledge in a way that he understands the [educational] content in question, I will be able to develop and cement that knowledge myself. I put my own knowledge in words and thereby reach a deeper knowledge."* This is possible to interpret as a way of saying that "I help others because it helps me," not that we can learn from each other. Learning strategies that, from a social constructivist perspective on learning, seem to be common in the student group are often based on the individual student and how she or he learns rather than it being the student group itself that has the function of creating a mutual understanding.

Interpretation from a Social Constructionist Perspective on Learning

If we instead choose to interpret the interview content from a social constructionist perspective on learning in which language is central (Burr, 2003; Gergen, 1995; Parker, 1998), the answers from the students constitute a statement of how they have understood how learning occurs. For example, the individual is of great importance for the students. Despite the fact that one student mentions the study group and the importance of social context, the recurrent statement is that no one can learn for another. Because, from a social constructionist perspective of learning, language provides man with symbols and codes that classify both experience and man thereby creating meaning and conditions in linguistic discourses, the students seem most comfortable with viewing the individual as the strongest and most important expression for learning. In other words, when learning is in focus, the individual is also in focus.

In the students', via language socially constructed, reality it appears to be natural that some know more than others and that these students support and help those students who don't know. It also seems natural that support is help to help oneself and that it is part of reality that there are many different reasons as to why the students don't know. The reasons range from the students being lazy, to doing too much that is not related to the education, to being unable to prioritise, and to the opinion that they are not suitable for studying a distance-based teacher education. One student claims, for example, if a co-student in spite of help does not succeed in managing their studies, then the first student must: "...*in some way emphasize that the student having difficulties is not in the right place...*" In the reality constructed by the students, individual problems in learning are, for the most part, an obstacle only for the individuals themselves. The responsibility or function of the study group is to be a social place of meeting not a forum for learning.

Because those linguistic discourses arising in different practices determine the participation in those practices, it is possible in a social constructionist perspective on learning, to describe participation in the study group as a normative feature. In those discourses, which are created, a linguistic inculcation of the social context is taking place, which indicates that it is the individual who counts. The language by this means both constitutes participation and the way in which the discourse is maintained and changed. The interpretation is that students who have an incorrect understanding of the content are offered help and correction within their study groups. This would imply that any help from the co-students demands both an individual engagement and a certain personal competence. One student claims, when it comes to helping co-students, that "...*I can imagine taking a certain amount of responsibility, especially if the co-student is able to do something by herself and also does so...*" In the students' answers there is no basis for an interpretation in terms of the study group having the possibility of deciding content and mutually creating points of departure for what is right and what is wrong.

Interpretation from a Sociocultural Perspective on Learning

If we interpret the interview material from a sociocultural perspective on learning (Säljö, 1999; van der Veer & Valsiner, 1994; Vygotsky, 1978) in which man's environment is the principle, which initiates existence, the answers from the students are expressions of how they have mutually

created a practice. Within this practice the students learn from certain rules or norms that are mutually held. It is possible to understand the students' participation in order to support and help each other as a process of internalising social relations. An understanding of learning as an individual process, in which those who already possess an understanding of the education content helps those who don't, is understandable. Students knowing more help those who are unable to reach an understanding that they cannot achieve by themselves.

This does not imply, in a sociocultural perspective on learning, that the student is a passive receiver. The student is always a creator of the culture in such a way that change is possible through practical acting, that is, through participation. By being in a context together with others the students mutually create the educational practice they belong to. It is important that the study group works well together and that the students are thus able to seek support in the group when feeling that their studies are going less than well and that there is a legitimacy in turning to the study group when there is also a problem outside the education context. One student says that: "...it [the study group] will not work out in a good way if everyone is not comfortable. If they are not I think that subgroups which counteract each other, so to speak, can easily appear within the main study group and suddenly we have two study groups within the little study group." That the students, first and foremost, understand the study group as something that is there for their own learning is understandable in a sociocultural perspective. The students use the group as a tool in their lives, which does not mean that they reduce it to an instrument, in other words they reificate their fellow students. The group instead becomes the practice in which the studies take place, although in an individual manner. It is through the students' social life that it is possible to acquire an understanding of his or her mental processes, a social life that is already invested with historical and cultural conditions; this is also made obvious in those references the students make to the surrounding conditions that frame both their own and their co-students' studies. A possible understanding is that studies are easier or more difficult to manage at various points in the student's life depending on personal circumstances. What makes the study group helpful is the possibility to use it in such a way that these conditions can be overcome. One student expresses it thus: "...in our first group we had a woman who was pregnant, and she took upon herself a certain amount of responsibility and asked if she could do her part of the work in advance since she knew that later on she couldn't be able to help the study group with the studies in an extensive way. During the six months she was less active she contacted us of her on

accord thereby making it easier for us to help her." As noted above, this is with a reservation that this kind of work should not intrude on the individual freedom every student feels that she or he needs. The social aspect remains, in spite of its function as support, subordinated to the individual.

That participation is possible to understand as action and argumentation, which should precede the individual's knowledge construction, is not very obvious. There are few statements in which the students suggest that it is, via participation in a dialogue, possible to create meaning. Rather, it would seem to be, that an unproblematic relation to knowledge as more or less absolute, makes possible for the study group to support the co-students learning processes, in such a way that the students, within certain limitations, give and receive help if there is something that a co-student does not understand. Thus, the interpretation from a sociocultural perspective on learning is that the students understand participation as being above all a social aspect of studying together with others. An interpretation that indicates an understanding of learning in which knowledge can be created, the meaning of that knowledge is negotiated through interaction between students who participate in a practice after which it becomes a part of the student's thinking, is, however, not possible for us to make. Despite that participation seems, to a great extent, to focus on the individual instead of on the social aspect, the students' knowledge is possible to understand as linguistic tools that, through participation, they use to create communities.

Discussion

The challenge of integrating ICT in teacher education is difficult, but at the same time not impossible. Within distance-based teacher education ICT has, in one way or another, always been a common element. The technological development during the last couple of years has been rapid, and the elements of ICT that are part of distance-based teacher education have changed. Regardless of the form ICT takes at any given moment, its complex relation to two, always present, parts remain the same; the education organiser and the student. To be able to give *one*, via interpretation, possible understanding of the challenge of integrating ICT in teacher education, each part can be studied either individually or in relation to one other. Throughout our interpretational process we have tested the empirical statements against a fixed position consisting of three perspectives on learning, all of which are interrelated in that they all emphasise partici-

pation as a condition for learning. This makes it possible to interpret the meaning of the students' participation in a distance-based teacher education supported by the use of ICT.

The most common theme in our interpretation of the meaning of studying a distance-based teacher education and participating in a community of other teacher trainees is that the individual student appears to be central. Even though the distance-based teacher education is organised in such a way that the students ought to work together and collaborate in study groups, our interpretation is that participation and learning are defined as being individual. The students seem to be required to be responsible for maintaining both learning, that is, to be successful in their studies, as well as the social context. The students seem to internalise their responsibilities and the norm seems to be that it is up to each student themselves to meet requirements, for example, to enter into discussion with other students; something not easy to accomplish without fellow students. Interesting in this context is that the education organiser, which both provides and administrates the web-based learning environment, not seems to be ascribed responsibility for providing students, separated by time and space, with further and more frequent meetings in order to discuss education issues. As it appears now, in line with our interpretation, it is more or less in the physical gatherings three to four times per semester that participation in a distance-based teacher education as participation with others is guaranteed. Is it perhaps therefore why students express that their meetings are only meetings when they occur within the common physical space?

One possible interpretation is that ICT, and then first and foremost in the form of web-based learning environments such as OLCs and VLCs, do not in themselves seem to ensure that the students log on to these learning environments to meet fellow students in order to enter into discussion or to inquire about education issues. In other words, it seems difficult to build generic web-based learning environments, which in their design and construction could be said to contain functions that evoke student participation and thereby evoke learning with others in a social situation.

Another recurring theme in relation to participation in a distance-based teacher education via ICT is that the individual students ought to be self-sufficient. When students are not considered self-sufficient it appears to be because the student is either lazy, does not have the right qualifications or predisposition or simply does not show enough interest. Within this theme there is also a notion of participation in the program that implies that students are pleased to help other students, but only in so much that it does not affect their own studies negatively. One possible meaning

of this could be that many students on the distance-based teacher education have a life situation in which it is important to finish the studies as soon as possible and to enter the working life. Teacher education is therefore used more or less in an instrumental way; the studies are expected to lead to something else and are conducted for the benefit of the individuals themselves. Another possible reason as to why the individual is prioritised before the social is that every life project is conducted from each student's own conditions and needs. In such a case, the specific web-based learning environment used to enable participation and thereby learning is most probably subordinate. A third understanding could be that it is possible to interpret the concept of teacher education as the embodied notions of learn how to teach others. If so, and despite the education organizer emphasises the social dimension (e.g. learning through participation) and relates the role of the teacher to concepts like coaching and apprenticeship, the students use the situation to enhance their own ability to teach.

We have in this chapter, within a philosophical hermeneutical approach, shown some of the aspects that could be important to consider when ICT is integrated in teacher education regardless of whether the students participate in a campus or off-campus program. Teaching is a profession conducted together with other humans, and our opinion is, therefore, that teacher education should not be characterised by the individual student's learning processes, but by students learning through and with each other. We believe this is possible in a well-organised teacher education program in which web-based learning environments are used to bring students together rather than to tell them apart. The question is, therefore, not if, but how and in what way ICT can be understood and integrated into teacher education. The challenge is hereby accepted!

References

- Anderson, T., & Garrison, R. (1998). Learning in a networked world: New roles and responsibilities. In C. C. Gibson (Ed.), *Distance learners in higher education: Institutional responses for quality outcomes* (pp. 97–112). Madison, WI: Atwood.
- Barlebo Wenneberg, S. (2001). *Socialkonstruktivism: Positioner, problem och perspektiv* [Social constructivism: Positions, problems and perspectives]. Stockholm: Liber.
- Bernstein, R. J. (1983). *Beyond objectivism and relativism: Science, hermeneutics, and praxis*. Oxford: Basil Blackwell.

- Burr, V. (2003). *Social constructionism* (2nd ed.). London: Routledge.
- From, J., & Holmgren, C. (2003). Till frågan om människoblivandet: Hermeneutik som allmän pedagogik [The question concerning to be a human: Hermeneutics as general education]. In M. Uljens & J. Bengtsson (Eds.), *Livsvärldsfenomenologi och hermeneutik. Aktuella humanvetenskapliga forskningsproblem (Forskningsrapport no 192)*. Helsinki, Finland: University of Helsinki, Department of Education.
- Gadamer, H.-G. (1989). *Truth and method*. London: Sheed and Ward.
- Gergen, K. J. (1995). Social construction and the educational process. In L. P. Steffe & J. Gale (Eds.), *Constructivism in education*. Hillsdale, NJ: Lawrence Erlbaum.
- Heidegger, M. (1962). *Being and time*. Oxford: Blackwell.
- Jobring, O. (Ed.). (2004). *Lärgemenskaper på nätet: En introduktion* [Online learning communities: An introduction]. Lund, Sweden: Studentlitteratur.
- Johansson, K. (1999). *Konstruktivism i distansutbildning: Studerandes uppfattning av konstruktivistiskt lärande* [Constructivism in distance education: Students' thoughts about constructivist learning]. Umeå, Sweden: University of Umeå.
- Jonassen, D. H. (2004). *Design of constructivist learning environments*. Retrieved May 11, 2004, from <http://tiger.coe.missouri.edu/~jonassen/courses/CLE/>
- Kowch, E., & Schwier, R. A. (1997). Considerations in the construction of technology based virtual learning communities. *Canadian Journal of Educational Communication*, 26(1), 1–12.
- Palloff, R. M., & Pratt, K. (2003). *The virtual student: A profile and guide to working with online learners*. San Francisco, CA: Jossey-Bass.
- Parker, I. (1998). *Social construction, discourse and realism*. London: SAGE.
- Paulsen, M. F. (2003). *Online education: Learning management systems: Global e-learning in a Scandinavian perspective*. Bekkestua, Norway: NKI Forlaget.
- Renninger, K. A., & Shumar, W. (2002). *Building virtual communities: Learning and change in cyberspace*. Cambridge: Cambridge University Press.
- Risser, J. (1997). *Hermeneutics and the voice of the other: Re-reading Gadamer's philosophical hermeneutics*. Albany, NY: SUNY.
- Schwier, R. A. (2002). *Shaping the metaphor of community in online learning environments*. Paper presented at the International Symposium on Educational Conferencing, Alberta.
- Searle, J. R. (1995). *The construction of social reality*. London: Allen Lane.
- Seufert, S., Lechner, U., & Stanoevska, K. (2002). A reference model for online learning communities. *International Journal on E-Learning*, 1(1), 43–55.
- Shotter, J. (1995). In dialogue: Social constructionism and radical constructivism. In L. P. Steffe & J. Gale (Eds.), *Constructivism in education*. Hillsdale, NJ: Lawrence Erlbaum.

- SOU1998:83. *På distans: Utbildning, undervisning och lärande/Kostnadseffektiv distansutbildning* [On distance: Education, teaching and learning/Cost-effective distance education]. Stockholm: The Ministry of Education and Science.
- SOU1998:84. *Flexibel utbildning på distans* [Flexible education on distance]. Stockholm: The Ministry of Education and Science.
- SOU1999:63. *Att lära och leda: En lärarutbildning för samverkan och utveckling* [To learn and lead: A teacher education for cooperation and development]. Stockholm: The Ministry of Education and Science.
- Stephenson, J. (2001). *Teaching & learning online: Pedagogies for new technologies*. London: Kogan Page.
- Säljö, R. (1999). Learning as the use of tools: A sociocultural perspective on the human-technology link. In K. Littleton & P. Light (Eds.), *Learning with computers: Analysing productive interaction* (pp. 144–161). London: Routledge.
- The Swedish Net University. (2004). *In English: The Swedish Net University*. Retrieved March, 5, 2004, from <http://www.myndigheten.netuniversity.se/Default.asp?c=63>
- van der Veer, R., & Valsiner, J. (1994). *The Vygotsky reader*. Oxford: Blackwell.
- Warnke, G. (1987). *Gadamer: Hermeneutics, tradition and reason*. Cambridge: Polity.
- Vattimo, G. (1997). *Beyond interpretation: The meaning of hermeneutics for philosophy*. Oxford: Polity.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Notes

¹ All quotations are translated from Swedish to English. It is sometimes difficult to translate but we try to be as close as possible to the original text.

The ArTeach Project:

One Strategy for Integrating ICT Skills and Curriculum Design During Pre-Service Teacher Training

Wesley Imms & Elizabeth Lloyd

Introduction

The *ArTeach* concept is an ongoing, collaborative project where over a period of years successive cohorts of pre-service teaching students developed a succinct and theoretically sound template for making lesson plans, and created and refined a method of collating these lesson plans and other teaching resources into a digital curriculum document. The end result is a multimedia CD-ROM/website that is distributed to students as a “survival pack” for their first years in the classroom. It contains quality-teaching resources created by the students themselves and considered by them to be relevant to their early career needs.

The project is considered noteworthy for a number of reasons. It provides an intriguing example of ICT theory in practice. It utilises the combined expertise of methods lecturers, ICT specialists and pre-service students. It is self-sustaining, in that successive cohorts of students’ critique, modify, make additions to and maintain the site. It requires students to use ICT skills, previously taught as a stand-alone subject, in a practical and authentic way. It requires students to consider the practical application of subject specific curriculum theory.

The purpose of this paper is to provide an overview of the *ArTeach* project, to discuss how it serves as an example of current ICT theories in practice in pre-service teacher education, and to present some “dilemmas” that emerge during its development. These dilemmas are insights that others may find valuable; while *ArTeach* is specific to visual art education, it is believed that the design and operation of this model applies equally to many other core discipline areas in pre-service teacher education.

The ArTeach Project

Context

The University of Melbourne offers degrees in primary and secondary teacher training, as well as extensive postgraduate studies in education. Primary pre-service teachers included in this project elected to study a four-year Bachelor of Education degree, within which art education was a compulsory subject in years one and two for 12 hours each year, and as a voluntary elective in years three and four for a total of 36 hours each year. The students discussed in this paper were Bachelor of Education (Primary) third year art elective students from the 2001–2004 cohorts.

Origins

As is typical in most teacher-training courses, students in this program were required to compile a series of lesson plans to illustrate their mastery of relevant curriculum theory and their ability to plan appropriate pedagogy. During a class early in 2001 students raised concerns about the lesson plan assignment that was being discussed. The essay styled lesson plan, typically used to undergo this task, was considered to have serious shortcomings. Students argued that it was an unwieldy and inaccessible document, difficult to use in the classroom during practicum teaching. It was time-consuming to write, and while often photocopied, bound and passed to the cohort as a resource, the finished product had limited appeal to fellow pre-service teachers due to its bulk, inconsistent structure and surplus of theoretical information. Students summarised the issue by calling the lesson plans “busy work.” The lecturer felt compelled to agree with many of these sentiments, often thinking that these assignments were uncomfortably removed from the “real world” of teaching.

During the following weeks class discussions focused on finding a solution to these concerns, eventually deciding to undertake a comprehensive restructure of the assignment and to access ICT skills being taught elsewhere in the degree course. Using knowledge gained during their “ICT in the Primary Classroom” subject, it was agreed that students should design a common electronic template for lesson plans, and a method of collating these plans into some sort of filing system where they could be recalled and

displayed easily. Because students would be responsible for designing the resource, the structure would be relevant to their teaching needs during their first years of practice – as they put it, a “curriculum survival pack.” The main stipulation made by the lecturer, given the amount of “up front” work and to ensure the project’s robustness, was that the structure had to become self-sustaining over succeeding cohorts of students. From this needs-driven beginning, the *ArTeach* project was launched.

The Concept

Due to the design of the third and fourth year Bachelor of Education Visual Art courses, the third year subject, with on average between 25 to 30 students each year, was ideal for this type of project². Brainstorming sessions in this class during mid-2001 decided a physical and organisational structure for *ArTeach* that has remained largely intact to the present time. The *physical structure* they designed consisted of an electronic template for lesson plans, and a master document for storing these lesson plans with hyperlinks and search tools to make the information accessible. Initially, Microsoft Word was chosen as the format due to its accessibility to all students and its ease of use. During this year, the lecturer, in consultation with the students, also developed an *organisational structure*, which included task outlines, timelines, management structures and a suite of committees allocated with specific tasks to undertake. The following section will discuss these structures in greater detail.

Physical structure of ArTeach: The lesson plan template

The initial task was the development of a template for lesson plans that met course needs and the requirements of students in the classroom. The product, called an *ArTeach Worksheet*, was a single-sheet, double-sided template that included key components of planning a lesson (Figure 1).

Page one consisted of an “aim” statement, an “exemplar” of the key concept to be covered in the lesson, and an example of the final product to be produced. Page two included an “objectives” statement embedded into a description of the lesson, a procedures section (for Australian art education curriculum this included “making” and “responding” components) and the key assessment criteria listed in a “critique” statement. This page also included an extension activity and a list of relevant resources.

Figure 1. A completed *ArTeach Worksheet* template



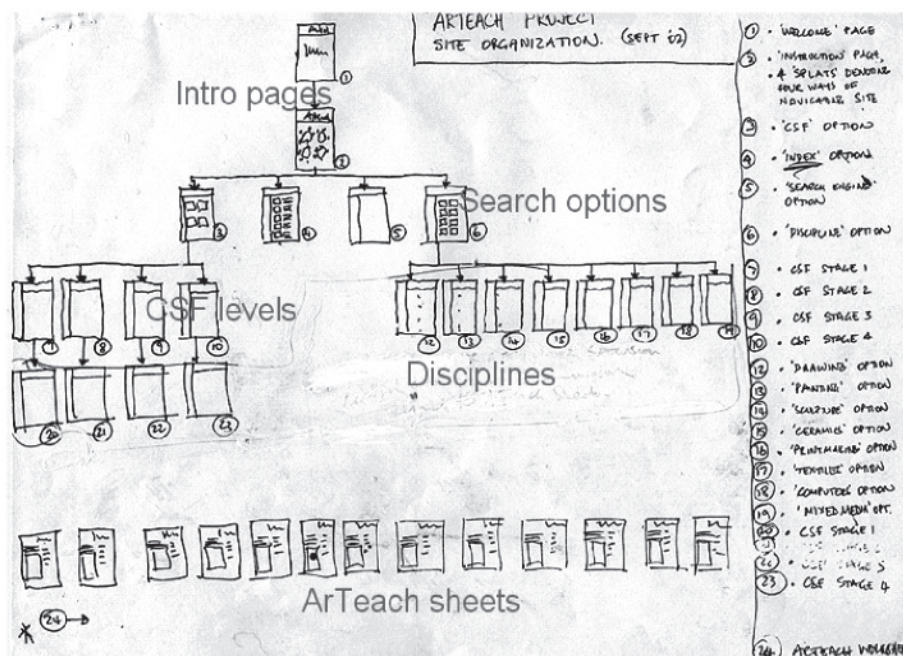
Each *ArTeach Worksheet* included a range of identifiers on the opening page, where students were required to summarise the key curricular features of their lesson. This provided a quick overview for readers, and a list of key terms to be used when lodging the lesson plan into the master document.

According to students, the *ArTeach Worksheets* contained many benefits over traditional lesson plan structures. Its brevity and succinctness allowed for easy use in classroom teaching situations. The plan flowed as a lesson might. It was authentic in that it avoided curriculum jargon (for example aims and objectives were embedded in discussion points intended for the start of the lesson). Assessment criteria were embedded in suggested discussion points for the conclusion of the lesson. Resources, including websites, book references, links to other sheets, and student examples of outcomes, were listed, often with convenient URLs.

Physical structure of ArTeach: The master document

With the potential of hundreds of *ArTeach Worksheets* being produced, a robust method of storage and retrieval was required. To serve this need a master document was developed, consisting of four layers (Figure 2).

Figure 2. Structure of the *ArTeach* master document.



After two intro pages (layer one), users entered a search page (layer two) where they could choose any one of three methods to explore the document; by CSF level³, art discipline⁴, or topic⁵, plus an as yet incomplete search engine. Layer three contained curriculum summaries written by the students in an attempt to de-mystify the Education Department's official curriculum document, which they felt lacked the detail they required for practical classroom applications. Each of these layers included thumbprints of, and hyperlinks to, relevant *ArTeach Worksheets* embedded elsewhere in the document. Level 4 was the storage facility for the actual *ArTeach Worksheets*.

Project organization

Ensuring that a group of students would be able to carry out this project required considerable planning. The project's organisational structure evolved during that first year (2001). In essence, it consisted of a management group and a set of committees with specified tasks and timelines. To ensure a collaborative approach, components of lecture times were used to identify tasks, review progress, and set new goals. Students volunteered to work on a committee depending on their self-perceived knowledge of ICT. These committees undertook a range of tasks, from the challenging

task of managing the project, to the relatively simple job of editing *ArTeach Worksheets*. Through this self-selection process, students with greater ICT experience lodged and digitally linked the *ArTeach Worksheets* using web authoring software, and students less skilled in ICT helped to design the “new teacher-friendly” structure of documents, undertook curriculum analysis, and produced the sample lesson plan sheets.

While all tasks were important, a critical role was that of the “student managers” who coordinated the committees and worked closely with the ICT specialists to ensure that proper protocols were being met. In succeeding years after 2001, final year Bachelor of Education students who as 3rd years had worked on *ArTeach*, filled this position. In this way, considerable continuity, student ownership, and best use of developed knowledge were ensured.

During the second year of *ArTeach* two ICT teaching specialists were engaged using modest funds supplied through a successful university Technology Infusion Grant application. These positions allowed students’ access to ICT assistance and advice beyond the capacity of the lecturer to provide.

Developmental Process

Stages of development

The *ArTeach* project grew over three years as successive cohorts of third year Bachelor of Education art education elective students refined the work done by students during the previous year. What were some of the critical stages of development?

During 2001 the student cohort designed a template for lesson plans (Figure 1), and a document structure that would “house” the plans as they were lodged (Figure 2). This involved considerable class discussion about what was actually needed in terms of a “curriculum survival pack” for their first year of teaching, and how it should be organised so they could access the information easily. This stage also involved considerable simplifying of the official curriculum documents, and group work aimed at writing sample tasks for the classroom. These items became the content for level 3 of the master document (see Figure 2).

At the beginning of 2002 (and subsequently, at the beginning of each new year), students undertook a written critique of the previous years product. This involved the students (1) hypothesising the “ideal” curriculum

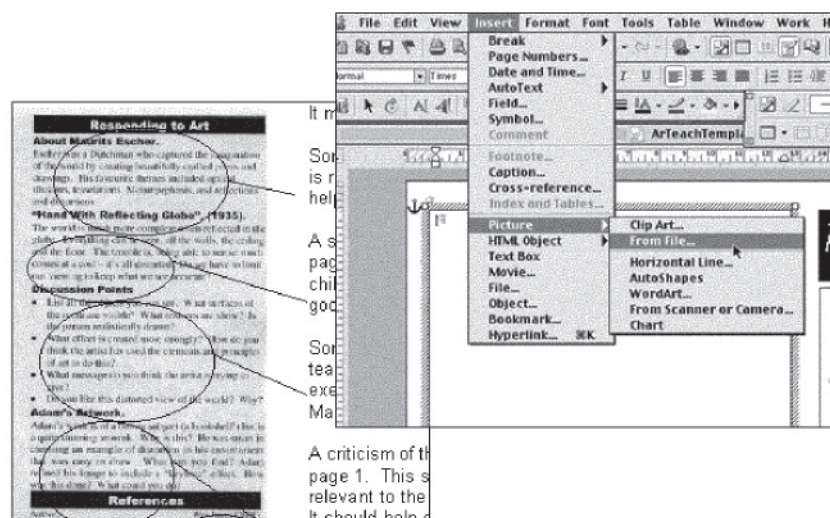
resource they would want as a new teacher, (2) analysing how the existing document met these needs, (3) carefully considering what changes would be required to bring the *ArTeach* document up to their “ideal”, and (4) specifying what skills they had to offer this process. From this critique, committees were developed to undertake the tasks stipulated by students, and schedules for completing these tasks were drawn up (Figure 3).

Figure 3. Group task schedule

Group	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Conversion								
Site Manag								
CSF								
Index								
Discipline								
Images								

The primary 2002 task was to convert the document to an HTML web-based format built using Dreamweaver. This occurred because the 2001 Microsoft Word document was prone to hyperlink and formatting errors, particularly when being swapped from PC to Mac platforms. This task included some restructuring of the document, but also considerable work on the aesthetic qualities of the document. In addition, this cohort developed a set of “cheatsheets” that explained to students in other years of the course how to complete *ArTeach Worksheets* (Figure 4).

Figure 4. “Cheatsheet” for completing *ArTeach Worksheets*



In this way, all students undertaking visual art in the Bachelor of Education degree began supplying lesson plans for *ArTeach* from 2002 onwards. While only those lesson plans deemed of a high standard by the editing committee were selected⁶, this development led to a considerable file of *ArTeach Worksheets* being available for lodging into the site.

The 2003 cohort completed this task, refined the site's appearance, and tidied the various links to ensure its smooth operation. The focus of the 2004 cohort is to lodge a backlog of material onto the site, and to refine its aesthetic appearance. In addition, during this year the cheatsheets that help students complete tasks are being finalised, and a "Managers Manual" containing job descriptions and a set of protocols for maintaining the site, is being constructed. One major task remains for a future year; a search capability is required that will combine, and possibly make redundant, the functions of the existing 3 methods of locating material.

Typical procedure

Now that the development of *ArTeach* is close to finalisation, how will it typically operate in future years? Students in any of the years of the Bachelor of Education (Primary) degree are provided the set of cheatsheets on a CD at the beginning of the year, including an empty *ArTeach* template. They produce their lesson plan during normal coursework. It is then submitted to their lecturer both electronically (burned onto a CD or via email) and in a hard format, together with a completed checklist that states all images are correctly filed into specified formats, and copyright is assigned to *ArTeach*. The work is graded, and those sheets deemed of sufficient merit are entered into an Excel Spreadsheet and then forwarded to the *ArTeach* editing committee. This committee makes necessary structural and grammatical changes, and inserts any links to other sheets that are considered useful. Sheets are then given to the management committee, where they are inserted into the master document, and a separate committee inserts the thumbprints and creates the necessary hyperlinks. Finally, the student manager quality assures the process to ensure proper protocols were followed. During this time, other committees work on improving the "site aesthetics", logos, colour schemes, and the content of information within the site. At the end of the year, CDs are burned and passed out to completing students as a finished class assignment. Thus far the site has not been posted on the Web due to copyright issues surrounding the use of "exemplar" images in the original worksheets.

While still in a process of refinement, in 2004 this essential structure is now in place and is advancing towards a "self-sustaining" status. By this

it is meant that previous dependence on ICT specialists is decreasing to the point where future cohorts will take full control of *ArTeach*. The “Managers Manual” that lists both organisational procedures and site management protocols, and the collection of comprehensive cheatsheets, should provide enough information to allow for future student independence even when modifying the site.

ArTeach and Current ICT Theory

What began as a project that was clearly practice based, over the years developed a parallel academic interest for some participants. Because grant money allowed the employment of an ICT specialist and an educational ICT lecturer to assist in management and to work with the various committees, issues concerning the way that pre-service teachers engage ICT in a practical sense became evident, and would often be discussed at meetings. From these discussions, presentations were made at conferences that helped identify and consolidate the key theoretical issues.

Situated Learning Theory and Collaborative Multimedia Projects

Within the wider field of computers and education, three areas explored in the literature have particular relevance to the *ArTeach* project. Each of the following informs the nature of the collaborative work undertaken in the project.

Problem-based collaborative learning

Problem-based learning has been seen to mitigate the tendency towards separation of learning from its context that is found in many educational institutions. Collaboration itself is also seen to bring aspects of real-world interaction into the classroom. Neo and Neo (2002) have claimed that creating multimedia projects is collaborative by its nature.

The Multi-media development process.

According to Neo and Neo (2002), collaborative multimedia CD-ROM projects contain the following six stages;

1. planning
2. media representation
3. digitisation
4. authoring
5. deployment
6. and CD-ROM delivery

Collectively, they refer to these steps as the Multimedia Development Process (MDP).

These stages may reflect the way in which development of a multimedia project proceeds in the world of professional ICT development. However, in the *ArTeach* project we found that the stages evolved somewhat differently. Because of the ongoing nature of the project the stages evolved more organically, and developed a cyclical form, with each new year's cohort repeating and revising some of the work of the previous year.

Using the Neo and Neo terminology, our Planning, Media Representation, and Digitisation stages happened concurrently with the Planning and Authoring stages, with groups of students engaged simultaneously on different tasks. Unlike in a commercial multimedia project, the Deployment and Delivery stages took on less importance than the other parts of the process. We simply burned the resulting product of each year's work, whatever stage it was at, and distributed it to students. In fact, it could be argued that once the CD is "delivered" the project is complete, while in an ongoing project like *ArTeach*, the collaborative process of revision and development is seen as valuable in itself. This concentration on the process and educational outcomes of the collaborative process, rather than the resulting product, differentiates this project from typical multimedia development and has advantages and disadvantages that will be discussed further in the Dilemmas section below.

Situated Learning Theory

Situated Learning Theory as developed by Brown, Collins and Duguid (1989) places central importance on the learner feeling that the learning activity has relevance to the real world; "*the notion of learning knowledge and skills in contexts that reflect the way the knowledge will be useful in real life*" (Brown & Collins, 1988, p. 2). To achieve transferable learning the learning activity must take place in a relevant context; the absence of such a context in the learning environment is theorised as leading to the inability of the learner to synthesise knowledge in a way that will be useful in future situations.

When learning and context are separated, knowledge itself is seen by learners as the final product of education rather than a tool to be used dynamically to solve problems (Herrington & Oliver, 2000).

Current literature suggests that the following situated learning elements (SLEs) must be provided to the learner in order to bring learning into context (Herrington & Oliver, 2000):

1. Authentic contexts that reflect the way the knowledge will be used in real life
2. Authentic activities
3. Access to expert performances and the modelling of processes
4. Multiple roles and perspectives
5. Collaborative construction of knowledge
6. Reflection to enable abstractions to be formed
7. Articulation to enable tacit knowledge to be made explicit
8. Coaching and scaffolding by the teacher at critical times
9. Authentic assessment of learning within the tasks

Although we approached the *ArTeach* project initially very much from a practical and pragmatic viewpoint, with early decisions about the organization of the project largely based on technical and structural considerations, it is interesting to note that the project naturally evolved to address most aspects of these nine SLEs. The ways in which the *ArTeach* process did not address some parts of these SLEs, along with ways that we intend to mitigate these shortcomings in the future development of the project, will be discussed in the dilemmas section below. We did notice that although the students had all completed a basic educational computing course in the previous year many of them were unable to recall and utilise these ICT skills, and it took some time and tutoring effort to bring them up to the technical competency required for this project. It should also be noted that there is some debate in the literature over whether computer-based environments can provide the kind of authentic learning environments that are required for situated learning (Tripp, 1993). However, although some of the *ArTeach* process was undoubtedly computer-based, much of the collaborative work in the project took place in a traditional face-to-face environment in the classroom.

Dilemmas Arising From ArTeach

The ambitious concept of organising large numbers of students to create an interactive multimedia product produced, not surprisingly, some difficulties. These are worth recording, as they portray the practical face of implementing ICT learning theory in a pre-service teacher education context. The evolving nature of the project, where each group builds on the design decisions made by earlier groups, suggests many technical, organisational and human possibilities for error or failure. Add to this the sometimes conflicting needs of the subject lecturer, the ICT specialist, and the ICT lecturer, and it was often felt that the *ArTeach* project had a limited future.

Structure versus Emergent Methodology

Students were divided into a number of groups with specific tasks and deadlines for work to be handed over to next group (see Figure 3). This provided the overarching structure in which student creativity could be harnessed while staying within the wider goals of collaboration. The project was constructivist in nature and evolved from an open-ended, loose process, analogous to the design method commonly used in visual arts, into an increasingly structured and scaffolded set of intended outcomes. Increased scaffolding was put in place as technical and design aspects of the project became more demanding over time. At first we wanted the process to be very wide in scope, trying to incorporate as many design ideas as possible; the process gradually became more focussed in terms of deadlines, tasks and outcomes required of the students over the life span of the project.

There was some discussion about the negative impact that this trend towards a more narrowed focus would have on the authenticity of the task. That is, we were concerned that taking design decisions out of the students' hands would remove the "realness" of the project. It was decided that one way to address this problem would be to begin each new cohort's involvement with the project with a similar open-ended approach. This was achieved using the critique process described earlier, conducted at the very start of each year before the students had become too familiar with the current status of the project. However, this revisiting of previous groups' design decisions might in future prove to be in conflict with the wider goals of ongoing project development, with each successive group merely

“reinventing the wheel” at the beginning of each year. A decision about which design elements of the project are open to ongoing critique/change by successive cohorts of students, and which are not, is vital if the project is to continue to evolve towards a useable end product.

Process *versus* Outcome

It became obvious early in the ArTeach project that there was going to be tension between process and outcome, with the desire to create a high tech, polished solution often in conflict with the ongoing need to make the project meaningfully collaborative for students.

It was often tempting from the ICT lecturer/ICT expert's point of view to take over from the students and fill gaps or fix broken elements in the site in order to bring it closer to completion. This was largely avoided as it was seen to take the ownership of the product, warts and all, out of the hands of the students. This tension, however, may be an inherent part of the process of collaboration in a multimedia project of this nature.

Pressure to Complete *versus* Student Need for Technical Support.

Leading on from the previous point, we resisted the urge to take on or finish activities that were assigned to student collaborators in cases where the amount of time it would have taken to get them to a technically proficient level in the particular IT skill was greater than it would have taken for staff to do the work themselves. With increasing pressure approaching project stage deadlines this became a very real dilemma. It should be noted, however, that the time pressures associated with this project were made significantly less acute because we agreed early on that any unfinished aspects of a particular cohort's work on the project would simply be carried over into the following year's cohort.

Desire For Technical Excellence *versus* Keeping ArTeach Consistent With The Technical Abilities of the Collaborators

The level of technical challenge inherent in a particular multimedia project is a key factor in a project's ultimate success or failure. The varying technical skill levels of the collaborators in the ArTeach project often meant that decisions were made that pushed the overall technical outcomes of the product towards the lowest common skill denominator. This is an ongoing problem in multimedia development of this type and is something that might be addressed through a more specialised approach to collaboration.

Course Time Demands *versus* Project Time Demands

There was a general lack of attention to deadlines and meetings in the early years of the project. While the subject lecturer and the ICT lecturer were conditioned to student tardiness, the IT specialist, charged with the task of keeping committees working, found this particularly frustrating. It was discussed that this may have been due to lack of some members of the class feeling ownership of the project as well as a lack of continuity of student work on the project due to students' other subject deadlines and extended periods of teaching practicum. This was taken into account in the 2002 review of the project and structures put into place for 2003 to make it more difficult for students to avoid addressing the main issues of the collaboration. In a review of the *ArTeach* project at the end of 2002, a more structured organisational approach was decided upon for the following year in order to get more student involvement at a higher level (see Figure 3).

Assessment Driven *versus* Process Driven

It was decided early on that the *ArTeach* project would not be primarily assessment-driven, as we agreed that rigid assessment from the start would detract from the collaborative process that we were trying to create. However, we were aware of the need to build authentic assessment into the process (see SLE number 9) without it becoming burdensome for the participants. This resulted in an uncomfortable situation, repeated each year, where final grades for participation in this project had to be individually

negotiated with each student. This occurred because projected tasks for the groups rarely remained accurate throughout the year, thus criteria were hard to specify, and also because it often occurred that individuals within each group did differing jobs with varying levels of commitment. There was little respite from this dilemma during the years of *ArTeach*, and it was to students' credit that they succumbed to the inexact method of negotiated assessment at the end of each year.

Future Development of the Project

Three issues remain to be adequately addressed. The "self sustainability" that was an original stipulation of the project is still to be tested in the harsh light of reality. As was mentioned earlier, the strategy of cheatsheets, and the development of the Managers Manual will no doubt be valuable tools in this quest. However, it remains to be seen how well they will work in practice when the support of the ICT specialist is withdrawn. In addition, the degree to which other lecturers without any attachment to *ArTeach* will be able to cope with the project's unique demands remains to be seen. A second issue is the development of a search device. This need was highlighted by the original cohort in 2000, and no work has been done to date to meet this need. It would appear to be a necessary addition to the project, and one that may require a specific grant of money in the future. The third ongoing issue is that of copyright. Art educators must, by the very nature of their subject, draw on examples of artworks from artists as they teach (exemplars). It is necessary for lesson plans, and thus *ArTeach*, to contain images lifted from copyrighted sources. While this may be (arguably) permissible for individual teachers for instructional purposes, it leaves any reproduction of *ArTeach* exposed to illegal practice. For this reason, *ArTeach* is only ever copied as a class assignment and given to participating students. Each *ArTeach Worksheet* carries a copyright warning, each student-created artwork has a signed copyright release form, and there are no plans to publish this valuable resource on the web until this issue is resolved.

Conclusion

Readers may initially dismiss *ArTeach* as a project specific only to art education. While, admittedly, this may be true for some of its components, the

fact that it was conceptualised by generalist pre-service teachers and developed by a team of people with quite varied loyalties, gives some suggestion to its potential applicability across all subject disciplines. This paper has attempted to analyse the lessons learned over the past four years of *ArTeach* in a way that informs all educators committed to implementing quality innovation in pre-service teacher education through innovative use of ICT. For this reason, the paper went to some lengths to describe this project's organisational structure and the processes of its development in the belief that the years of development have highlighted some significant issues for future use of ICT in this field. While *ArTeach* is certainly specific to one discipline, it has relevance for all subject areas.

ArTeach is a useful model of authentic, student-created, needs-driven curriculum development where students had controlling interest in the project, and where successive cohorts continued its development. *ArTeach* highlights ways that current ICT theory is reflected in current practice. It highlights a set of practical issues (dilemmas) that confront educators wishing to use ICT in similar group-based, student-relevant situations. It helps to reassure readers that ICT can be used effectively in a long term, complex, flexible, student-centred project. Finally, *ArTeach* emphasises that ICT, while indispensable for modern pre-service teacher education, is arguably most effective when used as a tool to address student issues, not as a central focus of itself.

References

- Brown, J. S., & Collins, A. (1988). The computer as a tool for learning through reflection. In H. Mandl & A. Lesgold (Eds.), *Learning issues for intelligent tutoring systems* (p. 1–18). New York: Springer-Verlag.
- Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32–42.
- Herrington, J., & Oliver, R. (1999). Using situated learning and multimedia to investigate higher-order thinking. *Journal of Interactive Learning Research*, 10(1), 3–24.
- Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. *Educational Technology, Research and Development*, 48(3), 23–38.
- Tripp, S. D. (1993). Theories, traditions and situated learning. *Educational Technology*, 33(3), 71–77.
- Neo, T. K., & Neo, M. (2002) Building a constructivist learning environment using a multimedia design project – A Malaysian experience. *Journal of Educational Multimedia and Hypermedia*, 11(2), 141–153.

Notes

¹ A 24 hour subject studied during the second year of their degree.

² The “curriculum” component of the third year visual art elective focused on further development of the basic lesson planning skills learned during the compulsory first and second years of the course.

³ Curriculum Standards Framework organises curriculum into levels (4 in the Primary years, 2 in the senior years) according to skills, rather than time.

⁴ For example, painting, drawing, printmaking, etc.

⁵ For example “Self Portrait” or “Painting Like Leonardo”

⁶ During 2003, all students in the bachelors program produced approximately 250 worksheets. Around 10% were chosen for ArTeach, but a higher proportion is expected in future years as standards become clearer.

Acknowledgements

The ArTeach project received financial support from three University of Melbourne Faculty of Education IT Infusion Grants. The authors would like to acknowledge the support of the Department of Language Literacy and Arts Education and the Department of Science and Maths Education at the University of Melbourne, and Mr Michael O’Brien, for their assistance and support.

Collaborative ICT Learning

Teachers' Experiences

Christina Chaib

Introduction

The computer, like all technical newfangled things, is often associated with conflicting attitudes and feelings. The computer is the most perfect, modern artefact of technology in everyday life. It takes a long time for people to get used to using new technology and discovering any possible advantages. Naturally, information technology with its hyperquick development is one of the most intrusive of all technical inventions in history (Castells, 1998).

To be able to influence the development and the use of ICT in an effective and optimal way, all teachers need to have good knowledge about the modern technology. Different courses have been added over the past few years, to the teacher training programs, and the working methods have changed because of IT. It means that the teacher students learn about IT at the same time as they practise using the technology and its various possibilities. Despite all these new activities concerning IT, the newly educated teachers often feel unsure and experience a lack of knowledge in the field of IT (Skolverket, Rapport 208, 2001; KK-foundation, 2002, 2003).

Besides the teacher education, teachers already working in schools are offered different courses with the purpose of developing a familiarity to new technology. Among all these competence development programs, the one reported in this paper, named ITiS, is the largest.

This contribution deals with experiences from 24 teacher teams in school who have participated in the national competence development program, ITiS, which stands for IT in School, and is an ICT project as well as a school development project. ITiS was continually evaluated by the School of Education and Communication in Jönköping.

The purpose of the study presented here is to illustrate what happens at the schools by having the teacher teams reflect together over interdis-

plinary, problem-based and student-oriented working methods, of which ICT forms an integrated and pedagogic tool (Chaib, 2002; Chaib, C., Chaib, M., & Ludvigsson, 2004; Chaib, M., Bäckström, & Chaib, C., 2001).

ITiS – A Model for Competence Development

ITiS started in 1999 for a period of four years. It covered all schools, i.e., pre-school classes, compulsory schools, and upper secondary schools.

This report deals with in-service training of teacher teams. The evaluation is focused on competence development for teacher teams and based on how they took joint responsibility for planning and conducting their development. In addition, ITiS comprised a number of different components (Delegation for ICT in Schools, 1999):

- In-service training for about 70,000 teachers in teams
- A multimedia computer for the participants
- State grants to improve the school's access to the internet
- E-mail addresses for all teachers and pupils
- Support for the development of the Swedish Schoolnet and the European Schoolnet
- Measures for pupils with special needs
- Awards for outstanding pedagogical contributions

The competence development was accomplished, from the government, through three forms of operations:

- Each teacher team completed an interdisciplinary, problem-based, and student-oriented development project together with their students.
- The teacher team functioned as a study group and, together with the support of a mentor the group studied, discussed, and documented their work. The mentor was at the disposal of the team for a total of 15 hours.
- A number of teams met on a continual basis for a total of 20 hours in a uniting series of seminars in order to discuss and exchange experiences. The mentor led the seminars after having received teacher training assistance.

Each teacher team worked as a study group that interpreted the aims of the program on their own, and thereby they determined the focus of the studies. Participants in ITiS were expected to take the main responsibility for their own as well as the group's learning and development. The teacher team was free to structure the work in a way that best benefited individual learning, considering the local conditions and performing this in co-operation with the mentor and the students. The competence development was equivalent to a total of three weeks of full-time study, which was spread over the period of time deemed necessary by the teacher team and the seminar group. This usually amounted from some weeks to one semester or its equivalent.

A key feature of the competence development was that every teacher team who participated was to summarise their own experiences in a final report. This was meant to reflect the personal learning and development during the competence development.

The focus of this competence development was the teacher team, not the individual teacher. Teachers and students were expected to learn to use the new technology and adapt it to new pedagogy. The process of ITiS itself was the focus of the competence development, not the output. For this purpose every teacher who participated in ITiS was supplied with a multimedia computer.

Theoretical Perspectives

As a theoretical approach for the study, the research group has adopted a social constructionist view of learning. We see the training program as a pedagogic process of communication in which the teachers created knowledge together in their interaction with one another and when solving any given task. Social constructionism, which deals with how people form their reality socially, is not one specific theory but rather it is represented by several competing theories (Berger & Luckman, 1966; Burr, 1995; Searle, 1997; Wennerberg, 2001). Social constructionist theories about learning are based on the conditions for learning among children and young students. Adult learning in formal contexts is often voluntary, even if not everyone may perceive it this way, and is therefore considerably more dependant on different factors of motivation. Adult learning depends on both an organizational framework, within which the learning takes place, and on the conceptions and, in particular, the social representations that a teacher has about IT within the school (Ellström, E., Ellström, P.-E., & Ekholm, 2003; Engeström, 1994).

Adults learning

Even if the social constructionist approach is taken towards the study, this theoretical perspective entails certain problems. Whether or not, and what, a student learns depends to a great extent on the sociocultural environment (Säljö, 2000). Nevertheless, in principle there is no theoretical difference between children and adults regarding the importance of the sociocultural context for learning. Yet the student, regardless of the nature of the sociocultural environment, can hardly avoid being “exposed” to learning. If the environment does not offer an acceptable stimulus, an adult can choose to leave the learning environment (Engeström, 1994). The knowledge that adults gather through a learning process is conditioned by their social patterns of behaviour and the practical activities of exercising their profession. For adults who are caught up in their careers, investing in education is directly dependent on what benefits can be seen from what they learn. Competence development of adults should therefore be characterized by clear and concrete elements related to how the respective professions are exercised. According to Engeström (1994), one should consider that learning in working life is often connected to functional needs and problems. This means that the search for practical results and applications dominate the learning process and its design. Short learning sessions under hectic and often disjointed working situations can lead to isolated knowledge and a lack of continuity.

Forms of learning

Learning takes place in many different situations and under many different circumstances. Three forms of learning are distinguished (Reg. Prop., 2001/01:72), namely formal learning, non-formal learning, and informal learning.

Formal learning is the form of education that occurs within the framework of the public education system. Non-formal learning normally occurs in environments that are less controlled by rules and are found outside the public education system. Finally, informal learning occurs, as the name suggests, completely informally. A clear educational situation does not even need to exist for learning to occur.

The teachers’ learning, within the program under investigation, appears to have been a combination of all of the above-mentioned forms of learning. The development of knowledge assumes providing teachers with the opportunity to strengthen their knowledge on an individual basis. Accordingly, the teachers had full liberty to control their own learning based on the specific situation. Yet at the same time, the program was, like all

other national efforts, controlled by a fast set of rules. Teachers who participated in the program did so within the framework of the given educational institutions. The guidelines for the program, as mentioned above, stated a number of criteria that teachers should follow (Delegation for ICT in Schools, 1999). At the end of their work, they were expected to present a report about how they experienced the process during the competence development program.

Collaborative learning

The teachers were expected to work in teams, to continually discuss the work within the group and with the mentor. They were supposed to work as study groups throughout the program. In this sense the works done by the teacher teams were carried out on a collaborative level.

Today, research once again focuses on the importance of collective learning and generation of knowledge. There is a shift from focusing on individual accomplishments in co-operation with other individuals to an increasing interest in collaborative group dynamics. A distinction is made between the concepts of "co-operation" and "collaboration" in connection with group activities. There is also less focus on important factors in collaborative situations, towards the nature of variables in interactive processes. This gives rise to a more process-oriented point of departure (Dillenbourg, Baker, Blaye, & O'Malley, 1990). However, the concepts of co-operation and collaboration are somewhat ambiguously defined by current literature. I support the following definition, "*Collaboration is distinguished from cooperation in that cooperative work... is accomplished by division of labour among participants, as an activity where each person is responsible for a portion of the problem solving..., whereas collaboration involves the... mutual engagement of participants in a coordinated effort to solve the problem together*" (Roschelle & Teasley, in Dillenbourg et al., 1990, p. 190). The above definition does not rule out the possibility of collaborating individuals being responsible for different parts of a shared task. The role of the individual in a collaborative group activity can change over time, depending on the nature of the problem. Sometimes one member in a group possesses a deeper knowledge, which is then passed on to the other members, while someone else in the group can be instrumental in developing the collective learning process by asking critical and analytical questions.

The division of tasks, *per se*, is not the separating factor between co-operation and collaboration, but rather of how the task is accomplished. In the case of co-operation, tasks can be divided between individuals, while in collaboration the task is integrated and must be coordinated, i.e., partial

results cannot be treated separately as they depend on each other (Dillenbourg et al., 1990).

The Purpose

The purpose of the study is to illustrate what happens when the teacher teams reflect together over the working methods they apply in the competence development. Of special interest is how the teacher teams experienced the support given by the mentors. The questions that make up the foundation for the result of this report are the following:

- To what extent do the teacher teams feel that the competence development has brought about pedagogical and administrative changes in their working situation?
- Which significance, if any, did the mentors have for the teachers' own learning experience during ITiS?
- Have the teacher teams conjured up any new opinions or thoughts regarding ICT as a pedagogical tool and if so, what are these?
- Do the teacher teams feel that their own learning has been enhanced, and if so in what way?

Qualitative Approach

A central objective of the training program was to stimulate the teachers to reflect on their own way of learning, i.e., the way they use ICT and in what way they can develop the learning setting and their work in the school. This study is intended to grasp teachers' thinking about the pedagogical consequences of the increased use of ICT in teaching settings.

Through a qualitative study of 24 teacher teams, we attempted to clarify the experiences of the teachers. The study aimed at gathering unique elements of their working methods. In order to understand and catch these unique elements, more and supplementary data collection methods are required.

In this investigation, triangulation has been used in some respects (Hammersley & Atkinson, 1983). To gather data surrounding the pheno-

mena, researched interviews, focus interviews, and participant observation were used.

Sampling

Both municipality size and the students' age were taken into consideration when choosing the teacher teams. The reason for this type of sampling was that differences could appear between different types of community size as well as between different levels of schooling. Among the 24 teachers teams, 9 of them came from big municipalities, 10 from medium sized ones and 5 from small municipalities. In each of these municipality types, the different grades were represented.

Data collection

In order to collect different type of data concerning both experiences the respondent groups had of working together, discussions with the mentor, and the practical work with students, different data acquisition techniques have been used. On those occasions when the mentor had a scheduled meeting with his/her teacher team when we were visiting the school, we have been present. The following data acquisitions methods were used:

- Focus interviews with the teacher teams
- Observation during a teacher team meeting with the mentor
- Observations of the pedagogical work
- Analysis of documents

The main quantity of data has been collected through focus interviews with the teacher teams (Wibeck, 2000). We chose focus interviews for this study since our interest was concentrated on how "*participants in a certain group think together about a phenomenon*" (ibid. p. 40). During the focus interviews, the participants discussed opinions and ideas about the structure and the experiences related to the competence development. We tried to meet with the mentors when we met with the teacher teams to conduct the focus interviews. This observation opportunity was fruitful, as we gained knowledge about what forms the guidance meetings could take. When visiting the schools, we were given the opportunity to observe the pedagogical work with the students. We also talked with the teachers and the students about their using of ICT in the schoolwork. The teacher team documented their experiences of the competence development in a report which we took part of.

Data analysis

Each school was initially described as a case study. The analysis, which our observations are based on, builds on a further processing of all of the 24 case studies. Each processing of data entails a reduction of the original material. Many assertions have been crystallized through the material.

We use the term “assertion” more or less as it appears in the so-called discourse analysis of Michel Foucault (see e.g. Dreyfus & Rabinow, 1982). An assertion is an enunciation, utterance or statement that is verbal or written and articulates an opinion about something. The term assertion as it is used in this report refers both to verbal utterances, which we have taken from discussions with the teachers and the students, as well as statements gathered from written material, which the teacher teams have supplied.

We have sorted and categorized the assertions based on their content. In this phase of the analysis, we were inspired by the contextual analysis as described by Svensson (1985, 1989). The contextual analysis procedure involves separation and delimitation of assertions in relation to their context. This is done in an exploratory and interpretive manner. The classification of data is based on empirical material. It means that data in this form are not interpreted.

To guarantee that we have comprehended the experiences from the teacher teams in a correct way, we asked them to read the case study and give their opinions. Any errors or misconceptions could therefore be eliminated. Information about the teacher teams is concise. We have tried to strike a fair balance between how much should be reported, and the risk of revealing the identity of those who have provided information. There is an inherent conflict between high validity on the one side and good ethics on the other (Kvale, 1997; Larsson, 1994). The different teams have been given a girl's or a boy's name.

The Experiences of the Teacher Teams

What follows is some of the most prominent features of the analysis presented. In an effort to provide a plain description of the results, a certain amount of overlapping in the text has been unavoidable.

The results are focused on those aspects that the teacher teams “highlighted” which deal with in what way they changed their working methods due to the competence development program. They made comparisons to how they have worked earlier. Four main aspects stand out as having

led to new working methods. One deals with how the teachers experience working in teams. Another aspect is about the support by the mentor. The third one touches on how the teachers' view of the computer as an educational tool influences their attitude towards the teaching situation. Finally, the fourth aspect deals with some difficulties that the teachers experienced when working with ICT in an enhanced way, which are all connected to the organizational structures in the school. The findings are presented in following aspects:

- Working in Teams
- Support by the Mentor
- ICT as an Educational Tool
- Organizational Hindrances

Working in Teams

The majority of the assertions show that the teachers developed new ways of organizing their work. Through the program the idea of a team was put into practice and developed, often with positive results. The most rewarding result was that the co-operation amongst teachers has been strengthened and that they learned a lot from each other.

Every teacher team consists of teachers with more or less different competences. They are educated to work in the preschool, during the leisure and recreation activity after school, and in the ordinary school. Those who work at the secondary and the upper secondary level are also specialists in some subjects, often two or three. It is a new experience for them to work with teachers from other specialities, which they appreciate very much. With this constellation of teachers in the same team they learn a lot from each other, both concerning working methods and the fields of competences. The teacher team has regular meetings, often scheduled to once a week. During these sessions they plan their work, discuss different possibilities and above all have an opportunity to reflect over what they are doing and how. The utterances from the teachers about working in teams was above all that social climate is developed at the same time as they enhance their know-how.

Social dimension

Every teacher team, with a few exceptions, was very positive to working in teams. To many of them it was also a new experience. Since the work with

the program often extended to several weeks, they had the opportunity to create close relations to each other. Most of the teacher teams are planning to continue to co-operate in the future. They are curious about to further developing the working methods they have tested. They found it very stimulating to share the same experiences with colleagues.

Even if the teachers like to work in teams, there were some sceptical utterances concerning this aspect. For example, co-operation is seen as time consuming. Almost every team worked very hard and despite that they were frustrated because lack of time. One teacher says that it can be hard for many to work together. Sometimes it functions very well, sometimes not at all. He adds that it differs between teams.

The work they have planned in advance took more time than they had calculated. Some teachers are also sceptical towards the effectiveness of the work. What do they gain when they co-operate besides the pleasure to work, and not be alone with any problems that appear? The teachers who are specialized in certain subjects did not co-operate with the colleagues in the “subject group” during the program. They were afraid that working in cross-disciplinary teams might lead to a decrease in the feeling of belonging to the “subject group”.

Learning dimension

Another positive aspect of the co-operation is that the teachers had meetings where they discussed and reflected over their work. These meetings have been experienced as very important to them. They were gathered when planning, and when sharing experiences with each other and they also exchanged valuable information. It was a luxurious way of working to them comparing to the ordinary work in school. They were able to test new ideas and to develop new ones. Normally they seldom have time for discussing meetings, but during the program the teacher teams tried hard to participate in the weekly meetings. There are some teacher teams who had problems finding “free” positions in the schedule for meetings, but for the most of them this worked.

Much of the time during the meetings was used by the teacher teams to discuss how to use ICT, both in their own planning and with the students. They also discussed how they ran their own work with the students within the program. As mentioned above, it takes a lot of time to work in a group. But as the teachers could see more advantages than disadvantages, they tried to eliminate those weaknesses and to increase the strong aspects. One thing they have learnt, which all the teachers have in common, is that they have to plan and organize the work far in advance and carefully, and still be open minded.

In every teacher team, there were at least one or two teachers who were used to use IT. These teachers functioned as an adviser to the colleagues in the team. They stimulated them, encouraged them, and even challenged them. Because of that, all the teachers enhanced their knowledge about IT and ways of using it. Especially those teachers who normally do not use IT in school learned a lot from the other teachers in the team. In some teams they did not succeed with the work without these “key persons” and all their knowledge about IT.

The most salient advantage with working in a team with teachers who differ according to the competence, is that the teachers thought it was easy to find projects to work with. That means that the teachers have discovered that everyone in the team contributes in a relevant and also necessary way to the project. They mean that it is valuable for the students to be aware of and to understand that different subjects are needed to create a good understanding of complex phenomena. Many of the teachers have experienced that it is comfortable for several grown-ups to work together, and that they all can participate in the work of the students and be able to help them when necessary.

Support by the Mentor

The mentor appears to be a central figure for the pedagogical discussions in the teams. The mentor played a vital role in keeping the team on the right course in its work, and gaining a meaningful result from its efforts.

The mentors had regular meetings with the teams and encouraged them to discuss issues that arose from every day teaching practice and to see things in a new light. The mentors’ sensitivity to important issues and problems seemed to be a positive factor in the eyes of the teacher teams. It was advantageous for the teachers that the mentor came from another school and could thus see their activities from another perspective and raise new questions. According to the teachers, the mentor worked as a pedagogical mentor and really encouraged them to work as a team. During the guidance meetings, a great deal of time was devoted to discussions of a general pedagogic nature. Teachers felt that the mentor was democratic in ensuring that everyone had a chance to speak. Initially, the guidance meetings dealt more with technology and computers, but eventually began to cover more of the educational consequences of increased use of ICT. The teachers were pleased that the mentor let them discuss and plan their own work. One teacher said, “*It was good to be able to see things through the eyes*

of an outsider.” In the final report of one of the teams, the following was said regarding the guidance meetings: *“It has never felt like a waste of time like so many other things do. That’s the greatest compliment I can give.”*

The most appreciated mentors were those who provided supervision of new pedagogic working methods, which were closely connected to computer use.

The mentors have, due to the teachers, also engaged the teacher teams to find it stimulating to learn more about ICT. Many of the mentors have contributed to increasing the self-confidence among the teachers. Since the level of ICT knowledge concerning educational settings in the beginning was low, the teachers needed much help and support. Many of the mentors helped their team with technical and practical problems concerning the computers.

There are also teacher teams who think that the content about using ICT was not enough during the meeting with the mentor. These teachers wanted more practical advice about certain software and how to use them in the learning setting.

Other teacher teams voiced criticism to the contrary. They got too much help about practical issues instead of getting advice about pedagogical tasks.

A few of the teacher teams criticized the mentors because of their lack of knowledge about ICT. These teams were all very used to using ICT and also had great knowledge of different software.

ICT as an Educational Tool

The teachers participating in ITiS were allotted a computer of their own. They got the opportunity to experiment by themselves, and because of that they learned a lot about different software and the new technique as well. The teachers’ utterances about ICT as a tool are divided into two parts. In the first part I present some examples of what the teachers have learned about ICT. The teachers’ reflections about ICT as a tool in the learning setting are described in the second part.

What the teachers learnt about ICT

The teacher teams expected to learn a lot about IT, computers and other digital tools, and most of them did. Many of those who had almost never used ICT earlier felt more comfortable when using it with the students. After the program many of the teachers were interested to learn more. Of

course there were also teachers who were disappointed not to have learnt as much as they expected.

Most of the teacher teams worked with word programs, looked for information on the internet and tried to evaluate the information on the net. Even though many teachers were critical towards the information they found on the internet, they were very keen to learn more about how to use the internet. All of the teacher teams received and adopted e-mail and sent documents. They also used the digital camera, scanned texts and pictures, and even downloaded pictures from the net. When they are working with documentation of schoolwork they need all this. Some teachers also worked with programs for dealing with pictures, and different programs for presentations, such as PowerPoint and Scala. Some of the teachers said that they constructed their schedule with Excel.

It is not just the programs the teachers have learned to handle. They have also been “*forced*” into solving technical problems. One reason is that it is hard to get help from other persons, another reason is that the colleagues are “*in the same position.*” Another thing the teachers say that they have learnt is that they have realised that they do not need to have knowledge about everything. In almost every classroom there is at least one, often more than one, student with good knowledge of computers and other ICT tools and their applications.

Reflections about ICT

The teachers’ reflections about ICT are mostly related to their work with the students. The teachers’ also mentioned some ideas about the role that IT has or will have in the future.

Increased use of ICT led to discussions about learning more about the internet and how to evaluate sources. Teachers felt that there was information on the internet which was inappropriate for study. They also thought that it was difficult to help the students to sort out all the information to be found on the internet. Even the students thought it was difficult to evaluate sources on the internet. For these reasons the students load pictures from the net while they consult ordinary books and digital dictionaries in order to find information. The teachers are satisfied with the way the students work since they feel that it is wrong to believe too much in what internet can do.

There are teachers who think that using computers or other digital tools in the learning setting stimulates the students to work hard. Some of these teachers say that the students want to work with complicated techniques and not to just use the computer to write. The students often

sit together in small groups at the computer. They create “a social space,” which astonished their teachers. Before, the teachers were worried about that the students worked all by themselves, isolated from one another. The students learn from each other. Many of the teachers experience that the students learn both to read and write better when working on the computer. The text is possible to read, it is presented without faults and has a good layout. The teachers were unsure if all the work on the computers lead to the students learning more. According to the teacher teams, the students must take more responsibility for their own work when the computers are used.

ICT is a relatively new tool and it is still under development. All the teachers are sure that ICT will influence the schoolwork in several ways. ICT has not yet become a natural tool in the learning setting, due to the teachers. To reach such a goal, access to all technical tools must increase. It is still possible not to choose to use ICT in school today.

Some teachers are convinced that the enhanced use of ICT and the knowledge about it will lead to big changes for the way schools organize work today. ICT is just another source of information, or a tool demanding new methods. ICT can create new conditions for learning, which the school is perhaps not yet ready to assimilate.

Organizational Hindrances

The organizational hindrances, as the teachers reported, are on a structural or organizational level. One critical viewpoint held by many of the teacher teams, as a consequence of increased use of computers in teaching, is that the school organization is not suited to an enhanced use of ICT. Almost all the teachers agreed about that it is necessary to change the organization of the school, which they mean is “*blunt according to scheduling and work division.*” Other teacher teams mentioned that the headmaster is the one who has to create new conditions to renew the learning setting. The way the teachers show their frustration differs between them. One of the disappointed teachers wanted to start a “free” school, that means that it is not run by the municipality, another one said that the teachers themselves ought to start to change the school administration if they want any development.

Some of the hindrances identified by the teachers are grouped into two categories. One deals with conditions that are not functioning concerning the teachers’ ability to develop convenient circumstances for collaboration

in an effective way. Such conditions include scheduling, division of work, and the ability to have spontaneous meetings. These problems are more or less connected to each other. The other category deals with problems related to computers, such as where they are placed, the condition of the equipment, and the access to them. The hindrances did not deal with the fact that several teachers were “forced” to collaborate in groups.

Difficulties to collaborate

Several teacher teams, especially from senior level compulsory schools and upper secondary schools, had more obvious problems with the scheduling and division of work responsibilities or the division of labour. One teacher says that, “*scheduling is a very important instrument in developing both ways to co-operate and the educational methods.*” Many teachers want to be able to arrange the school day more freely than they actually do. They want to have the opportunity to work within the team in a flexible way both concerning content, time, and physical place. Sometimes they want to be able to go on excursions and to leave school and visit other places without having planned it for weeks. There are those who work in this manner and they appreciate it a lot. They have in common that they all work in small units where the bureaucracy is not extended.

Another hinder, which is in a way connected to the scheduling, is that many teacher teams include different types of teachers, with different types of obligations. There are teachers, within the same team, who work under different conditions. One difference is the amount of weekly lessons, another is due to the salary, and a third one has to do with the status, according to the teachers. All differences between the categories of teachers lead to difficulties, among other things, being able to meet spontaneously. When some teachers are out of lessons, other ones are working and the opposite. Another problem is that some teachers have few lessons with many different classes, while other teachers have a lot of lessons in few classes. This variation leads to a difference in the engagement towards the students on a personal level. The teachers dream of a more flexible way of working.

The teachers need to plan meetings together with the colleagues in the team, has not been taken into account by the scheduling. Especially in the big schools, it is difficult for the teachers to meet spontaneously. These teachers have to work long and hard to find time to convene with colleagues. Meetings that appear “par hazard” are unusual in big schools. Teachers can have their working places in different buildings or at opposite ends of the same building. In Sweden, we are now getting away from big

units. Many of them are under reconstruction to become smaller units, which will be more convenient to work in and even to run.

Difficulties in using ICT

The problems reported by the teachers concerning the use of ICT were difficulties in accessing the technology, the quality of the equipment, and ability to get support when needed.

One big problem for most of the teacher teams was that they did not have enough computers when working with the students. In most of the schools, the teachers discussed whether they wanted computer labs or the computers spread out into the classrooms. At the schools that participated in the study, some had computer labs and others had the computers in the classroom. Several teacher teams thought that it was old-fashioned to work in labs but it was more convenient, and it allowed the students to use them at the same time. The computer labs are to be booked in advance since the demand is great. Work would have been easier to complete if there had been a guaranteed time allotted in the computer labs, according to the teachers.

Changes in the working place meant that the students had to work in different places in the school and sometimes apart from the teacher. For the teachers it was difficult to be able to survey the students' work. For some students it was hard to concentrate, others liked to run around and almost everyone had to wait for advice and support from the teachers. One teacher described their situation at the time in the following way: *"There are a lot of pauses...the students spend their time somewhere else but never at their desk, they would rather walk around."* Another teacher says: *"Now we can't keep them in the classroom. Instead they have to run to the computer lab as well and then they don't get their print-out..."*

The young students needed a lot of help. It was impossible for the teachers to give enough help to every student who needed support. They spent a lot of time waiting. They lost interest and started to do other things, such as run around, be noisy and interrupt the work of their classmates.

It was almost impossible for most of the teachers to work spontaneously with the computers, according to the teachers. One reason, described above, was that they did not have enough computers. Another reason was that the technical equipment did not have enough capacity to work with ordinary software and functions. A third reason was that they lacked technical support when needed. In every school, there is a certain person responsible for the technical equipment and giving support to the teachers. These important persons had a lot of hard work. The time alloca-

ted to these tasks was underestimated. That led to that the teachers either waited too long for help or did not get any help at all. This affected a lot in what way the teachers could follow their plan for the lessons.

Reflections

The aim of the competence development, ITiS, was that the teachers would have the opportunity to develop their professional roles and their own learning on a collective as well as on an individual basis (Study Guidance, June 2001). The teachers should also gain increased knowledge of the computer as an educational tool, and about ICT from a social and school development perspective. In addition, the competence development was built around teacher teams who were responsible for realizing the development aims but could freely form their work in a way that best benefited their own learning.

We can state that the program was successful, according to its ambition, as reported above. Even if the results described mostly show satisfied teachers, we of course have gathered a lot of critical viewpoints (Chaib, C., 2002; Chaib, C., 2004; Chaib, M. et al., 2001). In the text below, reflections about some of the findings, which I think is of special interest, are presented. The focus is not on what the teachers learned but how they learned.

When the teacher teams talk about the learning process they all mentioned the fact that they worked in teams. The teachers became better acquainted with colleagues, both old and new, and insight was gained as to other knowledge and points of view. The small group became important and valuable, both in a social and professional way. These forms are partially found in the smaller group consisting of the teacher team and sometimes the mentor and/or the school computer teacher. Individual practice, partly with one's own computer and partly through practical applications in the classroom, is also mentioned as important. For the most part, the learning form probably occurred as informal learning. Learning can be seen as an activity related process. From this perspective, learning takes place through interaction with other people and the surrounding environment (Lindqvist, 1999; Vygotsky, 1966). The teachers appreciated the opportunity to learn from and together with each other.

Säljö mentions: "*Human knowledge and skills, i.e., ways of understanding and manipulating the world (and oneself!), obviously emanate from collective situations and events – i.e., among groups of interacting human beings*"

(1996, p. 126). The conversations in the teams differ in character and are carried out between different individuals and groups. Many of these conversations have been institutionalized. Irrespective of where and between whom these conversations take place, they display inherent dynamics which should not be disregarded. These types of conversation are not merely instructive, or containing simple messages; on the contrary, they influence the entire situation of the individual and his/her perceptions of the world, i.e., we do not only get to know other people better, but also ourselves. Säljö points out: "*Interaction in the form of two and more part dialogues are essential ingredients in all forms of knowledge generation*" (1996, p. 129).

Providing the teacher teams with an external mentor was one of the most successful aspects of the program. According to Engeström (1994), there are advantages to involving several actors in a learning process. The mentors performed their tasks in slightly different ways, but they all filled the same sort of driving and catalytic role on the team. The mentor functioned as a pedagogic mentor and encouraged teamwork. According to Vygotsky's theory (Vygotsky, 1966) about the zone of proximal development (ZPD theory), the mentor contributed by "stretching the boundaries" for individual development. In many cases, teachers felt that such guidance affected their learning in a positive way (Phillips & Soltis, 1998).

References

- Berger, P. & Luckman, T. (1966). *The Social Construction of Reality*. Doubleday & Company.
- Burr, V. (1995). *An Introduction to Social Constructionism*. London: Routledge.
- Castells, M. (1998). *Informationsåldern. Ekonomi, samhälle och kultur. Band I: Nätverkssamhällets framväxt* [The information age. Economy, society and culture. Volume I: The rise of the network society]. Göteborg, Sweden: Daidalos.
- Chaib, C. (2002). *From ordinary teacher to computer nerd*. A study of teacher teams experiencing ICT. INSIKT 2002:1. Vetenskapliga rapporter från HLK, Jönköping, Sweden. School of Education and Communication, Jönköping University.
- Chaib, C., Chaib, M., & Ludvigsson, A. (2004). *Leva med ITiS – Nationell utvärdering av IT i Skolan* [Living With ITiS – National evaluation of IT in School]. Encell, Report 1:2004. Jönköping, Sweden: School of Education and Communication, Jönköping University.

- Chaib, M., Bäckström, Å., & Chaib, C. (2001). "Detta är bara början ...". *Erfarenheter och reflektioner från sex ITiS-arbetslag* ["This is just the beginning...". Experiences and reflections of six ITiS teacher teams]. Report 1. Jönköping, Sweden: School of Education and Communication, Jönköping University.
- Delegation for ICT in Schools. (1999). *Lärandets verktyg* [The tool of learning]. Stockholm: Ministry of Education and Science.
- Dillenbourg, P., Baker, M., Blaye, A., & O'Malley, C. (1990). The evolution of research on collaborative learning. In P. Reimann & H. Spada (Eds.), *Learning in humans and machines*. Pergamon.
- Dreyfus, H. L., & Rabinow, P. (1982). *Michel Foucault. Beyond structuralism and hermeneutics*. New York: Harvester Press.
- Ellström, E., Ellström, P.-E. & Ekholm, B. (2003). *Verksamhetskulturer och lärande. Om äldreomsorgen som lärandemiljö* [Work Culturers and Learning. About Eldercare as a Setting for Learning]. Lund: Studentlitteratur.
- Engeström, Y. (1994). *Training for change – New approaches in instruction and learning in working life*. Geneva: International Labour Office.
- Hammersley, M., & Atkinson, P. (1983). *Ethnography. Principles in practice*. Tavestock Publications London and New York.
- KK-foundation. (2002). *Tillgång, användning, kunskap och attityd till IT* [Access, use, knowledge and attitudes towards IT]. TNS GALLUP Sverige.
- KK-foundation. (2003). *IT i Skolan* (IT in School). TNS GALLUP Sverige. Centrum för Marknadsanalys AB.
- Kvale, S. (1997). *Den kvalitativa forskningsintervjun* [The qualitative research interview]. Lund, Sweden: Studentlitteratur.
- Larsson, S. (1994). Om kvalitetskriterier i kvalitativa studier [Qualitative criteria in qualitative studies]. In B. Starrin & P.-G. Svensson (Eds.), *Kvalitativ metod och vetenskapsteori* [Qualitative method and theory of science]. Lund, Sweden: Studentlitteratur.
- Lindqvist, G. (Ed.). (1999). *Vygotskij och skolan* [Vygotsky on schools]. Texter ur Lev Vygotskijs Pedagogisk Psykologi, kommenterade som historia och aktualitet [Texts from Lev Vygotsky's Educational Psychology, commented as history and actuality]. Lund, Sweden: Studentlitteratur.
- Phillips, D. C., & Soltis, J. F. (1998). *Perspectives on learning*. New York: Teachers College Press, Columbia University.
- Reg. Prop. (2000/01:72). *Vuxnas lärande och utvecklingen av vuxenutbildningen* [Adult learning and the development of adult education]. Stockholm: Ministry of Education and Science.
- Searle, J. R. (1997). *Konstruktionen av den sociala verkligheten* [Construction of social reality]. Göteborg, Sweden: Daidalos.
- Skolverket, Rapport 208. *Skolans datorer 2001* [The Computers at school in 2001].
- Study Guidance for ITiS Teacher Teams. (2001, June). Stockholm: Ministry of Education and Science.

- Svensson, L. (1985). *Contextual analysis – The development of a research approach*. Paper presented at the 2nd Conference on Qualitative Research in Psychology, Leusden, The Netherlands, 1985, August.
- Svensson, L. (1989). Fenomenografi och kontextuell analys [Phenomenography and contextual analysis]. In R. Säljö et al. (Eds.), *Som vi uppfattar det* [As we experience it]. Lund, Sweden: Studentlitteratur.
- Säljö, R. (1996). Samtal som kunskapsform [Conversation as a form of knowledge]. In C. Brusling & G. Strömquist (Eds.), *Reflektion och praktik i läraryrket* [Reflections and practice in the teacher profession]. Lund, Sweden: Studentlitteratur.
- Säljö, R. (2000). *Lärande i praktiken – ett sociokulturellt perspektiv* [Learning in practice – A sociocultural perspective]. Lund, Sweden: Prisma.
- Wennerberg, S. B. (2001). *Socialkonstruktivism – positioner, problem och perspektiv* [Social constructivism – Positions, problems and perspectives]. Malmö, Sweden: Liber.
- Wibeck, V. (2000). *Fokussamtal* [Focus Interviews]. Lund, Sweden: Studentlitteratur.
- Vygotsky, L. (1966). *Thought and Language*. Boston: MIT Press.

Social Studies Teachers' ICT Usage in Turkey

State, Barriers, and Future Recommendations

Ismail Guven & Yasemin Gulbahar

Introduction

ICT can help to change the nature of the interactions of teachers and students by changing the interactions within classroom, changing the type of interactions between teacher and students, allowing students more direct interactions with resources to support learning and increasing the interactions between students themselves (Harris, 2002). Influencing many facets of our daily life, Information and Communication Technology (ICT) have brought about an increased need for in-service ICT Teacher Education in recent years. With the rapid pace of technological developments, it could sometimes appear that the teacher training institutions have to make substantial investments in new hardware, software and trained manpower in order to stimulate and challenge teachers. Teachers have to be equipped and educated accordingly, educators and administrators find it difficult to integrate and introduce ICT in schools. Teachers are moving from teaching people everything to teaching people where they can find things out through the facilities of ICT. The introduction of these new resources often brings an associated demand for further training for teachers, which can delay the effective implementation of ICT. The innovative practices were not implemented and integrated without problems and difficulties. Some reasons that make difficult integrating ICT may be listed as follows: 1) the cost of providing and updating necessary tools, 2) already overloaded curriculum, and 3) a short supply of teachers knowledge on ICT (Leong & Sim, 1999).

Almost everyone accept that technology has already radically changed our world and might have a considerable contribution to instruction. Keeping in mind that change is constant when it comes to technology,

teachers and educators are continually challenged to learn more about educational benefits of ICT and its implementations in educational institutions. There are many implications for the implementation of ICT in schools. McCormick and Scrimshaw (2001), pay attention to the lack of necessary implications, state “... *a more sophisticated idea of change is needed if ICT is to have a significant impact on classroom practices*” (p. 37). The integration process should be viewed from different perspectives, and thus all problems such as technology proficiency, accessibility to ICT, in-service training and the others should be overcome by using appropriate solutions to existing barriers. Consequently, “*teachers must receive adequate ongoing training, technology use must be matched to curriculum’s philosophy and theory of learning, and adequate numbers of computers must be conveniently located within the classroom*” (Al-Bataineh & Brooks, 2003, p. 479).

Background of the Study

ICT has a great impact on society at large, but its integration into educational institutions is a painful process, since it is very difficult for policy makers in education to make huge commitments for the development of ICT in schools. Through ICT, young learners become technologically literate in social studies. Technology may contribute to the student’s attainment of social studies learning objectives. Preparing students for the real life in our technological and diverse world requires that teachers embed ICT in significant learning experiences (Braun & Kraft, 1995). Realizing learners’ potential and need to use ICT out of school activities, schools have to implement innovative practices for learners for making schools attractive. ICT clearly offers communication options unavailable or inaccessible without an electronic media in social studies. There are extensive databases available to teachers and learners to be used in social studies lessons. Teachers have opportunity to access huge information at first hand and the ICT provide teachers with more interactive, dynamic information venture for dialog ICT may contribute more positive outcomes for students in social studies.

The nature of social studies develops depending on how people change their ways of teaching and learning. Modern technology should, in this respect, be of particular interest for teachers in social studies. In order to be efficiently used in subject matters, such as social studies, the pervasive characteristics of ICT, as well as its costs, should be taken into account. By providing students with a larger amount of information, ICT makes them

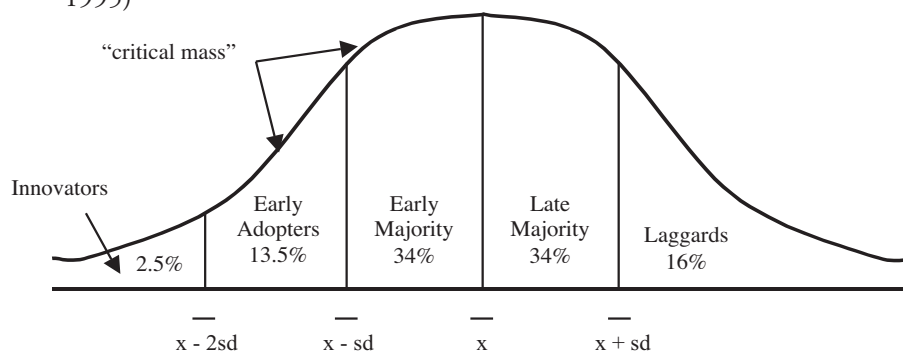
more able to learn and analyze the information provided. Thus, teachers and learners may have tools for analyzing several information resources irrespectively of where they live (Wilson, 1995).

Rogers's Theory of Diffusion of Innovations

Rogers (1995) defines an innovation as an idea, practice or object that is perceived as new by the individual, whereas he defines diffusion as “*the process by which an innovation is communicated through certain channels over time among the members of a social system*” (p. 5). Since diffusion research investigates the factors that influence the diffusion process, Rogers’s (1995) theory of the diffusion of innovations provides a theoretical framework for this research. The innovation in this research represents ICT, which includes information and communication tools and processes, and diffusion signifies the extent to which social studies teachers have adopted ICT in their daily teaching and learning activities.

Another theory discussed by Rogers is “Adopter Categories.” This theory states that individuals in a social system do not adopt an innovation at the same time. A certain percentage of individuals are relatively earlier by using an innovation at first hand or later in adopting new idea, as they are late. Innovativeness, the degree to which an individual is relatively earlier in adopting new ideas than other members of a social system, is the criterion for adopter categorization in Rogers’s theory. According to Rogers’s (1995) theory, the distribution of various adopter categories forms a normal, bell-shaped curve (Fig. 1).

Figure 1. Adopter categorization on the basis of innovativeness (Rogers, 1995)



The Purpose of the Study and Research Questions

The purpose of the current study is to explore ICT adoption patterns, ICT usage and barriers faced by the social studies teachers in selected primary schools in Ankara in Turkey. In order to shed light on these topics, this research mainly focuses on the following four questions.

1. What is the level of usage of the social studies teachers' use of software?
2. What is the level of usage of the social studies teachers' use of instructional tools and materials?
3. What are the barriers social studies teachers face during technology usage in the teaching-learning process?
4. What are the factors that encourage social studies teachers to use technology?

Method

The Convenience sampling method was used to reach participants of this research. 127 social studies teachers from many different schools responded to the questionnaire.

For this study, researchers developed "Information and Communication Technology Usage Survey", mainly based on discussions in the related literature (Bielefeldt, 2001; Haydn, Arthur, & Hunt, 2001; Iding, Crosby, & Speitel, 2002; McCormick & Scrimshaw, 2001). The first part of the survey consisted of 25 items regarding teachers' software use, as well as other instructional tools and materials. The second part consisted of 19 items regarding the barriers that teachers faced during technology utilization in the teaching-learning process. And, the last part consisted of 8 items about factors that encourage teachers' usage of technology. In order to ensure its content validity the survey was administered to social studies teachers, their educators and the experts who study in the field of computer sciences. Responses from them were analyzed and the survey was altered according to their recommendations. An estimate of the internal consistency of this survey yielded a coefficient alpha of 0.81, which indicated that social studies teachers' responses were consistent across items.

Descriptive analysis was used to analyze the data gathered for this research. Data was interpreted according to the Rogers' adopter categories.

Results

The social studies teachers rated their level of expertise on thirteen types of computer software and eleven types of instructional tools and materials by using three-point likert-type scale (i.e. 2=High, 1=Average, and 0=None, for computer software, and 2=Frequently, 1=Sometimes, and 0=Never, for instructional tools and materials). The participants (over 50%) rated their skills as average or high at word processing, spreadsheets, presentation software, computer aided instruction software, web browsers, search engines, electronic mail, discussion lists and newsgroups, chat/forum, electronic encyclopedias/atlas, and instructional films (Table 1). Based on Rogers's adopter categories, the descriptive results indicate that of the 13 software types, 11 of them have been used by more than 50% of the teachers, which means that computer software has diffused into the late majority.

Table 1. Percentage of self-assessed expertise level of social studies teachers' software usage

Software Usage	High (%)	Average (%)	None (%)
Word Processors (Word etc.)	44,1	24,4	31,5
Spreadsheets (Excel etc.)	8,7	54,3	37,0
Presentation Software (PowerPoint etc.)	12,7	43,7	43,7
Databases (Access etc.)	4,0	27,2	68,8
Computer Aided Instruction Software	11,1	53,2	35,7
Web Page Development Tools (FrontPage, dreamweaver etc.)	5,6	30,4	64,0
Web Browsers (Netscape, Explorer etc.)	15,7	48,8	35,4
Search Engines (google, yahoo etc.)	36,8	32,8	30,4
Electronic Mail (e-mail)	30,7	37,0	32,3
Discussion Lists and Newsgroups	20,0	31,2	48,8
Chat and/or Forum	15,2	45,6	39,2
Electronic Encyclopedia and/or Atlas	21,4	36,5	42,1
Instructional Films (video, CD, VCD etc.)	46,5	40,2	13,4

The participants (over 90%) rated their usage of instructional tools and materials as sometimes or frequently at printed materials and board (Table 2). The participants (over 50%) rated their usage of instructional tools and materials as sometimes or frequently at overhead projector, maps and globes, multimedia computer, television/video, radio cassette recorder, and slide projector. Based on Rogers' adopter categories, the descriptive results indicate that of the 11 tool types, 7 have been used by more than 50% of the teachers, which means that the use of instructional tools and materials have diffused into the late majority. Moreover, other descriptive results illustrated that opaque projector/document camera; computer-pro-

jector system, internet/web environment, and video camera have just diffused to early majority yet.

Table 2. Percentage of self-assessed expertise level of social studies teachers' instructional tools and materials usage

Usage of Instructional Tools and Materials	Frequently (%)	Sometimes (%)	Never (%)
Board	81,3	18,7	0,0
Overhead Projector	33,9	46,5	19,7
Opaque Projector and/or Document Camera	16,0	13,6	70,4
Multimedia Computer	11,9	42,1	46,0
Computer – Projector System	12,8	25,6	61,6
Internet/Web Environment	20,8	22,4	56,8
Television/Video	19,2	59,2	21,6
Radio Cassette Recorder	13,1	43,4	43,4
Video Camera	3,2	21,4	75,4
Slide Projector	19,0	31,7	49,2
Printed Materials (journals, books, worksheets etc.)	83,5	11,8	4,7

The participants used a three-point likert-type scale (i.e. 2=Agree, 1=Neutral, and 0=Disagree) to rate their level of agreement on 19 statements about barriers to adoption (Table 3). Of the 19 statements, 17 have been rated by more than 50% of the teachers as major barriers to adoption of technology into the teaching-learning process. Among 17 statements the top three are; (1) inefficiency of teachers' technical knowledge to prepare materials based on technology, (2) inadequacy of the courses of technology offered to students, and (3) inexistence of incentives for encouraging technology usage.

Table 3. Percentage of assessed barriers that social studies teachers' faced during technology usage in teaching-learning process

Barriers to Technology Usage	Agree (%)	Neutral (%)	Disagree (%)
Inefficient time to prepare materials based on technology	66,7	9,5	23,8
Inefficiency of teachers' technical knowledge to prepare materials based on technology	92,1	6,3	1,6
Problems about accessibility to existing hardware (computer, overhead projector etc.)	65,9	11,9	22,2
Inefficiency of institutions computer laboratory	64,3	4,0	31,7
Inefficiency of institutions technical infrastructure about instructional technology	50,8	7,9	41,3
Inefficient number of media (printer, scanner etc.) for effective use of computers	59,5	11,1	29,4
Shortage of computers used by teachers	62,7	0,8	36,5
Absence of reward systems for encouraging technology usage	73,8	14,3	11,9
Poor technical and physical infrastructure of learning environments	67,5	8,7	23,8
Inadequacy of computers used by learners	66,7	7,1	26,2
Inefficiency of guidance and support by administration	65,1	10,3	24,6
Insufficiency of financial resources for technology integration	66,7	16,7	16,7
Inefficiency of instructional software/electronic resources	60,0	15,2	24,8
Scarcity in resources on technology for attaining information	46,8	20,6	32,5
Deficiency in professional development opportunities for gaining knowledge and skill	63,5	18,3	18,3
Scarcity in support services in material development/technology usage	46,8	23,4	29,8
Lack of interest of teachers in technology usage	63,5	15,9	20,6
Difficulties due to improper teaching methods for technology usage	57,1	35,3	7,6
Inadequacy of the courses of technology offered to students	77,0	12,7	10,3

The participants used a three-point likert-type scale (i.e. 2=Important, 1=Neutral, and 0=Not Important) to rate their level of importance on 8 statements about incentives for adoption (Table 4). All the statements were rated as important incentives by over 80% of the teachers.

Table 4. Percentage of assessed factors that encourage social studies teachers' technology usage

Factors Encouraging Technology Usage	Important (%)	Neutral (%)	Not Important (%)
Rewarding the technology usage efforts of teachers in instructional activities	80,0	8,8	11,2
Investments of institution on infrastructure of instructional technologies	96,0	4,0	0,0
Investments of institution on in-service education programs for instructional technologies	90,5	9,5	0,0
Investments of institution on the support services of instructional technologies	87,0	13,0	0,0
Developing the policies and plans for diffusion of the instructional technologies	88,9	10,3	0,8
Providing support for the projects towards the expansion of instructional materials	92,1	6,3	1,6
Carrying out the studies for integration of technology into the curriculum	88,9	9,5	1,6
Reducing work load to provide opportunities to teachers for developing instructional materials	90,6	6,3	3,1

Conclusion

The willingness of teachers to change their existing educational habits to utilize ICT in new ways and to carry out preparation associated with implementing new practices are all crucial factors in determining the extent to which innovative practices may be adopted by larger numbers of Turkey. The Ministry of National Education has been organizing in-service education programs for teachers to advance teachers ICT use in Turkey. Every year, the Ministry of National Education provides almost 2000 teachers Information Technology usage training. In 2001, 2837 IT classes were established. The distribution of educational software purchased for these schools was completed in the same year. ICT classes contained computers, printers, instructional software, electronic references, video players, overhead projectors and TV (MEB, 2003). However, a number of factors, including economic instability, technological innovations and political initiatives created the above stated situation. All changes are accompanied by uncertainty, but change can also be instrumental in raising important questions. One question is what will be the long-term impact of ICT usage on instruction? The other question is the skills needed by teachers to use ICT effectively and adaptation rate of ICT into instruction. ICT creates enormous possibilities but demands high level of skills. Therefore, not all teachers welcomed the widespread introduction of ICT in schools. However, there is still no consistency in using ICT. These give rise to hindrance

for ICT usage in the classroom. However, teachers use the printed materials such as maps, globes and timelines widely as regular social studies activities and daily life provides natural settings for using map and globe.

Although the proposed barriers were perceived as real barriers by more than 50% of the social studies teachers, the item related with the “Inefficiency of teachers’ technical knowledge to prepare materials based on technology” has the highest percentage. This result shows the importance of in-service training once again and parallels with the result on instructional tools and materials usage indicate that social studies teachers appear to be unaware of possible technologies that could be helpful in their teaching processes as a result the majority does not use ICT. Zhao, Pugh, Sheldon, and Byers (2002) state that: “...teachers need to know the benefits and constraints of various technologies and how specific technologies might support their own teaching practices and curricular goals. They also need to know how to use technologies” (p. 511). The results also indicate that social studies teachers are not computer literate which leads to the need of in-service training.

The fact that social studies teachers scored the item “Investments of the institution on infrastructure of instructional technologies” as the factor which encourages most of them shows parallelism with the literature about importance of accessibility to technology. Norris, Sullivan, and Poirrot (2003) also underlined the importance of accessibility in their survey study and concluded: “...teachers’ use of technology for curricular purposes is almost exclusively a function of their access to that technology” (p. 25). Again stating the importance of accessibility in their study, Zhao, Pugh, Sheldon, and Byers (2002) stated that: “Although in recent years there was a great progress in bringing computers and networks to schools, we found that in many schools teachers did not have easy access to either of the two infrastructures” (p. 512).

Finally, the results revealed parallel findings with the literature that the goal of integration of technology in social studies area, as in all other areas, is yet to be reached (Barron, Kemker, Harmes, & Kalaydjian, 2003; Bielefeldt, 2001; Mills & Tincher, 2003).

The changes in technology could ensure that ICT might be proliferating in the classroom. There are many benefits such as better access to information, the promotion of collaborative learning and new ways of teaching and learning for both learners and teachers in social studies teaching. However, all these challenges require a modification of the role of teachers. Therefore, teacher education programs must be revised according to the requirements of new technology and changing conditions. Social studies teachers in schools need to develop new way of instruction using

the ICT. However, they expect to participate in in-service education programs, as the changes in the use of ICT require engagement with teachers concerning their views of knowledge and their personal constructs. The poor facilities in the schools must be improved for erasing the hindrance of ICT usage in social studies and more investment should be made into the ICT components. As the use of a variety of ICT has motivating and interest-generating qualities, teachers are demanding to have more skills on using and adopting ICT into their classroom and they expect to have more information from formal organizations such as the Ministry of National Education. Therefore, the teachers should be provided with opportunities to explore the outcomes of ICT and its effective use in the classroom use by manuals and in-service education programs.

References

- Al-Bataineh, A., & Brooks, L. (2003). Challenges, advantages and disadvantages of instructional technology in the community college classroom. *Community College Journal of Research and Practice*, 27, 473–484.
- Barron, A. E., Kemker, K., Harmes, C., & Kalaydjian K. (2003). Large-scale research study on technology in K-12 schools: Technology integration as it relates to the national technology standards. *Journal of Research on Technology in Education*, 35(4), 489–507.
- Bielefeldt, T. (2001). Technology in teacher education: A closer look. *Journal of Computing in Teacher Education*, 17(4), 4–15.
- Braun, J. A., & Kraft, C. (1995). Using technology to learn from travelmates' adventures. *Social Studies and the Young Learner (Technology and Social Studies Special issue)*. January/February, 7(3), 8–10.
- Harris, S. (2002). Innovative pedagogical practices using ICT in schools in England. *Journal of Computer Assisted Learning*, 18, 449–458.
- Haydn, T., Arthur, J., & Hunt, M. (2001). *Learning to teach history in the secondary school, "A companion to school experience"* (2nd ed). London-New York: Routledge & Falmer.
- Iding, M., Crosby, M. E., & Speitel, T. (2002). Teachers and technology: Beliefs and practices. *International Journal of Instructional Media*, 29(2), 153–170.
- Leong, Y. P., & Sim, W. K. (1999). Current issues and trends in the pre-service and in-service training of teachers on information and communication technology in Brunei Darussalam. Report prepared for the APEC initiative, Integration of Information and Communication Technologies (ICTs) through Teacher Professional Development. Bandar Seri Begawan: Universiti Brunei Darussalam. Retrieved April 9, 2004 from <http://www.cmec.ca/international/forum/itr.brunei.en.pdf>

- MEB. (2003). *National education at the beginning of 2003*. Ankara: MEB Publications (National Education Ministry).
- McCormick, R., & Scrimshaw, P. (2001). Information and Communications Technology, knowledge and pedagogy. *Education, Communication and Information*, 1(1), 37–57.
- Mills, S. C., & Tincher, R. C. (2003). Be the technology: A developmental model for evaluating technology integration. *Journal of Research on Technology in Education*, 35(3), 382–401.
- Norris, C., Sullivan, T., & Poirot, J. (2003). No access, no use, no impact: Snapshot surveys of educational technology in K-12. *Journal of Research on Technology in Education*, 36(1), 15–27.
- Rogers, E. M. (1995). *Diffusion of Innovations* (4th ed.). New York: The Free Press.
- Wilson, J. (1995). Social studies online resources. *Social Studies and the Young Learner (Technology and Social Studies Special issue) January/February*, 7(3), 24–26.
- Zhao, Y., Pugh, K., Sheldon, S., & Byers, J. L. (2002). Conditions for classroom technology innovations. *Teachers College Record*, 104(3), 482–515.

Transforming the “Context” of Teaching and Learning:

Issues and Directions for Planning and Implementation

Sui Ping Chan & Pui Man Jennie Wong

Introduction

To meet the challenges of the changing environment and the new demands on the Hong Kong Institute of Education¹ to maximise its contribution to the provision of quality education in 21st century, a Strategic Plan for 1999–2004 was developed in 1999. One of the key issues in the Strategic Plan was to restructure the current teacher education programmes in our institute and adopt information technology in programmes (HKIED, 1999). To enhance the quality of teaching and learning, introducing IT-based flexible learning in programmes was an identified area for development. In order to develop better insights into incorporating IT-based flexible learning in English modules, the English Department of the Institute successfully obtained an IT development grant and undertook a research project to transform a range of English modules to incorporate online components.

The research project was divided into two stages of implementation. In Phase I (January 2003–June 2003), 19 modules from both initial and professional upgrading programmes joined the Project, with five modules selected for a focused study on their effectiveness in using the NextEd platform² to conduct online teaching and learning. In Phase II (August 2003–December 2003), 28 modules were converted to incorporate online components using Blackboard ML².

In the first part of this paper, we will mainly focus on some of the key issues which emerged from the findings. These included students’ perceptions of (i) their communication ability, (ii) opportunities for interaction,

(iii) the instructional design, and (iv) the learning context in terms of its technical convenience. It is concluded that online learning has a positive impact on students' overall learning experiences, especially in developing in students' self-directed and responsible attitudes towards learning. The second part of the paper will share an example of good practice in incorporating online components in a conventional face-to-face module. Preliminary suggestions for future planning and implementation of online learning and teaching will then be presented.

Value of Online Teaching and Learning

Online learning is considered as an interactive process between the students and the teacher within a specific learning environment. It provides a co-operative and interactive learning environment, which is rich in information for students to learn online (Shun, 1999). In addition, there should be a wider use of motivating and engaging activities that promote interaction between students, which is mainly achieved through written message contributions (Salmon, 2002).

According to Relan and Gillani (1997), in an effective online learning environment, students would feel closer to the teacher and their fellow students because online discussion enhances collaboration. It is time and space independent. An online learning environment extends the boundary of learning to allow learning to occur in any place around the world. It provides a learning tool for teachers and students to facilitate information exchange beyond the classroom. It should also promote dynamic interaction among students and the teacher and hence fosters real collaborative learning through text-based communications and thoughtful and reflective exchange (Harasim, 1990). One of the important values of online learning is the provision of self-directed modes of learning through which an individual can take the initiative in identifying their learning needs and resources for learning (Jolliffe, Ritter, & Stevens, 2001).

In the context of teacher education, the professional development of a teacher's capacity to act as well-informed critics of reforms individually and collectively is vital. This requires the development of critical thinking, which involves the processes of judging, evaluating, comparing and contrasting, and assessing (Elder and Paul, 1994). Online discussion provides a platform for professional academic exchange from which participants can gain more insights into the issues being discussed through appreciating the perspectives of others. The public sharing of opinions creates an optimal environment for critical thinking.

Another important value-added element of online learning and teaching is flexibility. Flexibility refers to one or more of the free choices in time, place and learning methods in organising one's learning (Ross, 1991). When students are given choices in place, time and ways of learning, they are in fact required to make decisions on how to utilise such autonomy in organising learning. This creates the conditions for students to learn to be self-directed and responsible for their learning and prepares them to be life-long learners. The potential strengths of online learning provide us an alternative for the betterment of learning in teacher education.

Aims and Objectives of the Study

The study aimed to investigate the effectiveness of online learning modes in the selected modules and identify issues of concern that were generated from the data collected from student evaluations and tutor reflections. Implications and suggestions for the future design of online teaching and learning will be drawn. The objectives of the study were to:

- 1) Investigate students' evaluations of online learning experiences;
- 2) Explore factors affecting the implementation of online teaching and learning;
- 3) Draw implications for future development.

Research Design

In Phase I, five modules, which incorporated a range of value-added IT components such as online tasks/readings, discussion forums, hypertext links to other texts, were selected for analysis. These modules were B-Ed(P), B-Ed(L-1), B-Ed(L-2), PGDE(S) and EC (the names are replaced by pseudonyms). The first three modules were modules from four-year full-time Bachelor of Education (Honours) programmes for pre-service student teachers. The latter two were modules from programmes offered to in-service teachers to upgrade their professional knowledge on a part-time basis. To identify factors that have impacted on online teaching and learning, both qualitative and quantitative methods were adopted to triangulate data collected from multiple sources. These methods included interviews with tutors and students, and student questionnaire evaluation.

Questionnaire Design

To collect information on students' attitudes, habits and experience in on-line learning in the module, a student questionnaire was developed and administered at the end of the module. The module tutors were invited to review the questionnaire and add questions according to the needs and nature of the module. A few students were invited to give comments on the design of the questionnaire to check for the clarity of questions. The survey included "Yes/No" questions and responses on Likert opinion scales (1–4 rating scales with 4 being the most favourable rating because a neutral response is not available). An open-ended section was included to invite students to give additional comments or suggestions. Questionnaires used for all the modules were found to be highly reliable with most of the factors registering a Cronbach's reliability Alpha above 0.7. We received a total number of 176 responses to the student evaluation questionnaires, with a response rate of about 85% (see details of the students' response rate in Appendix 1).

Student and Tutor Interviews

Students from the chosen modules were invited to participate in a face-to-face interview. The purpose of the interviews was to collect qualitative feedback on issues that were difficult to obtain through questionnaire such as opinions that required justification. We were able to conduct 12 interviews from the sample of 176.

Five module tutors from the chosen modules were invited to complete the NextEd tutor evaluation questionnaire at the end of the module. A post-module interview was also held to further explore issues that emerged from the student evaluation questionnaires.

Limitations of the design

As the subjects of the study were limited to students and tutors from five chosen modules, the results may not be generalised to represent the views of the other fourteen modules which also joined the Project in Phase I.

Results and Discussion

Students' overall responses to online learning experience

The questionnaire results indicate that students of the five chosen modules were generally positive towards their online learning experience. 81% reported that their online learning experience was positive. The overall mean score of students' evaluation of online learning experience across the modules was 2.99. The overall results were encouraging. The areas that they appreciated most included:

- Flexibility in learning
- Developing self-directedness and taking responsibility to learn

In terms of flexibility in learning, 84% of the sampled students agreed/strongly agreed that online learning provided them with flexibility. Due to the outbreak of SARS in Hong Kong in 2003 and suspension of classes in the Institute, online discussion was created for two modules, namely BEd(L-1) and EC. Student interviews revealed that students were pleased that they were still able to continue learning and communicate with each other through NextEd during the class suspension period. The flexibility in time and place of learning was much appreciated.

About 80% of students agreed/strongly agreed that online learning was useful to develop them as self-directed learners. In addition, students generally agreed that online learning enabled them to be more responsible in managing their own learning. Yet, some students opined that they were more responsible not because of the online activities but the tutor's active involvement such as frequent monitoring of students' participation in the online discussions.

To facilitate the discussion of the findings, four potential areas were identified for discussion. These included students' perception of communication, design, learning context, and learning outcomes. Questions related to these four areas can be found in Appendix 2.

Perception of communication

"Perception of communication" refers to students' perception of:

- their ability in IT skills
- their language proficiency in communicating through online discussion

- their feelings on communicating in a text-based medium with no oral support
- the opportunities for expressing opinions through online discussion

The findings show that more than 90% of the students felt that they were confident at the basic IT level, with the exception of the EC students. Only 77% of EC students were confident at the basic IT level. In order to test if students' IT level has a significant effect on student's online experience, a correlation between students' IT level and online learning experiences was calculated. Our hypothesis was that students' IT level did not have significant effect on students' online learning experience because the majority of online tasks in the study did not require the application of advanced IT knowledge/skills. The correlation calculation indicated that the hypothesis was accepted with $p\text{-value} > .05$ across all modules. In other words, students' IT level does not have a significant effect on their online learning experience.

Since online learning requires students to interact through competent use of English to communicate online, a survey of students' self assessment of their language proficiency was conducted. More than 25% of students claimed that communication in English was a barrier to their participation in online learning. Some students further elaborated in the interviews that they considered the use of formal English a barrier. The result was a bit surprising as the subjects took English as their first major elective in their study. Students' English language proficiency seems to be a factor that might affect the effectiveness of online learning and teaching. When students were asked a related question on whether they felt comfortable conversing through a text-based medium, about half of the students in three out of five modules did not feel comfortable.

In terms of the opportunities to express opinions, more than 70% of the sampled students generally thought that they had more opportunities to express their opinions through online discussion. Some of the students stated that taking part in online discussion could give them more time to prepare and review their responses before sending them in the public arena. It seems that online learning was an attractive alternative for some students who might not be willing to contribute to face-to-face class discussion.

Both the BEd(P) and EC modules were found to have the lowest mean (2.58) in this area. It was worth comparing to see if the two modules shared similar characteristics which might account for the low ratings. It was found that both BEd(P) students and EC students had a low perception

of their language proficiency and confidence in communicating through online discussion. Even though the tutor in EC was very active in motivating and encouraging the students, this did not improve the participation much. The issue of language proficiency is thus an area of concern.

The student interviews also raised the issue of tutors' involvement in online discussion. Some students pointed out that their motivation to join in online discussion would be reduced if their tutors did not monitor the online platform regularly or provide timely feedback to their online discussions. The extent of tutor involvement in online discussion was also an issue raised during the tutor interviews. One tutor opined that online discussion was an additional channel for students to exchange views. She did not see the need to engage in the online discussion herself as she could discuss issues of concern during face-to-face tutorials. Yet, another tutor expressed concern about how to handle online discussions more effectively. She found that it was time consuming to respond to individual responses in the online platform. The role of tutors in managing online discussions is thus another area of concern.

There are many factors that affect students' participation in online learning. However, our findings seem to suggest that good understanding of students' language proficiency and confidence in communicating through text-based is needed. In addition, tutor's engagement in online discussion might encourage students to involve themselves more actively though this is not guaranteed.

Design

"Design" refers to the instructional decisions in the choice of activities and time spent, which are intended to stimulate students' interest in learning, inspire students to think critically, and develop insights through online discussion. The findings show that the majority of students (84%) agreed that the time they devoted to online activities in the module was reasonable. They generally felt that spending 1–2 hours/week on online learning in the module was reasonable. About 70% of the students stated that online discussion was considered valuable. 75% agreed that they had gained more insights into the issues being discussed through appreciation of the perspectives of others in online discussion. However, fairly low ratings were obtained in the following two areas:

- stimulating students' interest in the subject
- inspiring students to think critically

55% of the students agreed that the online activities stimulated their interest in the subject. 56% of the students agreed that the online activities inspired them to think critically on issues covered in the module. One's interest in a subject is determined by a number of factors and it might be too simplistic to expect online activities can address the issue of interest fully. However, the student interviews have provided us with some useful hints on how to organize our online activities more appropriately to meet the needs of the learners. For instance, a student from the BEd(P) module commented that the module should focus more on speaking and phonics by providing more resources on phonetics. The resources could be video or audio files or provision of hyperlinks to phonetics websites. Another student suggested the use of more interactive self access activities such as fill-in-the-blanks and video watching. The value of online discussion was repeatedly emphasised in the interviews across modules. Students viewed online discussion as an important avenue to gain access to views of others and considered this type of peer support important. The following are some of the students' views.

I think the discussion forum is most effective. I enjoyed reading others' responses. If I found the topic confusing, I could always discuss ideas with other students and this helped me to gain a better understanding of the topic. (A student of BEd-L2)

I think NextEd discussion forum is useful because the tutor gives feedback. (A student of BEd-L1)

I think online learning enabled me to be more responsible, because I can view other students' comments and share my opinions with them. This kind of peer support is important. (A student of EC)

In the area of critical thinking, the findings did not show that this was addressed fully through online learning. Only 56% of the students agreed that the online activities inspired them to think critically on issues covered in the module. From the interviews with tutors, it seems that tutors tended to reserve the face-to-face tutorial time to deal with issues that require critical thinking. Some tutors stated that it was their strategy to create more straightforward exercises as online activities so that they could reserve the 'valuable' face-to-face time to deal with higher order thinking activities. It is worth further investigating the effectiveness of such an approach in organising learning activities.

Qualitative feedback from students seems to suggest that careful consideration of the nature of module and the relevance of activity types are required. Interactive activities such as online discussions and self access materials or exercises were welcomed by students. Tutor's responsible manner and active participation may also have an impact on students' interest and motivation to engage in the online learning.

Learning context

"Learning context" in our study addressed the technical aspect. In the questionnaire, the questions of this aspect examined the extent to which the online module was easy to access, and technical problems were quickly resolved. We found that if learning to use the online platform required more effort and time to get familiar with than learning the module materials, students were less likely to think online learning effective because they did not find it helpful and they did not think spending time on exploring how to use the online platform was conducive to learning.

The quantitative data support that technical convenience was a significant factor affecting the effectiveness of online learning. Only 63% of the students agreed that the technical problems were quickly resolved. The results indicate that more work is needed to minimize or prevent potential technical problems.

Outcome

"Outcome" refers to the behaviour or attitude subsequent to learning online. The questions of this aspect examined the extent to which online learning provided flexibility and opportunities for students to become self-directed and responsible learners. Feedback from the students indicated that the online activities were useful to their professional development. The evaluation confirmed that students perceived NextEd as a helpful addition to the module. About 84% of the students agreed or strongly agreed that online learning in the module provided them with flexibility to learn at their own pace. 80% of the sampled students agreed that the online self access materials enabled them to be more responsible for their learning. 74% of the students agreed that the online components of the module were useful to their professional development. 78% agreed that the online components of the module were useful to develop themselves as a self-directed learner.

To conclude, the findings show that students were generally positive towards their overall online learning experience. They were particularly appreciative of its flexibility and opportunities in developing their self-direc-

tedness. However, the areas that need further attention include students' language proficiency, instructional design for critical thinking, tutor's role in online discussion and technical support.

Sharing of Good Practices – An Experience from the Module “Lexis, Morphology and Semantics”

In this second part of the paper we will share a successful experience in incorporating online components in a module which joined the Project in Phase II. We will illustrate how the value of online learning is realised through incorporating online components as a supplementary part of the module.

The Context

From September to December 2003, the module “Lexis, Morphology and Semantics” was delivered to a group of 31 year-3 student teachers of a full-time B.Ed programme. The module has two broad aims, firstly, to introduce the student teachers to the key concepts of lexis, morphology, and semantics; and secondly, to enable the learners to apply the linguistic knowledge gained from the module in vocabulary learning.

The tutor has taught the same module for 4 years, but mainly in a face-to-face context. In the preceding year she had developed some hands-on experience of how to integrate online elements in the module, but she still considered this aspect a new area for development. Similarly, the students reported that this module was their first experience in using the online learning platform in the B.Ed programme.

Student Evaluation of the Online Learning Experience

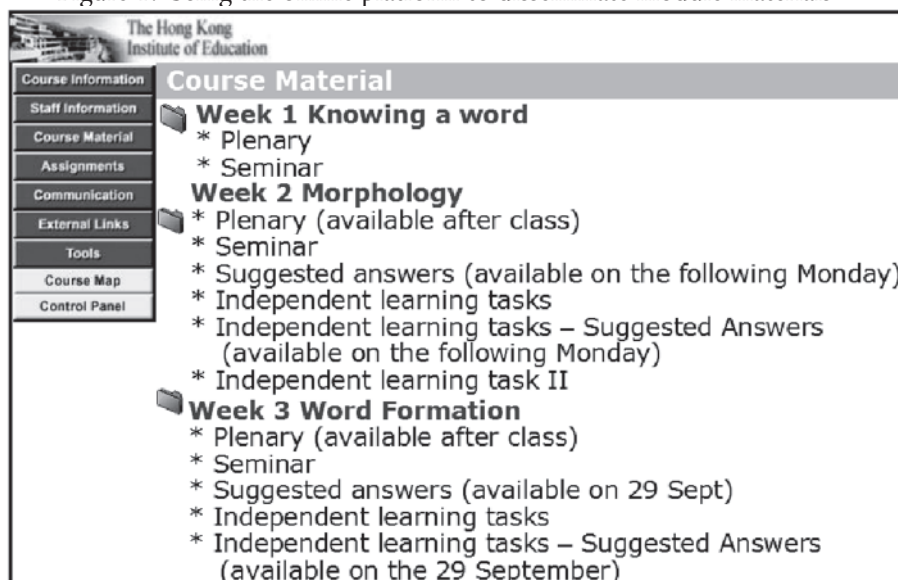
Data collected from the student post-module questionnaire reveal that the students had very positive feedback to the online components of the module. The overall mean score of all the questions was as high as 3.341 (with 4 being the most favourable rating), indicating that the majority of learners had a favourable experience in the online learning mode. This can be further confirmed by the fact that 92% of students strongly agreed/agreed to the statement “Online discussion was considered an important part of

the module”; and up to 96.4% of them strongly agreed/agreed that “the online activities can stimulate my interest in learning the subject”.

The Online Components

The online components of this module took two major forms. Firstly, the online learning platform was used as a channel to disseminate module materials such as suggested answers for seminar tasks and independent learning tasks. Figure 1 shows a part of the contents page of the module materials uploaded online for students’ retrieval. There will be further discussion of this component in later sections.

Figure 1. Using the online platform to disseminate module materials



The second major online component was the discussion forum. Altogether six online discussion forums were set up for the students to exchange ideas with their peers and the tutor on a range of topics that were related to the application of linguistic knowledge in vocabulary learning (see Fig. 2).

Figure 2. Online Discussion Forums

Discussion Board		
Add Forum		
1	Word Etymology Post here any interesting findings about the origin of the words we discussed today (30 October Task 7): sandwich / butterfly / OK / breakfast / mayday / goodbye + any other words of your choice	Modify Remove [4 Messages] [All read]
2	Vocabulary Learning Strategies Share useful vocabulary learning strategies	Modify Remove [3 Messages] [All read]
3	Multi-word units / Idioms / Similes / Metaphors If you find any interesting examples of idioms / similes / metaphors etc, please share with your classmates.	Modify Remove [4 Messages] [All read]
4	Love letter (Seminar Task 7, 23 October) Suggest or coin some metaphors or similes to describe love. Then write a love letter to your imaginary or real boy/girl friend using these metaphors or similes!	Modify Remove [30 Messages] [All read]
5	Word Formation (Independent task 2) Examples of authentic trade names that are formed by interesting word formation processes	Modify Remove [24 Messages] [All read]
6	Vocabulary learning & Morphology Learn the meaning of at least one new word by using the morphological knowledge you have gained from this module. Share the word and its meaning with your class here. Explain briefly how your knowledge in morphology has helped you understand the meaning of the word. Then provide an example of the word put in a sentence.	Modify Remove [52 Messages] [All read]

The Value of Online Teaching and Learning

The value of online teaching and learning has already been outlined in the first part of this paper. In the following sections, concrete examples will be provided to illustrate how these values are exemplified in the teaching and learning of this module.

Extension of space and time of learning

The class met once every week for 12 weeks. In each lesson, relevant linguistic concepts were presented and the students were given seminar tasks to further consolidate their understanding of these linguistic concepts. As indicated in Figure 1, suggested answers of these seminar tasks were disseminated via the online platform a few days after the class meeting. The students were required to check answers on their own and if they came across any difficult issues or problems they could bring them up in the following lesson. Independent learning tasks and suggested answers were also provided through the online platform for the learners' self-access work. This use of the online platform facilitated information exchange beyond the classroom, and, more importantly, provided the class and the tutor

with the chance to handle the more straightforward topics on a self-access basis. Class meeting time could then be reserved for the discussion of more challenging and critical issues. This arrangement received very positive feedback from the learners. Post module evaluation shows that 88% of them strongly agreed/agreed that the provision of online activities was able to create time and space for more meaningful class activities.

The time and space independent nature of online learning also enabled the class to make use of the discussion forums to gain extra space and time for learning. For example, one task required the students to apply their morphological knowledge in learning new words and share the new words with their peers (see Fig. 2, Forum 6). This task was also used in another class of the same module. But instead of using the online mode this second class was asked to present their findings in class. Both groups of students found the task useful in extending their knowledge and understanding of the morphological concepts. Yet, due to time constraint, only a few students of the class that used the face-to-face mode could present their findings. On the other hand, the online discussion forum helped the first class resolve the time and space constraint and all the students had the opportunity to contribute to the forum and to share each other's vocabulary knowledge. The post-module evaluation shows that they were appreciative of this flexibility in learning – 84% of them strongly agreed/agreed that online learning could provide them with flexibility to learn at their my own pace. It was also noted that many students responded to the discussion forums late in the evening or at midnight (see Fig. 3–8 below). It is evident that online learning had provided them with the flexibility to work on the learning activities at a time convenient to them.

Application of knowledge and concepts to develop vocabulary-learning strategies

In order to help the students achieve the module aims, most of the topics used in the discussion forums were designed in a way that allowed the students to apply the newly acquired lexis, morphology and semantic knowledge in their real life experiences of vocabulary use and learning (see Fig. 2). Then through the online discussion forums they could share these experiences with their peers and tutor. Through these interactive online exchanges, the students could further consolidate their understanding of the linguistic concepts as well as to transform the concepts into practical vocabulary strategies. Figure 3 shows an example of a student's contribution to the above-mentioned discussion forum on application of morphological knowledge in vocabulary learning. It is evident from the example that the

student was able to use the concept of morphology to analyse the meaning of the new word.

Figure 3. Vocabulary learning and morphology

Current Forum: Vocabulary learning & Morphology Date: 09-18-2003 01:18 Author: [REDACTED] Subject: chiropodist	Read 15 times
<p>The new word is "chiropodist"</p> <ul style="list-style-type: none"> - chiro- + -pod + -ist - "chiro-" → means hand (from Latin chro-, from Greek kheir) - "-pod" (suff.) → means foot (from New Latin -podium, from Greek podion) - "chiropody" means the branch of medicine that deals with the diagnosis, treatment, and prevention of diseases of the human foot - "ist" (suff.) → mean a specialist in a specified art, science, or skill e.g. biologist. - so "chiropodist" means one who treats diseases of the hands and feet 	

From her past experience of teaching this module the tutor found that the topic "word formation processes" was often considered as straightforward and boring, and normally it could not arouse a high level of interest in the learners. However the task that asked students to search interesting word formation processes in authentic trade names succeeded in stimulating students' interest in the topic (see Fig. 2, Forum 5). Through participating in the search of relevant brand names, word formation processes were no longer only bookish knowledge but lively examples that the students came across in their everyday life. Many students contributed their findings to the forum, mostly very interesting and inspiring. The following diagram shows one interesting example (see Fig. 4).

Figure 4. Word formation processes

Current Forum: Word Formation (Independent task 2) Read 38 times Date: 10-21-2003 23:00 Author: [REDACTED] Subject: fcuk
<p>When I was in UK, I saw a boutique named "fcuk". At first I thought it was another word (you guess), but when I got closer to that shop, I found that it was really "fcuk". I asked my hostmother and she said that fcuk is a famous clothing brand in UK. I checked the dictionary and found that "fcuk" is an acronym. It stands for "French Connection United Kingdom"</p>

In this example, the student shared one real life experience she had during an immersion programme in the UK. Through this online sharing, she not only shared the meaning and word formation process of the lexical item but a number of vocabulary learning strategies she had adopted in the learning process, including:

- being sensitive to authentic examples in one's everyday life (*coming across a boutique*);
- making a connection between new word (*the brand name*) and old (*the "another word" that she did not specify*);
- seeking help from a native speaker with assumed greater cultural knowledge (*her hostmother*);
- use of learning tools (*the dictionary*)

This contribution surely provides a good model of applying learning strategies in the acquisition of vocabulary knowledge.

Cultivating self-directedness in learning

A further value of the online learning mode is the opportunity to cultivate self directedness in learning. This was a major principle the tutor had in mind in the design of the tasks for the online discussion forums and she was glad to see that majority of the students (88%) also strongly agreed/agreed that the online component of the module was useful to help them develop as self-directed learners. The online discussions engaged the students in, firstly, active exploration of authentic examples that illustrate the lexical and morphological concepts introduced in the module, and secondly, the chance to share their learning with their peers and tutor. In this way, instead of adopting a didactic approach to teaching and learning, the tutor provided the students with the opportunity to engage in active construction of knowledge and collaborative learning, students' ownership of learning was fostered.

The following example shows how knowledge was jointly constructed between a student and the tutor, leading to the development of self-directedness in the learner. This contribution is a response to the topic on vocabulary learning and morphology (see Fig. 2, Forum 6). The student shared his understanding of the word "panoramic" but he had difficulty in analysing the morphological components of the word (see Fig. 5).

Figure 5. Developing self-directed learning (1)

Current Forum: Vocabulary learning & Morphology	Read 24 times
Date: 10-08-2003 23:38	
Author: [REDACTED]	
Subject: panoramic	

I've found this word in a sentence "Its new Health and Wellbeing Center and pool has panoramic views of the Mediterranean". I didn't know the word, therefore I started a search.

I found that pan can mean all or total. I guess that the suffix "-ic" made the word an adjective (as in the word academic). But I couldn't find anything related to oram, oramic or noram. Then I checked the dictionary and know that the word means a full surrounding view.

To support self-directed learning, the tutor chose not to provide him with the answer directly. She believes that the ability to use resource materials to develop knowledge is an important vocabulary learning strategy. Hence, in her response she gave him a suggestion of dictionaries that would help him find the answer (see Fig. 6).

Figure 6. Developing self-directed learning (2)

Current Forum: Vocabulary learning & Morphology	Read 24 times
Date: 10-14-2003 18:21	
Author: Pui Man, Jennie WONG <jennie@ied.edu.hk>	
Subject: Re: panoramic	

Yes, you have got the correct definition of the word but can you split the word into its smallest meaningful units (morphemes) as well to help you have a better understanding of the meaning of the word?

Try dictionary.com or American Heritage dictionary online. You'll be able to find how many morphemes the word consists of.

Jennie

The student took the advice and found the information he needed. It is clear from his response that he was appreciative of this opportunity to take a more proactive role in learning (see Fig. 7).

Figure 7. Developing self-directed learning (3)

Current Forum: Vocabulary learning & Morphology	Read 22 times
Date: 10-23-2003 01:18	
Author: [REDACTED]	
Subject: Re: panoramic	
<p>I tried the American Heritage dictionary online, and it states that horama is a Greek word. the prefix "pan" + "horama" forms the noun panorama.</p> <p>It's really a useful website, thanks Jennie!</p>	

The above example shows how the student collaborated with his tutor in the learning process. It is hoped that this also help provide the other student teachers with insights in the importance of facilitating their learners to construct knowledge collaboratively with the teacher's monitoring and guidance.

In addition to using feedback to nurture self-directed and collaborative learning, the tutor had also adopted several other strategies to foster in the students these very important learning abilities. Firstly, instead of adopting a laissez-faire approach³, the tutor has taken a very active role to encourage the students to participate in the discussion forums and to respond to their contributions. In class, she would, from time to time, show the lists of contributors to the discussion forums and asked the students if their name could be found. Since this was the students' first experience in using the online platform, she believed that they might need more encouragement and closer monitoring in order to get used to this mode of learning.

Another strategy she had used was to link the students' online contributions to the module assessment. The assessment of this module took the form of an examination and the students were informed that some of the items that were posted on the forums might appear in the examination. The purpose of this is to encourage the students to read their peers' contributions to widen their morphological and lexical knowledge as well as to extend the collaboration of learning from tutor-student to student-student.

Provision of an alternative means of participation

Another task in the discussion forum required the students to suggest or coin some metaphors or similes to describe love, and then use these metaphors or similes to write a love letter (see Fig. 2, Forum 4). The following is a touching love letter from a student to her parents (see Fig. 8).

Through this contribution, the student shared her feelings and gratitude to her parents. This kind of sharing of one's inner feeling is probably unlikely to occur in a face-to-face presentation in class. 76% of the students reflected that they could have more opportunities to express their opinions through online discussion. This comment on "more" opportunities probably refers not only to the increase in quantity which was brought about by the extension of learning space and time through the online mode, but also the difference in the nature of sharing as indicated in the above example. The discussion forums provide an alternative channel and means for the students who were shy and/or were not willing to share their ideas in the face-to-face context.

Figure 8. A love letter

Current Forum: Love letter Date: 11-05-2003 00:48 Author: [REDACTED] Subject: Your surname is my surname	Read 33 times
<p>My dearest dad and mum,</p> <p>.....</p> <p>You are the best doctors in the world. Your care and greetings are the best medicine. My love is more permanent than any diamonds. What I want to share with you is more than the countless stars. I feel guilty that I can't always stand beside you. I promise that I won't leave you until the day I die. I know I am the treasure in your mind and that's why you give me the name "Po".</p>	
<p>Note: Po [_] in Chinese means treasure, jewel, precious</p>	

Conclusion and Implications

This paper examines students' and tutors' evaluation of their online learning and teaching experiences from which a number of issues emerged. These include students' perception of their language proficiency and confidence in communicating in online text-based writing, appropriacy of instructional design to achieve the goals of online learning and teaching, and adequacy of technical support to learners who are used to face-to-face mode of learning and teaching. These issues will be further investigated in the second phase of the project. Based on the feedback and experiences drawn from the Project, some preliminary suggestions are made here for consideration.

- **Students' readiness**

To facilitate students' readiness in online learning, a pre-course introductory session and publication of user manuals are considered necessary. It should be demonstrated to students how to get access to the online learning environment at the beginning of the semester.

- **Students' language proficiency and learning styles**

In order to design an effective online learning environment, we need to understand students' language proficiency and learning styles. Some students respond more positively to online discussions while some prefer face-to-face discussions. Due to low perception of their own language proficiency, some students may not feel comfortable to interact in text-based communication. Therefore, an initial informal assessment of students' knowledge/skill level and preferred learning style might be conducted. Instead of imposing online learning as a "compulsory" element, we may discuss with students if they "want" it. Having got their voice in, students may think that they can play an active part in managing their own learning.

- **Students' time on online learning**

Tutors need to consider how much time students are willing to spend on online learning. If the time spent on online learning activities is too long, students might feel overloaded. If it is too short, online learning may be superficial. Our findings suggest that 1–2 hours online work per module each week is reasonable.

- **Tutor's commitment**

Tutors need to be aware that "extra" time and effort is needed to put in online teaching. Tutors should not underestimate the commitment required to support online discussions. This commitment often involves the time spent on replying to students' messages, checking discussions on a regular basis and following up discussions. It is rare to get enthusiastic student response especially in online discussion if the tutor does not play an active part.

- **Careful consideration of the objectives of online learning in the module**

If self-directed learning and collaborative learning are considered important learning outcomes in the module, then online learning may be an appropriate means. Online learning provides flexibility for self-

pacing study because online study materials, video and audio, online quizzes can be accessed whenever the students wish to. In addition, online learning can foster collaborative learning. Conditions can be created for students to collaborate through using a variety of tools, such as online discussion, file exchange and chatroom.

- **Let students know the feedback time to reduce student's anxiety**
Online discussion is usually asynchronous. This means students might need to wait several days before getting a response to a message. The waiting period might lead to uncertainty and even anxious feelings. A solution is to set deadlines and inform the students when the tutors will give feedback to students. This reduces anxiety and creates a reasonable space for the tutor to respond. When a discussion is responded to promptly by students/tutors, students tend to feel that they must also take part in the discussion. Pressure might have been put indirectly on students who have not contributed to the discussion forum. In fact, contribution to the discussion gives students a sense of belonging.
- **Creating a user-friendly learning context**
Very often, students experience technical issues related to hardware and software. Students might become annoyed when they cannot get access to the online module. Students should be told how technical support can be gained if they run into technical difficulties. Issuing of student user manuals could also help students to learn how to manage the online environment independently.

References

- Elder, L., & Paul, R. (1994). Critical thinking: Why we must transform our teaching. *Journal of Developmental Education*, 18(1), 34-35. Retrieved on May 13, 2004, from <http://www.kcmetro.cc.mo.us/longview/ctac/definitions.htm>
- Harasim, L. M. (1990). Online education: An environment for collaboration and intellectual amplification. In L. M. Harasim (Ed.), *Online Education: Perspectives on a New Environment*. Westport, CONN: Praeger.
- The Hong Kong Institute of Education. (1999). *Strategy: Strategic Plan for 1999–2004*. Hong Kong: The Hong Kong Institute of Education.

- Information Technology Strategy Committee. (2000). *Information Technology Competency in Education (ITCE): A Guide for students-Pre-service (Primary and Secondary) Programmes*. Hong Kong: The Hong Kong Institute of Education.
- Jolliffe, A., Ritter J., & Stevens D. (2001). *The online learning handbook, Developing and using web-based learning*. London: Kogan Page.
- Relan, A., & Gillani, B. (1997). Web-based instruction and the traditional classroom: Similarities and differences. In B. Khan (Ed.), *Web-based instruction* (pp. 41–46), Englewood Cliffs, NJ: Educational Technology Publications, Inc.
- Ross, R. (1991). Structure and functions: Implications of access, open learning and technology. In *Occasional Papers in Open Learning* (pp. 18–25).
- Salmon, G. (2002). *E-tivities: The key to active online learning*. London: Kogan Page.
- Schrurn, L. (1993). *Social interaction through online writing — Computer conferencing: The last word* (pp. 171–196). Victoria, B.C: Beach Holme Publisher.
- Shun, Der Su. (1999). *The effects of enhanced web-based instruction on pre-service teachers' mathematics achievement and attitude changes toward mathematics and toward computers in Taiwan, Republic of China*. University of Northern Colorado.

Notes

¹ The Hong Kong Institute of Education provides initial and professional upgrading teacher education programmes in full-time and part-time modes. Initial professional teacher education programmes are offered to prepare beginning teachers in Hong Kong. And a range of full-time and part-time professional upgrading programmes are offered to in-service teachers to cater for their professional development.

² NextEd and Blackboard ML are online teaching and learning platforms which are specifically designed for online learning. Our institute transferred its online learning environment from NextEd to the Blackboard Learning System in the academic year 2003-2004. In the second phase of implementation, it was reported that the new system was more user-friendly.

³ It is noted that tutors in the project adopted very different stances in perceiving their roles of facilitating online learning. The findings from Phase II seem to suggest that tutors who were more proactive in facilitating students' participation in online activities received more favourable feedback in the module evaluation.

Acknowledgements

This paper presents part of the research outcomes of the project ‘Transformation of English Department Modules into Flexible Online Modules Using the NextEd Platform’, funded by ITSC of the Hong Kong Institute of Education. We would like to express particular thanks and appreciation to module tutors and students who kindly agreed to share their online learning teaching experiences to make the project possible. Special thanks is extended to Dr David Carless, Dr Micheal Keppell and Dr Elizabeth Walker for reviewing the drafts of the paper. The opinions expressed are those of the authors. None of the project members or reviewers necessarily agrees with everything we say here.

Appendix I

Sample modules and response rate in Phase I Implementation

	Module name	No. of students	Response rate
Pre-Service Modules	B-Ed(P)	72	59 (81.9%)
	B-Ed(L-1)	21	20 (95.2%)
	B-Ed(L-2)	53	50 (94.3%)
In-Service Modules	PGDE(S)	38	25 (65.8%)
	EC	24*	22 (91.6%)
		208	176 (84.6%)

* All students enrolled on the sample modules joined the project except for the “EC” module. Out of 50 students who enrolled on the “EC” module, 24 of them from the same group joined the project.

Appendix 2

Student questionnaire

Areas for discussion	Related questionnaire items
Perception of communication	<p>18. I am more confident to share my opinions through online discussion as compared to face-to-face interaction.</p> <p>19. I have more opportunities to express my own opinions through online discussion than face-to-face interaction in class.</p> <p>24. Communication in English is not a barrier to my participation in online communication.</p> <p>25. I feel comfortable conversing through a text-based medium in which oral and non-verbal cues are unavailable.</p>
Design	<p>10. The amount of time devoted to online activities in the module was reasonable.</p> <p>11. The online activities stimulated my interest in the subject.</p> <p>12. The online activities inspired me to think critically on issues covered in the module.</p> <p>14. I found the online discussion valuable.</p> <p>17. Through online discussion, I have gained more insights into the issues being discussed through appreciating the perspectives of others.</p>
Learning context	<p>20. The technical problems were quickly resolved.</p> <p>21. The NextEd module was always easy to access.</p>
Outcome	<p>13. Online learning in the module provided me with flexibility to learn at my own pace.</p> <p>16. The provision of self access materials enabled me to be more responsible for my learning than learning in a conventional tutor-led classroom context.</p> <p>22. The online components of the module were useful to my professional development.</p> <p>23. The online components of the module were useful to develop myself as a self-directed learner.</p>

ICT in the Learning Process

As Part of a Dialogue When Teachers Encourage Pupils'

Learning

Stefan Svedberg & Jörgen Lindh

Background

This article focuses on current main problems in Swedish ICT education (Hehrne & Norén, 2003). We will first start with a general overview of the present state and point to different shortcomings.

Since 1997, KK-foundation has carried out surveys concerning teachers' knowledge of and attitudes to IT in the compulsory and upper secondary schools. Last year 1,203 teachers were interviewed about using IT as a pedagogic tool. The result of this survey was published in October 2003 in the report "IT in school". The result shows that 82% of the teachers were positive to IT in education. Compared with earlier surveys (53%) they showed greater interest in IT as a pedagogic tool. As the most important motive for using IT in education the teachers specified that it facilitates pupils seeking information (91%), that using computers is becoming a natural habit (84%) and pupils' motivation is increased (77%).

The reason for not using computers in education according to the teachers' interviews is the lack of competence in using computers (61%), not having the habit of using computers/general knowledge of computers (30%) and the absence of the skill to seek information (16%). The teachers were also unsatisfied with the training of teachers concerning how to use IT in education. 74% were not quite/not at all satisfied with the knowledge they got during their education in the teacher training college.

A recent investigation by Carlsson and Lindh (2003) has shown a great variation between different Swedish teacher training colleges concerning ICT, and that the teacher training seldom reaches a proper level in this view. In their study, they have examined most of the teacher training

colleges syllabi, and conclude that ICT training does not meet the goals of compulsory and upper secondary schools. In particular they point out that there is a lack of well-educated teachers in the field of ICT, who can take a position as ICT specialists needed in upper secondary schools.

Furthermore, there has been vast criticism of the way ICT has been used as a tool in Swedish schools. A great source of confusion has been associated with the use of the Internet. A lot of anger has been poured out on the way many teachers use the Internet, as a too vague and unreflected course of action.

The above factors have initiated a debate about how Swedish authorities ought to tackle these problems; how Swedish teacher training colleges have to change their way of introducing and educating teacher trainees with respect to ICT knowledge.

What complicates the matter is that nobody really knows – essentially – what is good or bad ICT education. It is not possible to give a clear and ready answer to the question whether education and pupils' learning improve with computer support. The reason is the complexity of the problem. Before we can shed light on the matter, it implies that one has to know the meaning of the word "improve" (Pedersen, 1998). If the meaning stands for a better quality of learning the probability is high that we would get different results. Of certain importance is also the fact when and to whom you put the question whether computer support improves learning or not.

Due to the lack of reflection, which was characteristic for the optimism in this technology domain in the beginning of 1994, the expectations were high that implementing computers in schools would result in "improvement of learning" (SOU 1994:118, p. 9). The confidence that computer support would impact on pupils' learning was clearly expressed in the study by the KK-foundation in the beginning of 1996. Out of the 298 teachers who were participating in the project concerning 27 municipalities, as many as 82% insisted that the use of computers/IT had had an improving effect on pupils' learning (Riis et al., 1997). Only two years later however it appeared that "*the computers and ICT were attached to less credibility than 1996*" (Riis in Tydén & Andrae Thelin, 2000, p. 47). Briefly, the argumentation in this article is as follows:

- The way of educating future teachers in the field of ICT has a strong impact on the way ICT is introduced and taught to Swedish children/youngsters.

- The more knowledge future teachers have about different ways of learning with computers, i.e. a certain kind of knowledge we can call meta knowledge, the more suited the candidates are to tackling problems concerning ICT related skills and how to use a computer in a better way in their own teaching situation.

By this, we consider teacher training of ICT as tightly interrelated with education supported by ICT in regular schools.

Computer Support and Learning

Within the research on the subject of computer support in education, the answer to the question whether it improves learning as mentioned above is uncertain due to many variables. In an international perspective, Clark (1983) remains critical, referring to the fact that earlier studies concerning the question of how media impact on learning have not been able to present any positive result. Hagler and Knowlton (1987) draw the same conclusion and they warn against overestimating the impact of computer support on pupils' learning. Rognhaug (1996) on the other hand pursues a wait-and-see policy referring to Okolo, Bahr and Rieth (1993), who claim that computer support in education does not automatically – in all cases – improve learning for those who are involved. In other words, they do not in fact eliminate the possibility that the use of computer support may improve learning in certain cases for some pupils. This conclusion has among others been confirmed by the results from studies at Stanford University in the USA, which reveal “*learning with IT leads to better results in knowledge compared with learning in a traditional way*” (SOU 1996:67, p. 11). Bjessmo (1997) agrees, referring to the fact that the research on the subject of computer support in education confirms that IT improves learning and the knowledge of learning. Jedeskog (1993) shares this opinion by stating that pupils using computers conceive the tool as a new contribution that facilitates learning as well as understanding in education. The same goes for Farkell-Bååthe (1999) who has shown that pupils in the middle form school improve in mathematics by using computer support. Another example shows that the computer is regarded as a cognitive or a mind tool supporting the learning process:

Mind tools therefore are computer applications that require students to think in meaningful ways in order to use application to represent what they know. (...) I also argue that the most appropriate use of the computer is as a cognitive tool for accessing information and interpreting and organizing personal knowledge. (Jonassen, 1996)

Out of these results, it is relevant to put the question why scholars have drawn different conclusions concerning whether learning improves when using computer support in education.

One explanation to these diverging results could be that different procedures are mixed and that the learning processes are not fully described, which makes it hard to draw conclusions what has really made an impact on learning (Pedersen, 1998). Another explanation is the fact that many of the comparative studies are based on the wrong implicit presumption that media can be exchanged without the way of working or the content of the education being influenced (Lindh, 1997). Referring to Papert (1995) there is always a risk with studies like these. He points out that if we only believe in what we see and estimate the computers' impact on education based on the results we get from the classrooms today, we are making the future to the permanent prisoner of yesterday. That is why we must ask what type of studies that must be based on estimation whether the use of computer support is of any importance for pupils' learning in education and if so in what way this use is of relevance.

Romiszowski (1992) claims that case studies are preferable instead of formal comparative studies in studying computer support in education in relation to education without that support. Prior experiences reveal that ethnographical approaches and research in the field are preferable as a research way in which the presentation of content and gradations are fully described. They generate new theory and are diachronic, i.e. follow a time-process. Furthermore, one points out the importance of using naturalistic observations or field studies in the research of ICT in education in order to reveal what kind of restrictions occur in the daily work (Pedersen in Tydén & Andrae Thelin, 2000).

Focusing on the Learning Process

Going back to the question whether pupils' learning in education improves with the help of computer support, we shall now focus on the learning process. Our main idea is that learning rather deals with learning how

to learn than simply learning facts “*it is rather a matter of process than a matter of product*” (Axelsson in Tydén & Andrae Thelin, 2000, p. 58). In other words, it does not deal with the possibility to read any differences concerning pupils’ learning, which may occur, but to focus on phenomena that may be – to some extent – of significance for the learning process. For example, we can study how pupils comprehend the computer support in education when they deal with different tasks, what impact using computers has on their work and how they perceive the result of their work (Svedberg, 2001a). If we compare that way of attacking the question, whether computer support improves learning, we are here dealing with a change of perspectives from an outside estimation to an inside description. We are thus focusing our interest on the pupils on the one hand, and the way of working, on the other. In both cases, we are depending on the medium in use.

The expectation that one with the use of more computers could improve learning has not yet been met and will not. Something more is certainly needed. As Papert (1995) points out it is essential that teachers at the same time are open to all kinds of variations in education. The same is pointed out by Riis, Jedeskog, et al. (1997) in that they propose a development like a change of central conditions in schools: the role of the teacher, ways of working, and strategies of learning and how to use knowledge or information. In the proceeding text, we shall therefore discuss this change of central conditions to see what they mean to us.

Thus, we suggest a new perspective on computer support in education, which is based on the learning process. In judging pupils’ comprehension of a new medium, like the computer, there is always a problem because of the use of a new medium, which means a new way of working. That is why we always have to be aware of the interaction between medium and way of working in use. That is the reason why it is so hard to decide which of these is the assumption and which is the consequence (Lindh, 1993). Furthermore, we have to consider how the pupils’ motivation to learn is influenced since the result of learning is highly related to the kind as well as the degree of motivation (Isberg, 1996).

Motivation factors such as curiosity, interest, fun, thrill and the joy in succeeding are seen as intrinsic motivation factors distinguished from extrinsic motivation factors, which are related to concurrence, ability, expectations from outside, threat and punishment (Fransson, 1976; Keller, 1983; Malone, 1981). As to intrinsic motivation factors, Fransson (1978) has shown that if this kind of motivation is stimulated it commonly leads to a holistic (understanding) way of acting, which in its turn leads to im-

proved learning. What are the results concerning the use of computers in this domain? How do pupils comprehend this medium?

Rognhaug (1996), referring to Ellis and Sabornie (1986), states that there is no generic effect of motivation. However, recent research in this domain shows results, which point in the opposite direction. Thus, Jedeskog (1993) claims that by using computers as a complement in traditional education, the pupils are stimulated to a greater extent by curiosity and they are more interested in developing and deepening their knowledge which supports learning. Lindh (1993) also draws the conclusion that the best contribution of the use of computers may be to stimulate the interest for learning, resulting in greater activity among the pupils in education. Edström, Riis, et al (1997) share the same opinion. They have studied how teachers have answered the question whether computer support/IT improves learning or not. The most common answer was that the pupils' commitment and interest increase in situations when they use computer support/IT. For the matter of differences in learning related to gender Pedersen (1998) points out that the attitudes of boys using computers are more positive in general than the attitudes of girls who are interested in how computers can be used in a context. The objection to the results however can be raised in those cases, where pupils develop a positive attitude to the medium and way of working in question that it is mainly regarded as a Hawthorne-effect, which means that they enjoy the pleasure to work with something new in education (Danielsson, 1983). It is also a well-known fact that a varying content and ways of working in education have proven to have a positive impact on learning (Berg et al., 1980). The objection however is hard to claim in those cases dealing with studies executed over a long period of time.

Discovery Learning

As stated above, stimulating pupils' curiosity, interest and the joy of succeeding, their intrinsic motivation can be raised. We can choose a way of working, which is based on the condition that pupils construct their own questions related to what subject they want to study. In so doing, there is reason to believe that this process based on their own choices will raise their motivation too. This is in fact what discovery learning is about, to begin in a state of wondering inquiry. In that way, the education is guided with the help of the pupils' questions, and the way of working is to

seek and investigate information in order to answer the questions (Nilssen, 1993; Sjöberg, 1990).

Taking into account that we now have access to more accurate and up to date information in a faster way than before, it means that our need for textbooks is not as great as before. Therefore, it is reasonable to assume that the information and communication technology (ICT) will change the education in the sense that pupils are getting more active as learners and are constructing their own knowledge out of the information on the Internet (Pedersen in Tydén & Andrae Thelin, 2000). Therefore, we have reason to believe that it will be possible to support discovery learning with the help of using computers and the increasing access to rich and well-structured information. The changes, which can be expected, referring to medium and way of working, must include the importance of social as well as emotional development in education (ibid). Accordingly, we have chosen to present a way of working divided into ten items, which are the foundation for what is here intended to be an explorative way of working. The main purpose in using this way of working is to develop a critical and democratic behaviour in pupils. The reason why the need for critical thinking, which has been stressed lately, is primarily enhancing the use of computers in schools:

In addition to domain-specific knowledge and skill, dealing with wicked problems – like environmental ones – by using information resources like the Internet requires critical thinking skills, in particular skills in searching for information and in evaluating claims and information sources. (Reimann in Tydén & Andrae Thelin, 2000)

An Explorative Way of Working

The items in the way of working as mentioned above can be described as follows:

1. Going through the fundamental democratic values.
2. Going through interesting subjects based on pupils' choices and drawing up questions, hypothesis and assumptions.
3. Going through possible sources of information with ease of access.
4. Seeking relevant information.
5. Deliberative discussions on questions, problems, assumptions and hypotheses.

6. Working through collected information.
7. Grouping information together.
8. Presenting the results.
9. Evaluating the results.
10. Deliberative discussions on the work and the results as a whole.

In the report to follow, we will focus on the items 1, 5, 6 and 10, which we consider to be most related to the question whether computer support improves learning. Before that, we regard it essential to describe the meaning of deliberative discussions.

Deliberative Discussions

Within the research in this domain, deliberative discussions are described as the very foundation of our democracy. They intend to strengthen democracy in education and help pupils to reach democratic competence. In other words, the discussions contribute to teach pupils how to create meaning and knowledge within most domains. Characteristic for deliberative discussions are that pupils' attitude to a certain problem is questioned and that different opinions are shown and respected by the pupils. That means for example that they a) get opportunities to confront different views and arguments, b) are trained to show tolerance and respect to each other, c) have to learn to listen to the arguments in the discussion, and d) have to try to reach at least temporary agreements.

The ideas, which are expressed in the complements of the curriculum for the compulsory school concerning the possibility to develop democratic competence, have mainly been borrowed from Habermas, who represents a certain optimistic variant of critical theory. Significant for his world of concepts is what is described as communicative acting and competence (Habermas, 1984, 1990). For Habermas, communication represents something mutual. As Alvesson and Sköldbberg (1994) point out, communicative acting affords ample opportunities for dialogues. In the form of dialogue, rational conditions are discussed until an agreement is reached. Of central importance in that context is the competence of the participating actors concerning reflective ability and condition and that all of them in principle have got the opportunity to express thoughts, attitudes, feelings and intentions in order to shed light on the questions and problems which are discussed. Thus, it is desirable that in education we stimulate learning, which develops different kinds of cognitive abilities all together in active

participation. In other words, we hereby deal with education in which cognitive socialization is stressed (Säljö, 2000).

The premise for taking part in a rational discussion is that the participants are considered to be competent and that they participate under equal conditions. There is however, reason to question whether pupils in the compulsory school are considered to be competent in that respect and if they can always participate on the same terms (Fjellström, 2000). Further on there is reason to question whether consensus has to be the final goal for deliberative discussions. Since pupils are learning by conflicts and solving conflicts, also dissension can be apprehended as meaningful concerning difficult and complex questions. The initial point here is what makes democracy to what it is today, namely that we can reach an agreement in all domains but that we have the right to disagree and that we are sometimes even encouraged to do so (Liedman, 1986). One criticism of Habermas' communication theory is that dissension is useful in the sense that it opens up for the possibility to see and conduct in different ways to the world around us and to avoid rigid behaviours (Alvesson & Sköldberg, 1994). Out of that, the ideal seems to be dissension in favour of consensus.

Furthermore, there may be reason to object to the very stressing of cognitive abilities, which characterize the supplements of the curriculum concerning critical and democratic competence at the cost of the creative abilities. It means that the cognitive aspect in the sense of scientific knowledge is stressed, distinguished from the estimating, emotional and aesthetic aspect (Fjellström, 2000).

The foundation ideas in the deliberative democracy we can find in the works of Dewey (1927) and Durkheim (1992). Scholars like Habermas (1997), Gutmann (1987, 1996) and Englund (1999) have been able to develop a theory in a social and educational perspective. Bohman and Rehg (1997) have made a survey over deliberative democracy.

In our way of working, deliberative discussions occur as for items 1, 5, and 10, which are presented in the following description. We also have chosen to illustrate item 6 since we appreciate it as being of special importance in this way of working.

Going Through the Fundamental Democratic Values

The following questions are to be illustrated in item 1: 1) What are the democratic values referring to? 2) What is the meaning of the concept

democratic competence? 3) Why are concepts like democratic values and democratic competence considered to be of importance in education? and 4) How can these concepts be related to pupils' own situation in school?

The teacher together with the pupils in the classroom conduct discussions related to those questions. The following concepts are relevant: equality, solidarity, liberty, integrity and inviolability. Characteristic for a person who possesses democratic competence is a sense of justice, generosity, tolerance, and responsibility. Of central importance is the teacher's ability to stimulate the pupils to reflect on certain examples connected to the concepts mentioned in the text above and to discuss practical examples taken from their daily work based on different comprehensions of concepts. The condition here is that the teacher permits a variation of values to be confronted by not letting his comprehension dominate the discussion.

Deliberative Discussions on Questions, Problems Assumption, and Hypotheses

The following questions are to be illustrated in item 5: 1) What practical problems do pupils perceive when seeking for information, content of information, focusing, teamwork and the use of the library? 2) How do we reduce or minimize possible problems met in the way of working? and 3) How can the teacher lead the discussions in order to facilitate pupils' participation?

Discussions in groups ought to be structural (Hoel, 1996). Under such conditions, it is important that every pupil gets the opportunity to give his/her views while the others are listening actively showing their wish to discuss the problems in question. Therefore, nobody shall feel odd or outside the community because of his/her comprehension differs from all the others. That is why it is so important that the teacher succeeds in bringing about the feeling that all comments, questions and views are equally important. Primarily it deals with how pupils perceive work so far. What they comprehend as right or wrong is thus of minor importance and interest in this context.

Questions like what, how and why are included in the discussions which are aiming at increasing the pupils' awareness of the learning process. The goal is to teach them to respect each other and to develop positive behaviours helping all pupils and thereby themselves (Dimenäs & Sträng Haraldsson, 1996).

Deliberative Discussions on the Way of Working and the Result as a Whole

The following questions are to be illustrated in item 10: 1) How is the way of working to be summarized? 2) What do pupils apprehend that they have learned? 3) How do they comprehend the way of working on the question? 4) What can be improved? 5) How has their relation to the task been changed from time to time? 6) What are the new questions caused by their results? and 7) How do they proceed?

As a counterbalance to the estimation of the pupils' verbal and written results, the teacher should focus on the learning process. It may deal with problems conceived by the pupils from time to time, why the problems have come up, how they solved the problems and what they have learned from their experiences. Out of these new experiences, it would be convenient to discuss the ongoing work and what new questions concerning the content as well as the way of working. An exploratory way of working compared with discovery learning is to be seen as a cyclical process developing into several metamorphoses. The difference is, as we regard it, the rise of quality as it means letting pupils confront each other to develop knowledge and skill. In that way, they are taking part in the democratic process, which leads to democratic competence, which is the condition for pupils so that they as grown-up citizens will be able to contribute actively in developing the democratic society, which we defend.

Working Through Collected Information

In the same way the following questions are to be illustrated as for the important item 6: 1) What previous experiences do pupils have from studying, sorting, interpreting, comparing, estimating, valuing, reflecting critically, analysing, structuring, answering questions, verifying hypotheses and drawing conclusions out of sources and texts? 2) What preparations are needed? and 3) How much time is needed?

Three phases characterize the item in question: 1. preoperational phase, 2. interoperational phase, and 3. postoperational phase. The activities included and how they are related to each other are stated below.

Figure 1. Descriptions concerning which activities are included in the three phases of the item

1 Preoperational phase	2 Interoperational phase	3 Postoperational phase
studying	estimating	structuring
sorting	valuing	answering questions
interpreting	reflecting critically	verifying hypotheses
comparing	analysing	drawing conclusions

The Fundamental Opinion of Constructivism

A new way of working today is based on a fundamental opinion of constructivism (Eskilsson & Helldén, 1996). Referring to the items, which include deliberative discussions in order to develop a democratic behaviour, teaching pupils to build their knowledge in interaction with each other, it is convenient to use the concept *social constructivism*, which is to be regarded as an extension of the concept constructivism (Björkqvist, 1992). Significant for collaborative education is that it can contribute to new forms of learning in which the pupil is getting a part of his/her own and other pupils' knowledge process (Bjessmo, 1997). The method, which is entitled, Computer Support of Collaborative Learning (CSCL), is characterized as the pupils being equal and participating actively in a communication process in which the knowledge is shown and they can discuss with each other without chaos breaking out (Koschman, 1994). In certain contexts, the name "co-operative learning" is used. Collaborative and co-operative learning have the same goal to work together, which is also the goal for education and learning. Another method, which is closely related to these methods, is Computer Support for International Learning (CSILE) (Scardamalia & Bereiter, 1992).

Teaching How to Seek and Use Information

As a result of the research in this domain, one has a deeper understanding of the problems concerning their characteristics and what causes them. It seems quite obvious that one of the causes to the problems in education is supposed to be the obscurity in what seeking information or information competence really stands for. Therefore, it must be of great importance for the research work in the future to state what these concepts involve and

what meaning they have. Since most of the survey studies are nearly related to the critical thinking process the research must not be focused on only the problem how to seek information. More important is the problem how to use information (Limberg et al., 2002, p. 147f).

Due to scholars' work recently the competence in seeking information is related to teachers' own learning process. Because of that, it is important to develop teachers' deeper understanding of the meaning of seeking and using information. Riis (2000) draws the same conclusion, claiming that teachers need deeper knowledge as for the grounds for scientific work concerning seeking and using information (p. 97). The problem is how they, as teachers, can help pupils create meaning out of information and about seeking information (ibid., p.169). Experience from the Swedish school project ITiS shows that teachers' competence in a broad sense is most important for pupils' knowledge and skills concerning the use of ICT as a pedagogical tool in education (Chaib & Tebelius, 2004). The use of ICT as a thought-provoking tool in developing teachers' competence ITiS has contributed to new approaches in reflecting and thinking about working in school. Our conclusion is therefore that developing teachers' competence in using ICT as a pedagogical tool in school must be one of the high priorities in teacher training.

Summary and Conclusion

IT or ICT has been influencing life in modern communities, although the IT-revolution which one hoped for has not occurred. Instead, there was an IT-evolution. That means, among other things, that the computer is looked upon as any tool in the education process. The interest for the IT-technology has turned into an interest for the IT-pedagogy instead. The reason is that there has been a change of perspective concerning our view on how computer support affects pupils' learning over the last decades. It implies that the fixing of technique from earlier has now turned to putting pedagogics in focus. Instead of studying the concept "IT and learning", it is now relevant to study "learning and IT" (Tydén in Tydén & Andrae Thelin, 2000). In spite of our interest in pedagogical questions, we have not yet been able to find adequate forms of the way ICT is delivered in schools.

In this presentation, it is our intention to show how to perform certain contexts to optimise the effect on learning with the help of computer support in education. The information technology will be used best when it is

fully integrated into the development of the education as a whole (Papert, 1995). The question whether computer support improves pupils' learning must be put in a larger context relating to the role of teacher, the way of working and the way of using information and knowledge. Furthermore, the view of knowledge must be changed. It means that we must consider the fact that knowledge is a process or a way of relating to knowledge and learning rather than, to a product (Maltén, 1981). We have presented the results out of that perspective in a report in which an example of an exploring way of working is described (Svedberg, 2001b).

On the basis of a learning perspective, one would expect that questions related to pupils' democratic, critical and reflecting behaviour on different levels in the education system and in what way computer support improves learning would be enlightened in detail. Furthermore, we regard it as desirable to investigate when and how skills concerning the behaviours mentioned above can and have to be developed, and what skills and knowledge pupils are expected to master on different levels in the compulsory school. When is it relevant to develop democratic competence, exercise skills as interpreting, investigating critically, comparing and valuing information, use a way of working like seeking information with computer support and use a reflecting way of working? How can/are these exercises to be performed in order to stimulate holistic learning? What kind of computer applications would support a learning process like this? Since the computer seems to play a central role as a valuable tool in that learning process, there is good reason for studying the possibilities this medium can offer. The remaining question is: How can teachers help pupils create meaning out of information and how to seek and use information?

References

- Alvesson, M. & Skoldberg, K. (1994). *Tolkning och reflektion. Vetenskapsteori och kvalitativ metod* [Interpretation and reflection. Theory of science and qualitative method]. Lund, Sweden: Studentlitteratur.
- Axelsson, B. (2000). Reflektioner kring projektet Forskarcirklar för pedagoger i Mora. Hur IT blev ett naturligt redskap [Reflections on the project Research education for pedagogues in Mora. How IT became a genuine tool]. In T. Tydén & A. Andrae Thelin (Eds.), *Tankar om lärande och IT – en forskningsöversikt* (pp. 31–50). Stockholm: Skolverkets monografiserie.
- Berg, G., Larsson, T., Lindblad, S., & Wallin, E. (1980). *Förändring och förnyelse i skolan* [Change and regeneration in school]. Vällingby, Sweden: Liber UtbildningsFörlaget.

- Bjessmo, L.-E. (1997). *IT och undervisningens villkor* [IT and conditions of the education]. Stockholm: HLS. Matematiska ämnenas didaktik [Didactic of the mathematical subjects]. Reports from the Faculty of Education at Åbo Academy, Finland, no. 2.
- Björkqvist, O. (1992). *Social konstruktivism som grund för matematikundervisning. Forskning och utvecklingsarbete i de matematiska ämnenas didaktik* [Social constructivism as foundation for education in mathematics. Research and development on didactics of the mathematical subjects]. Reports from the Faculty of Education at Åbo Academy, Finland, no. 2/1992.
- Bohman, J., & Rehg, W. (Eds.). (1997). *Deliberative Democracy. Essays on reasons and politics*. Cambridge, MA: MIT Press.
- Carlsson, S., & Lindh, J. (2003). *Vad innebär IKT i skolan ur ett didaktiskt perspektiv?* [What does IKT in school mean seen from a didactic perspective?]. Jönköping, Sweden: Internationella Handelshögskolan, Jönköping.
- Chaib, M., & Tebelius, U. (2004). *ITiS-satsningen 1999–2002. Sammanfattning av den nationella utvärderingen*. [The ITiS-project 1999–2002. Summing up the national evaluation]. Report from School of Education and Communication, Jönköping University, Sweden.
- Clark, R. E. (1983). Reconsidering research on learning from media. *Review of Educational Research*, Winter, Vol. 53, No 4, 445–449.
- Danielsson, A. (1983). *Företagsekonomi – En översikt*. [Business administration – A survey]. Lund, Sweden: Studentlitteratur.
- Dewey, J. (1927/1984). The public and its problems. In J. A. Bodyston & J. Dewey (Eds.). *The Later Works, 1925–1953. Vol. 2* (pp. 253–372). Carbondale & Edwardsville: Southern Illinois Press.
- Dimenäs, J., & Sträng Haraldsson, M. (1996). *Undervisning i naturkunskap* [Teaching natural science]. Lund, Sweden: Studentlitteratur.
- Durkheim, E. (1992). *Professional ethics and civic morals*. London: Routledge.
- Edström, R., Riis, U., Fahlén, L., Jedeskog, G., Pedersen, J., Samuelsson, J., et al. (1997). *Informationstekniken i skolan. En fråga om ekonomi och pedagogik? En lägesbestämning via 97 svenska kommuner* [IT in school. A question of economy and pedagogics? A determination of position by 97 Swedish municipalities]. Uppsala, Sweden: Pedagogiska institutionen, Uppsala universitet.
- Ellis, E. S., & Sabornie, E. J. (1986). Effective instruction with microcomputers: Promises, practices and preliminary findings. *Focus on Exceptional Children*, Vol. 19, No 4, 1–16.
- Englund, T. (1999). Den svenska skolan och demokratin. Möjligheter och begränsningar [The Swedish school and the democracy. Possibilities and limitations]. In SOU 1993:93. *Det unga folkstyret. Demokratiutredningens forskarvolym VI*, (pp. 13–50).

- Eskilsson, O., & Helldén, G. (Eds.). (1996). *Naturvetenskapen i skolan inför 2000-talet. Det femte nordiska forskarsymposiet om undervisning i naturvetenskap i skolan* [The natural science in school before the 21st century. The 5th nordic research symposium on teaching natural science in school], Kristianstad, March, 1996. Kristianstad, Sweden: Fagus förlag.
- Farkell-Båathe, S. (1999). *Bättre studieresultat med hjälp av datorer* [Improved study results with the help of computers]. (Forskningsrapport). Stockholm: Lärarhögskolan i Stockholm.
- Fjellström, R. (2000). Diffusa resonemang om skolans värdegrund. Senaste nytt [Diffuse discussions on the values of school. Latest news]. *Svenska Dagbladet*, Retrieved from <http://www.svd.se/kultur/understreck/understreck001024.asp>
- Fransson, A. (1978). *Att rädas prov och att vilja veta. Studier av samspelet mellan ängslighet, motivation och inläring* [To dread examinations and wanting to know. Studies concerning the interrelation between timidity, motivation and learning]. Göteborg, Sweden: Acta Universitatis Gothoburgensis.
- Gutmann, A. (1987). *Democratic education*. Princeton: Princeton University Press.
- Gutmann, A., & Thompson, D. (1996). *Democracy and disagreement*. Cambridge, MA: Harvard University Press.
- Habermas, J. (1984). *The theory of communicative action. Vol. 1*. Boston: Beacon Press.
- Habermas, J. (1990). *Kommunikativt handlande. Texter om språk, rationalitet och samhälle* [Communicative action. Texts on styles, rationality and community]. Göteborg, Sweden: Daidalos.
- Habermas, J. (1997). *Diskurs, rätt och demokrati* [Discourse, right and democracy]. Göteborg, Sweden: Daidalos.
- Hagler, P., & Knowlton, J. (1987). Invalid implicit assumption in CBI comparison research. *Journal of Computer-Based Instruction*, Vol. 14, No 3, 84–88.
- Hehrne, M. & Norén, L. (2003). *IT i skolan* [IT in school]. Stockholm: KK-stiftelsen [KK-foundation]/ Centrum för Marknadsanalys AB.
- Hoel, T. Lökenstgard. (1996). Kjønn, interaksjon og elevsamarbeid [Sex, interaction, and pupils' collaboration]. *Nordisk pedagogik* 1/96, vol 16, 31–41.
- Isberg, L. (1996). *Lärarrollen i förändring* [The teacher's role in change]. Lund, Sweden: Studentlitteratur.
- Jedekog, G. (1993). *Datorn som pedagogiskt hjälpmedel*. [The computer as a pedagogical tool]. Lund, Sweden: Studentlitteratur.
- Jonassen, D. H. (1996). *Computers in the classroom: Mindtools for critical thinking*. Columbus, OH: Prentice Hall.
- Keller, J.M. (1983). Motivational design of instruction. In C. M. Reigluth (Hrsg.), *Instructional design, theories and models: An overview of their current status*. Hillsdale, NJ: Lawrence Erlbaum Associates.

- Koschmann, T. (1994). *The collaborative learning laboratory: A technology enriched environment to support problem-based learning*. U.S.; Illinois: Clearinghouse NO IR017854.
- Liedman, S.-E. (1983/86). Kunskaper och kontroverser [Knowledge and controversies]. In J. Naeslund (Ed.), *Kunskap och begrepp* [Knowledge and conceptions]. Stockholm: Liber.
- Limberg, L., Hultgren, F., & Jarneving, B. (2002). *Informationssökning och lärande – en forskningsöversikt* [Seeking information and learning – a research survey]. Stockholm: Skolverket.
- Lindh, J. (1993). *Datorstödd undervisning i skolan – Möjligheter och problem*. [Computer support in school – Possibilities and problems]. Lund, Sweden: Studentlitteratur (a 2nd edition 1997).
- Malone, T. W. (1981). Toward a theory of intrinsic motivation instruction. *Cognitive Science*, 4, 333–369.
- Nilssen, T. (1993). *Konstruktivismen i klassrummet* [The constructivism in the classroom]. Oslo, Norway: Det matematisknaturvetenskaplige fakultet. Universitetet i Oslo.
- Okolo, C. M., Bahr, C. M., & Rieth, H. J. (1993). A retrospective view of computer-based instruction. *Journal of Special Education Technology*, Vol. 12, No 1, 1–26.
- Papert, S. (1995). *Hur gör giraffen när den sover? Skolan, datorn och kunskapsprocessen*. [Title of the original: The Children's machine. Rethinking School in the Age of the Computer, 1993]. Göteborg, Sweden: Daidalos AB.
- Pedersen, J. (1998). *Informationstekniken i skolan. En forskningsöversikt* [IT in school. A research survey]. Stockholm: Skolverkets monografiserie.
- Pedersen, J. (2000). Kommer informations- och kommunikationstekniken att förändra skolan? [Will the information- and communication technique change school?]. In T. Tydén & A. Andrae Thelin (Eds.), *Tänkar om lärande och IT – en forskningsöversikt* [Thoughts on learning and IT – a research survey] (pp. 15–30). Stockholm: Skolverkets monografiserie.
- Reimann, P. (2000). Fostering critical thinking about environmental issues with "Mind Tools". In T. Tydén & A. Andrae Thelin (Eds.), *Tänkar om lärande och IT – en forskningsöversikt* [Thoughts on learning and IT – a research survey] (pp. 62–94). Stockholm: Skolverkets monografiserie.
- Riis, U. (2000). Framtidsfrågor [Questions for the future]. In U. Riis (Ed.), *IT i skolan mellan vision och praktik – en forskningsöversikt* [IT in school between vision and practise – a research survey] (pp. 90–100). Stockholm: Skolverket.
- Riis, U. (2000). Elever, lärare och organisationer kring informationstekniken i skolan, ELOIS [Pupils, teachers and organizations about IT in school]. In T. Tydén & A. Andrae Thelin (Eds.), *Tänkar om lärande och IT – en forskningsöversikt* [Thoughts on learning and IT – a research survey] (pp. 31–50). Stockholm: Skolverkets monografiserie.

- Riis, U., Jedeskog, G., Axelsson, B., Bergman, M., Edström, R., Fahlén, L., et al. (1997). *Pedagogik, teknik eller ekonomi?* [Pedagogics, technique or economy?]. Uppsala, Sweden: Pedagogiska institutionen. Uppsala universitet.
- Romiszowski, A. (1992). *The Selection and Use of Instructional Media* (2nd ed.). New York: Nichols publishing.
- Rognhaug, B. (1996). *Kunskap och lärande i IT-samhället* [Knowledge and learning in the IT-society]. Stockholm: Runa Förlag AB.
- Scardamalia, M., & Bereiter, C. (1992). Textbased and knowledgebased questioning by children. *Cognition-and-Instruction*; 9(3), 177–199.
- Sjöberg, S. (1990). *Naturfagenes didaktikk fra vitenskap til skolefag* [The subjects of natural science from science to school subjects]. Oslo, Norway: Gyldendal.
- SOU 1994:118. *Informationsteknologin. Vingar åt människans förmåga* [The information technology. Wings to the ability of man]. Stockholm: Allmänna förlaget.
- SOU 1996:67. *IT i skolan. Om IT som förändrande kraft i skolans utveckling* [IT in school. About IT as a changing force in the development of school]. Stockholm: Allmänna förlaget.
- Svedberg, S. (2001a). *Informationssökning med IT-stöd. Fyra delstudier i grundskolans årskurs 6* [Using information technology as an aid to seeking information. Four sub-studies in Grade 6 of the compulsory school] (doctoral dissertation). Malmö, Sweden: Högskolan i Malmö. Lärarutbildningen.
- Svedberg, S. (2001b). Informationssökning med datorstöd – att utveckla ett källkritiskt och demokratiskt förhållningssätt i årskurs 9. [Using information technology as an aid to seeking information – to develop a critical and democratic behaviour in Grade 9 of the compulsory school]. *Human IT nr. 4*, 29–83.
- Säljö, R. (2000). *Lärande i praktiken. Ett sociokulturellt perspektiv*. [Learning in practical situations. A social-cultural perspective]. Stockholm: Prisma.
- Tydén, T. (2000). Antologins innehåll [Content of the anthology]. In T. Tydén & A. Andrae Thelin (Eds.), *Tankar om lärande och IT – en forskningsöversikt* [Thoughts on learning and IT – a research survey] (pp. 11–15). Stockholm: Skolverkets monografiserie.
- Tydén, T., & Andrae Thelin, A. (Eds.). (2000). *Tankar om lärande och IT – en forskningsöversikt*. [Thoughts on learning and IT – a research survey]. Stockholm: Skolverkets monografiserie.
- Utbildningsdepartementet. (1994). *Information om 1994 års läroplan för det obligatoriska skolväsendet (Lpo 94)* [Information on the curriculum of 1994 for the compulsory school]. Stockholm: Utbildningsdepartementet.