In the Information age, ICT learning requires a balance between the concrete and experiential learning process and the abstract conceptualisation of Andragogy. Future Teacher Professional Development will need to understand the complexities of the concrete experience and the abstract conceptualisation of new knowledge.

Professional Development will need to comprehend how experienced teachers as digital immigrants learn. It will further need to understand what abilities are essential for these experienced teachers and how they develop an awareness of their ICT learning.

This paper will examine a study that was undertaken with a group of Post Registration Primary School Educators. These experienced teachers undertook the Post Registration or fourth year of their Bachelor of Education (Primary) course at an Australian Educational Institute. These experienced teachers with limited ICT exposure went through an ICT learning process over a period of one year. They finally acquired the ICT knowledge and skills, however within the time span of one year, theoretical pedagogy was absent or minimal.
1 Introduction
In the twenty first century, teachers have realised that they need to be knowledgeable, skilful and able in applying ICT (Information and Communication Technologies) effectively and efficiently (Anderson & Elloumi 2004). Some teachers have embarked upon ICT and utilised the tools within their classrooms. However, there are other teachers who lack the confidence, skills and knowledge, but rate it highly as a professional development need (Hargreaves et al. 1996). These practising experienced teachers often have not received their pre-service training in computer use, yet they have experienced increasing expectation to incorporate computer technology into their teaching (Niederhauser 2001; Russell & Bradley 1997 as cited in Phelps & Ellis 2002).

This paper examines a study that was undertaken with a group of Post Registration Primary School practising experienced teachers. These teachers undertook the Post Registration or fourth year of their Bachelor of Education (Primary) course at an Australian Educational Institute. Teacher Professional Development programs have been proposed and trialed and despite this many teachers often feel threatened and have a high computer anxiety which is further exuberated by the often excellent computer skills of some of their students (Williams 1993).

1.1 Background to study
At the turn of the twenty first century, the dawn of technology, globalisation and life long learning, teaching like many other professions has transcended the traditional learning environment. A number of Developing Countries' educational bodies began to investigate learning and teaching developments in the new milieu. Australian educational bodies did not lag behind; but started to advocate that ICT needs to be an integral part of the educational system and lifelong learning.

The enculturation of experienced teachers and the reconstruction of learning environments are at the heart of transforming the collective learning process as teachers work and solve problems together. Significant features in the enculturation process in this study have been the ICT artifacts, the practice of utilising the ICT tools and the culture that played “a large role in shaping the development of individual minds; and individuals’ thoughts and deeds [which] serve to maintain or to alter the cultural milieu” (Well & Claxton, 2002, p. 3).

For the cultural milieu of the twenty first century teacher learning communities, it is paramount to firstly identify and secondly to understand the experienced practising teachers’ learning process and abilities. These two factors need to be robust enough and smart enough to meet future challenges in the information age.

1.2 The Challenge for Teachers
A major challenge for experienced teachers migrating into the information age is how they individually learn and acquire the necessary information, knowledge and skills for the 21st century. This research attempted to identify,
understand and report on teacher learning and in particular, teachers who have extensive teaching experience but limited ICT knowledge and skills.

These experienced practising teachers grew up before digital technologies; they are not frequently confident or comfortable with ICT. However, they need to migrate into the information age. They, like all immigrants, have to learn new and creative ways to enhance their survival in the third millennium, where the acceleration of knowledge has allowed communication and application of information to be rapidly disseminated. In order for these teachers to fully participate in the technologically rich society, they must actively engage in the construction of authentic and purposeful ICT learning and teaching.

2 Methodology

2.1 Participant Observation Qualitative Methodology
This research applied a participant observation qualitative methodology to assist in the further development and understanding of the learning process of experienced practising teachers in a mixed mode of learning in Higher Education. Mixed mode delivery entails two forms of interaction. In this case the lecturer met the participants face-to-face for a designated time during the academic year at University. The other component of the delivery occurred when the whole group transfers to online mediation; WebCt.

In this study the Participant Observation Qualitative research methodology incorporated participant observation in the university classroom, interviews at three points of the course – beginning, mid and final points and participants’ written documentations. Finally, in an interview, the lecturer verified the collected data.

2.2 Focus of study
The focus of the study was on the learning of sixteen teachers, who have general classroom teaching experience, but who were relatively unfamiliar with Information Communications Technology (ICT). Using the concepts of learning and in particular adult learning, David Kolb’s experiential learning came into the foreground when deciding to incorporate learning styles and modes of learning (David Kolb 1984). Learning Styles assisted these teachers to process, accommodate and demonstrate their understanding of particular ICT knowledge and skills as adult participants in this environment. Kolb created his framework for an adult learning environment with long life learning in mind (Kolb 1984; Rainey & Kolb 1997). The process of learning based on Kolb’s Experiential Learning framework incorporated the modes of learning and the learning styles that are relevant to the ICT milieu.

Further to Kolb’s framework; Gardner’s (1983) Multiple Intelligences framework was used to investigate the abilities that the participants needed to attain educational goals in this ICT environment.

As ICT has become an essential component in the lifelong learning process for the information age, the researcher wanted to find out how experienced practising teachers as digital immigrants learn utilising Gardner’s Multiple
Intelligences/abilities and Kolb’s Learning Styles to process learning in the ICT context.

2.3 The Analysis
In order to stay close to the raw data, the themes and the understandings through Kolb’s and Gardner’s frameworks were placed into matrixes, allowing for greater data reduction, display and arriving at a conclusion and verification (Miles & Huberman 1984). A number of tactics were employed to draw meaning from the data, namely; counting, clustering, constructing patterns and drawing meaningful conclusions that needed to be verified. As the researcher was the sole collector of the data, this brought about a concern in relation to the reliability of the data collection. The researcher carefully recorded the learning process and made every attempt to verify and maintain all evidence of teacher learning; carefully and thoroughly recording the insights and categorising the meanings and understandings of the learning processes and abilities.

3 Discussion
According to Kolb (1984) teachers prefer an accommodative learning style, that is a style that incorporates an orientation towards CE (Concrete Experience) and AE (Active Experimentation). He also points out (figure 1) that learners ‘touch all bases’ Kolb (2003, p.6) from Concrete Experience, Reflective Observation, Abstract Conceptualisation to Active Experimentation (see dotted lined circle in figure 1).

However, in this study, learning styles for practising experienced teachers are not as clearly defined as Kolb states in his work. Individual learning differences and learning in an ICT context according to this study indicates that the influx and influence of ICT might have created a conflict with the traditional perception of university lecture orientated learning.

The research found that the majority of participants preferred to construct their learning by doing and experimenting with technology and observing their peers in a collaborative and interactive social learning environment. These teachers did not employ Abstract Conceptualisation (AC) to enhance and expand the ICT pedagogical theory. They used Abstract Conceptualisation (AC) to comprehend the technical aspects of ICT. These participants wanted “real world learning” (Kolb 1984, p.34) they were interested in interactions with
each other within a particular cultural situation, so that they could use it (ICT) the next day.

Besides the learning process, the researcher like Howard Gardner found that learners needed certain abilities or intelligences to solve and generate problems that they encounter in real life. Gardner also emphasised that once learners have these abilities, they can make a valuable contribution within their culture (Gardner 1983).

The sequence of the Multiple Intelligences has importance for Gardner. He begins his list of intelligences with verbal and logical intelligences (Table 1) because they “are particularly important in the kinds of schools that we have today — ones that feature listening to lectures, reading, writing and calculating…” (Gardner 2004, p31). In learning from the time of Aristotle and in our own traditional classrooms with traditional methods of learning, these two intelligences were highly respected. The student was successful, if she/he could articulate and persuade his audience to think in a particular frame of mind (Vialle, Lysaght & Verenikina 2005). However, this study challenges Gardner’s order of MI (Multiple Intelligences) and claims that three intelligences are predominantly employed; interpersonal intelligence (social interaction), kinesthetic intelligence (doing) and intrapersonal intelligence (self-reliant interaction) in the ICT learning environment.

<table>
<thead>
<tr>
<th>Intelligence</th>
<th>Descriptors</th>
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<tr>
<td>Verbal/Linguistic</td>
<td>Words</td>
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<tr>
<td>Logical Mathematical</td>
<td>Numbers/logic</td>
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<td>Visual/Spatial</td>
<td>Pictures</td>
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<td>Interpersonal</td>
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<td>Intrapersonal</td>
<td>Self-reflective</td>
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<td>Bodily Kinaesthetic</td>
<td>Physical experience</td>
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Table 1

The traditional learning university lecture approach of minimal form of interactive communication did not allow “interfunctional relations” (Vygotsky 1962, p.1) where human communication takes place in a sociocultural environment. In the ICT environment, the learning process is the coupling of interpersonal intelligence with verbal and visual intelligences. Learning in the ICT environment as per se is not a solo activity. It requires others to support the learners, bounce ideas off each other and finally it requires some action during the process. Kinesthetic intelligence, learning by doing, is activated to solve the challenges of the ICT cultural learning environment. Learning requires collective and individual reflection through interpersonal and intrapersonal intelligences.

The Researcher observed and found that learning processes and abilities in the ICT environment were different from the traditional approach. During the study, it became evident that experienced teachers need certain learning abilities and processes in their function, transition and scaffolding from previous learning experiences for survival in the ICT culture of the 21st century.

The cultural context of this study was the ICT milieu in the information age and the participants in this study were attempting to solve the problems and
challenges related to their information and communication technology (ICT) learning. They employed certain intelligences and learning processes in this particular cultural context to solve the challenges of their new learning; how to employ ICT equipment and apply it in their lives in the ubiquitous ICT environment.

This work emerged as there was a quest to understand the learning process and how these experienced teachers learn and migrate into the ICT environment, which is different from the traditional lecture orientated university classroom. These experienced teachers needed to leave the safe and sound predigital environment. The researcher wanted to know how they learned and what abilities were essential for them in order to enter the digital native (Prensky 2001) world of the 21st century.

At the end of the course, these experienced teachers, regardless of the hard work and hours spent in focusing on their new learning; they acquired a digital accent (Prensky 2001). They were fascinated and adopted the new technology and tried to adapt to the new environment, but they still had a foot in the past (Prensky 2001). The “digital immigrant accent can be seen in such things as turning to the Internet for information second rather than first, or in reading the manual for a program rather than assuming that the program itself will teach us to use it…” (Prensky 2001, p. 2)

These teachers were not digital natives (Prensky 2001) like their students, who employ the hyperlearning process (Perelman 1962) of the 21st century. They did not arrange “their information in a non-linear manner with the computer automating the process of connecting one piece of information to another” (Snyder 1997, p.126). They were not “accustomed to the twitch-speed, multitasking, random-access, graphic-first, active, connected, fun, fantasy, quick pay-off world of … the Internet” (Prensky 2001, p. 1).

However, these experienced present day teachers as digital immigrants, had progressed into a survival state in the new information age and their learning was similar to the learning of new arrivals in a foreign country. They could survive in the environment, however when placed in an environment that required abstract conceptualisation (Kolb 1984) in their profession, they appeared to be neither fully comfortable nor confident with ICT. They were not at the stage where they were thinking of abstract ideas, concepts, and pedagogical issues in regard to ICT.

This section discussed a number of issues that were raised in the study regarding the entry of experienced teachers into the information age. The study used the frameworks of Howard Gardner (1983) and David Kolb (1984) to come to a broad appreciation and understanding of experienced teachers' learning struggles. The teachers experienced ICT learning anxieties and there were changes as they learned how to push buttons, think how to apply the software and finally become receptive to changing their practices.
4 Transition
The teachers’ transition from experienced practising teachers with limited ICT exposure to digital immigrant teachers with digital citizenship (if not digital native status) became evident over the three points of data collection:

In the initial data collection as these experienced teachers were learning the basics of ICT (how to push buttons), the most common intelligences used by the participants was interpersonal intelligence to reason and come to a collective knowing of the concrete ICT experience. They experimented with the software to obtain new ideas, knowledge and skill. They employed kinesthetic intelligence to create new activities with the tools of this new and unfamiliar ICT environment in which they were neither comfortable nor confident. They attempted to become aware of the new ICT environment, its tools and functions. They asked where is the on button.

During the middle data collection when the participants began to think how to apply the software, they were doing and experimenting with the software, however they were not mastering it. They were dabbling with … the software. They were engaged in the pondering and thinking about the concrete experience. They collectively struggled with ICT and thought about the concrete experience and how to apply the software in their classrooms and lives.

During the final data collection when the participants consented and became receptive to changing their practice, the study saw that the participants’ confidence and comfort with ICT increased. They experimented with the concrete experience, and reflected on the technical ICT issues. They willingly discussed the technical issues, supported and showed each other what they had discovered in their experimenting. They shared their newfound knowledge in a collaborative, supportive and interactive environment.

The modes of learning (Kolb 1984) and some of the multiple intelligences (Gardner 1983) were more prominent than others in this study. The above short description of data collection points indicate that there were no great variations; three multiple intelligences were mainly employed instead of all multiple intelligences. The modes of learning that Kolb specified for teachers’ accommodative learning style did not correspond to the three modes of learning in this study. Nonetheless, Kolb’s and Gardner’s frameworks were useful as they assisted in showing the broad approach to the learning of experienced teachers with limited ICT exposure and competence.

In summary, this research indicates that the most common intelligences used by the participants in this study were interpersonal, kinesthetic and intrapersonal intelligences. The most common learning processes according to Kolb’s framework were active experimentation, concrete experiences and reflection observation. The abilities and processes of learning for these participants did not alter significantly over the year. However the participants learned about and discussed ICT technical issues rather than the pedagogical discourse inclusive of ICT learning and teaching.
Learning in this study, analysed through the frameworks of Kolb’s and Gardner’s theories, appeared to have a static character and the frameworks were inadequate for this ICT learning environment. Kolb’s and Gardner’s frameworks did not allow the researcher to interpret the dynamics and the development of the active learning processes. There were changes in the learning practices and in the acquisition of a new ‘language’ for these experienced practising teachers with limited ICT exposure.

During the year, these teachers acquired a digital language although not to the same level as the language of the digital native (Prensky 2001, 2003). Additionally as mentioned, they moved from learning how to push the ICT buttons, to thinking through how to apply the software and finally they willingly changed their practice using ICT (Figure 2).

4.1 Changes
Throughout the academic year, during the different data collection points, these experienced teachers experienced a learning struggle. There was anxiety, however there were ICT victories and the participants resolved many ICT challenges. With the support of their lecturer and their respective networks, they worked together to construct their understanding, knowledge and skills. Collectively and collaboratively they mediated and problem solved the ICT challenges to personally internalise their newfound knowledge as they changed their learning and teaching practices and approaches to ICT.

The learners in this context, scaffolded from their previous knowledge and skill base. They actively engaged and shared their work. They employed hands-on interaction with the software. They undertook authentic ICT challenges within a collaborative and supportive environment.

These participants began to speak the new ICT language. Like a small child advances from one word to “simple sentences to more complicated ones, and finally to coherent speech made up of series of such sentences; in other words, he proceeds from a part to the whole...” (Vygotsky 1962, p.126). This process “develops through a slow accumulation of functional and structural changes” (Vygotsky 1962, p. 126) that branch from the social interaction to the individual. Learning ICT language for these participants in this study was just as Vygotsky identified. Furthermore it involved emotional and intellectual development as the participants went through Perezhivaniya and Mislenija (Vygotsky 1999).
5 Perezhivanija and Mislenija

In the migration process into the ICT learning environment unlike the traditional classroom, learners like immigrants, collaborated and cooperated with each other in learning about the ICT tools and environment. These experienced teachers with limited ICT exposure like true immigrants, often went through a process of perezhivanija (переживания) (Vygotsky 1999) and mislenija (мышления) (Vygotsky 1999).

Perezhivanija is the process of an endurance taking the learning to heart or feeling something keenly. In the endurance process of learning and the overthrowing of perezhivanija learners entered the process of mislenija; the thinking and pondering about the ICT application. It was a journey undertaken by the participants into this new learning environment.

In the process of learning, the participants often felt perezhivanija (переживания) (Vygotsky, 1978, 1999), as they approached each new learning situation. These experienced teachers also employed collective mislenija and mislenija to solve ICT challenges. Mislenija (мышления) (Vygotsky, 1999) is the thinking and pondering process about the ICT application.

5.1 Initial perezhivanija

The initial perezhivanija (Figure 3) was a fear of the technology, just in case they might break something. They asked each other where’s the on button.

5.2 Collective Mislenija

The social interaction within this university classroom assisted the participants in overcoming perezhivanija and encouraged mislenija. The participants collectively with the assistance of the lecturer and other people within their network supported each other through interaction, action and reflection. The participants learned, thought and taught each other the different icons/buttons and softwares that could be applicable to their workplace and their lives in the new ubiquitous ICT environment.

5.2 Mislenija

As they began to use ICT more frequently and interact with other participants, their confidence, knowledge and skills increased. They began to employ mislenija. They pondered, talked about what they learned and they would try most of the programs that were available to them in the university classroom.

On returning to their workplaces and personal lives, they often experimented and would stay up till one am…knowing that the next day they would have to
front up to work. This did not bother them, because their confidence increased and they were able to ponder about the ICT technical issues that they were comfortably resolving.

5.3 Perezhivanija
However as the participants learned about a new program, apprehension appeared, although unlike the initial perezhivanija. Further into the year perezhivanija was about the new knowledge and how to apply it in their respective contexts.

Perezhivanija had a practical element and begged the question ‘how do I do it?’ rather than thinking ‘I am afraid of it!’ The practical application of doing led the participants to a collective mislenija.

In returning to the university classroom, the participants would consult each other and the university lecturer, as their guider and facilitator. Any issues that arose in their learning would be discussed and collectively they would figure out the ICT challenge.

Within this ICT milieu, a continuous process of collective and individual perezhivanija and mislenija (Vygotsky 1999) occurred about ICT tools and applications. However in the development of ICT learning, mislenija, the actions and encouragement on the part of the lecturer and the participants enabled the participants to scaffold and embrace ICT in their zone of proximal development (ZPD).

5.4 Zone of Proximal Development (ZPD)
Vygotsky originally proposed the Zone of Proximal Development (ZPD) as a metaphor “for observing and understanding how mediational means are appropriated and internalised” (Lantolf 2000, p. 17). The ZPD is not a physical place in time and space. The metaphor refers to the sociocultural activities where the intermental and intramental planes appear. The intermental place refers to the social interactions where an individual mediates with others and the intramental plane is where the individual after mediation with others, internalises learning (Van Der Veer & Valsiner 1994).

These two planes can be compared to the interpersonal and intrapersonal intelligences (Gardner 1983) as seen in this study. The interpersonal intelligence or the intermental plane allowed the participants to collectively share, interact, ponder upon and support each other in their learning struggles. The intrapersonal intelligence or the intramental plane allowed the participants to ponder and think individually about the ICT challenges and tools, and how to apply the software in their practices with the support of their networks.

Vygotsky (1962) also refers in the Zone of Proximal Development (ZPD) to a complex chain that is dynamic and consecutively joins individuals from one link to the next link with all its attributes and knowledge. This dynamic learning and enculturationalising process fuses and guides the learners through the acquisition of new knowledge. Learners scaffold from the other links and
acquire new knowledge and skills, which they in turn pass onto other learners. They in turn begin to use and understand ICT, and its language. They adopt the necessary actions to begin the internalisation of intellectual development necessary to function in the new environment of ICT.

These experienced teachers talked with their ICT coordinators and they understood the language, however they were not as fluent as the digital natives. They bought their USB sticks without the assistance of their children or others. The digital immigrants began the migration process that developed with the assistance of their network within their ZPD. They exchanged their newfound knowledge and skills, however the journey was not completed within the academic year. They did not theorise about the ICT pedagogy nor join the digital natives in their advanced forms of learning.

6 Sociocultural theory
Vygotsky proposed the sociocultural theory of “how the developing individual acquired these [higher psychological] processes from his or her culture” (Rosa and Montero 1990, p. 78). Vygotsky’s sociocultural theory is characterised by three general themes:
1. Development is a transition from the simple to the complex in a social context.
2. Higher mental functions have their origin in social life.
3. Tools and signs mediate the human interpersonal and intrapersonal process of learning (Vygotsky 1962, 1975).

In this ICT context, within the limits of one year, these experienced teachers made the transition into the information age and learned best by interacting with people as they:
1. acquired knowledge through culture (they learned what and how to think about ICT) (mislenija)
2. shared the process of how to solve problems through guidance within the culture
3. interacted and transmitted knowledge
4. internalised the body of knowledge (Vygotsky 1962, 1999)

The socialisation of the cultural practices and the use of the cultural tool gave teachers an opportunity to acquire, however not fully master the knowledge and skills that digital natives are comfortable and confident with. The socialisation allowed teachers to construct knowledge and skills through discussion and interaction with others in their environment. This in turn allowed the participants to construct personal knowledge and develop skills that were meaningful for them.

In the socialisation process, learning occurred at a social level (interpersonal) and later at an individual level (intrapersonal). At the social level interpersonal relationships developed to bridge the gap as Vygotsky describes “the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky 1978, p. 86).
7 Learning and Teaching (Учить)

The exchanges and collaborations brought about the fusion of learning and teaching which Vygotsky has described using the Russian concept учить - uchit (1999) that saw the participants become collectively and actively engaged and self-directed in ICT learning. They jointly solved problems, shared knowledge and skills. In the new sociocultural ZPD of the 21st century, teachers through the mediation of ICT tools became engaged “in cooperative dialogues in which teaching and learning merge in a single integral process of joint performance. Such an inextricable connection between teaching and learning makes great sense for a Russian-speaking person such as Vygotsky as the verbs ‘teach’ and ‘learn’ are translated into Russian as one word ‘uchit’” (Vialle et al 2005, p. 60; Vygotsky 1999). Uchit (Учить) in the 21st century is the fusion of cooperative, collective and independent learning and teaching within a zone of proximal development with the mediation of ICT tools and symbols.

Uchit requires learning communities, which encourage interpersonal and kinesthetic intelligences to flourish. Once the knowledge and skills are obtained individuals need to be able to actively experiment and practise their concrete ICT experiences to reinforce their newly acquired knowledge and skills by employing intrapersonal intelligences. Participants need to collectively and individually reflect on ICT uchit. Furthermore in the learning and teaching communities, strategies need to be developed that encourage uchit abstract conceptualisation of ICT pedagogy.

8 Conclusion

Finally, within one academic year, these experienced teachers with limited ICT exposure entered the information age and became digital citizens. However they still remained digital immigrants. It is fundamental to identify and understand the social and cultural learning moments in order to scaffold and adjust the process of learning and teaching (uchit) to maximise intellectual development within a learner’s zone of proximal development (ZPD). Furthermore, it is crucial to understand the digital immigrants’ perezhivania and mislenija processes. Learning is not a solo activity, but the interaction with others, the mediation of tools that in this instance changed the learning process from previous known learning environments. According to Vygotsky (1978) an essential component of learning is the interaction with others and the cooperation with peers.

Vygotsky’s theory underscores the importance of interaction and interpersonal relationships. In this interaction, participants continuously grappled with ICT challenges in their ZPD. Initially they went through a process of perezhivania. However this university ICT learning environment enabled them to form a learning community. They discussed, collaborated, used mislenija, asked questions and scaffolded from their previous knowledge and skills to construct with others and through technology their own understanding of the ubiquitous ICT milieu.
Vygotsky’s work has become an important component in this study. On the other hand, Kolb’s and Gardner’s frameworks were useful initially to come to a broad appreciation and understanding of experienced teachers’ learning struggles as they entered the information age. However Vygotsky’s theory has enabled the researcher to map the emotional and intellectual development within this ICT environment.

In conclusion, future teacher professional development will need to incorporate the findings of this research to understand the emotional and intellectual development of experienced teachers when acquiring ICT knowledge and skills. Also professional development will need to incorporate experiential learning processes and necessary abilities which will need to be balanced with the infusion of ICT pedagogical theory.
Bibliography


Miles, MB & Huberman, M 1984, Qualitative data analysis: a sourcebook of new methods, Sage Publications, Beverly Hills.


