

To skill or to construct? Effective Information and Communication Technology professional development within the context of current school reform.

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To skill or to construct? Effective Information and Communication Technology professional development within school reform

by

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Within the context of a current school reform, professional development in Information and Communications Technology (ICT) is seen as a necessary ingredient for all stakeholders involved in educating the children of tomorrow. This paper reports on an initial stage of a research project that is concerned with models of teacher ICT professional development that achieve multiliterate outcomes. The paper explores the alignment between the teachers' understandings of their need for ICT professional development and the demands presented within the reform itself. Initial findings suggest that a conflicting paradigm exist in that the teacher's demand for skill based ICT professional development does not equate with the constructivist ideology present within the school reform. This has consequently lead to two key prepositions. Firstly that skill based training in ICT may not enable the transition to a more constructivist approach to the use of ICT within the classroom. Secondly that the school based reform itself has created an antithetical position that is limiting to the potential educational use of ICT and can be seen as driving the form and function of professional development.

1. Introduction

Information and Communication Technology (ICT) is being enlisted as an integral component of current educational reform (see for example Queensland Government, 2002). In Queensland this is being interpreted and implemented through the New Basics Project (Education Queensland, 2000) which seeks to reform curriculum, pedagogy and assessment. These changes are informed by a constructivist paradigm that has implications for the use of ICT in the classroom and the professional development in ICT required by the teachers.

This paper investigates what teachers understand as 'effective' ICT professional development as part of this school reform by first providing a framework for analysis through key principles of the constructivist paradigm, then relating these to current documentation driving school reform. The paper will then explore the understandings of teachers' needs for ICT professional development within this constructivist framework.

2. Principles of a constructivist paradigm

A basic premise of the constructivist paradigm is that the learner comes to the task with prior knowledge and understanding. When a new or different concept is presented, the learner builds on and or modifies pre-existing mental models to form new constructs. Piaget labels this context of inconsistency as 'Disequilibrium', where the learner is striving to assimilate or accommodate this new information (Wadsworth, 1971, p.18). It is the process of the individual constructing their own understanding through interactions with the environment that defines constructivism (McInerney & McInerney, 1994, p. 182). Another premise of the constructivist paradigm is that learning occurs within a social context and that it is affected by the interactions that a learner has with others, what Vygotsky's calls the 'zone of proximal development' (Ashman & Conway, 1997, p. 97).

Constructivism has specific implications for pedagogy. Firstly, it asks students to cope with very complex situations where the cognitive load is high. Perkins (1991, p.19) explains that cognitive instruction aims to confront the learner with situations that make the inherent inconsistencies in the learners' native model plain and challenge the learners either to construct better models or at least to ponder the merits of the alternative models presented by the teacher. Therefore this conflicted path has very high cognitive demands. Complex situations are most effectively represented in authentic tasks, that is those that have real-world relevance and utility; are problem based and or related to community issues; draw on knowledge from across the curriculum; provide appropriate levels of complexity; and allow students to select appropriate levels of difficulty or involvement (Jonassen, 1991, p 29).

Constructivist pedagogy is learner centred. The focus is on active exploration, where the learner is developing the necessary skills to become autonomous and where the teacher progresses the learner within their 'zone of proximal development' by providing just enough help or guidance (Ashman & Conway, 1997, p.97). The difficulty presented to the learner in such a constructivist learning setting, are two-fold. They are faced with the challenge of discovering the concept for themselves as well as learning how to learn, developing and implementing strategies for independent thinkers and learners.

Lastly, constructivist pedagogy emphasises how the learner goes about constructing knowledge rather than the end product of that construction (Jonassen, 1991, p.30). The emphasis is on the process of learning, on how the individual acquires the skills, strategies and resources needed to perform learning tasks effectively as well as the ability to know when and how to use particular learning strategies. McInerney and McInerney (1994, p. 222) refer to this as 'metacognition', the process of knowing how to monitor one's cognitive resources and knowing how one learns.

In the discussion following, these four principles of constructivist pedagogy identified above, namely 'high cognitive load', 'authentic tasks', 'autonomous learning skills' and a 'process emphasis' (represented graphically in Figure 1) to analyse teachers' thoughts and ideas on ICT professional development.

Figure 1: Principles of constructivist pedagogy used as analytical tools in this paper.

3. Current School Reform

In 1997, the *Queensland School Reform Longitudinal Study* (QSRLS) was commissioned to investigate the degree to which reforms of central office support and school organization capacity, was capable of

generating pedagogical reform and improve student outcomes, both academic and social. It stated: "There is a need to shift teachers' attention and focus beyond basic skills to key aspects of higher order thinking and substantive conversations with students- that is, towards more productive pedagogies, assessment strategies and student performance outcomes" (Department of Education, Queensland 2001a, p.15). The results of the QSRLS have provided a foundation for the current strategic philosophy of Education Queensland's *Queensland State Education 2010* (QSE 2010) (Department of Education, Queensland 2001b). QSE 2010 stresses the need to offer students, parents and the communities state educational programs that are diverse and flexible, but also relevant and powerful. This philosophy is being implemented through the New Basics Project (Education Queensland, 2000) which involves reform of curriculum, pedagogy and assessment.

The New Basics Project consists of three components that have a reciprocal relationship: 'Curriculum Organisers', 'Productive Pedagogies' and 'Rich Tasks'. The Curriculum Organisers are "future oriented categories for organizing curriculum" (Department of Education, Queensland, 2000a, p.1). They are: 'Life Pathways and Social Futures'; 'Multiliteracies and communications media'; 'Active Citizenship'; and 'Environments and technologies'. Productive Pedagogies are "classroom strategies that teachers can use to focus instruction and improve student outcomes" (Department of Education, Queensland, 2000b, p.5). There are 20 strategies categorised under four headings: 'Intellectual Quality'; 'Relevance'; 'Supportive Classroom Environment'; and 'Recognition of Difference'. Rich Tasks are the "outward and visible signs of student engagement with the New Basics. They are the assessable and reportable outcomes of an enacted three year curriculum plan" (Department of Education, Queensland, 2001c, p. 8). There are suites of Rich Tasks for years 3, 6 and 9 that are called 'juncture years'.

The New Basic Project employs the principles of the constructivist paradigm in the following ways. Its curriculum and philosophy is set towards a futures direction, preparing students for new workplaces, technologies and cultures: "the new work order involves not only skills in high-tech and print literacy, but also skills in verbal face to face social relations and public self-presentation, problem identification and solution, collaborative and group capacity (Education Queensland, 2000, p.10). This futures premise indicates key elements of the constructivist principles namely, real world application and relevance, social context and interaction and high cognitive requirements. It also asserts the belief that students now need to "know how to learn through a range of media: from face to face instruction and workplace mentoring, to print self-instructional materials and on-line resources" and that "following Vygotsky, learning can be conceptualized as an apprenticeship with new and old technologies" (p.11), where technology becomes the knowledgeable guide within the 'zone of proximal development'. Both the value of autonomous learning and the application of cognitive and social learning theory are indicated here. The New Basics curriculum organises knowledge and skill into clusters of practices rather than distinct disciplines. By its nature the New Basics is transdisciplinary as it: "draw[s] upon practices and skills across disciplines" (Department of Education, Queensland, 2000a, p. 2) representing a more real world understanding of cognition. These essential clusters of practices are used by teachers to engage learners in a more relevant and intellectual manner, which again is consistent with the principles of constructivist pedagogy.

The approach to pedagogy in the New Basics Project is taken from the QSRLS which in turn was based

on research on authentic pedagogy by Newman and Associates (Lingard, Mills & Hayes, 2000, p.44). To take into account the Australian schooling context and the concern for social as well as academic outcomes, the original elements of authentic pedagogy were incorporated and expanded to twenty strategies under the four dimensions of the Productive Pedagogies' identified above. The link between Productive Pedagogies and constructivist principles are within each of the four dimensions. For example, the first dimension, 'intellectual quality' involves strategies of higher order thinking, deep knowledge, deep understanding, substantive conversation, problematic knowledge and metalanguage. This reinforces that 'intellectual quality' is indicated by a complex task where the constructivist principle of 'high cognitive load' is required.

Lastly, the Rich Tasks can be conceptualised as the constructivist principle of 'authentic tasks' as they are based on:

Dewey's concept of the 'enterprise' and the 'project' as unifying devices for the curriculum; Vygotsky's concept of the classroom as a 'zone of proximal development' for teaching and learning; Freire's concept of 'problem-posing' and 'problem-solving' education to teach students how to analyse and act upon their worlds; and Sizer's concept of 'demonstrations of mastery' as a way to focus pedagogy and accountability in school renewal. (Education Queensland 2000, p.51).

The focus on cognitive development through a constructivist paradigm is reiterated through these known theorists. Dewey's theory of learning is that optimal learning occurs when people are confronted with substantive, real problems to solve, which is also indicated in Freier's work that assumes that the most authentic and powerful pedagogy is one that focuses on immediate problems in the learners world (Department of Education, Queensland, 2001c, p.4). Sizer's belief that the demonstration and exhibition of intellectually rich activities provides focus for learning (p.5) adds to the authentic nature of the Rich Tasks. In summary, the Rich tasks are designed to require a high cognitive load and draw from transdisciplinary combinations of knowledge to confront the learner with substantive real life problems to solve where the teacher acts as mentor, scaffolding and enhancing the actual learning and development.

Thus it can be seen that the current reform within Education Queensland employs constructivist principles in the philosophy underlying the reform (QSRLS), its policy document (QSE 2010) and its vehicle for implementation (New Basics Project). The following section of this paper will explain the research context from which the data is drawn and relate that data to the constructivist principles identified above.

4. Research Context

The data discussed below is drawn from initial research that is being funded under an Australian Research Council Linkage grant concerned with sustainable models of teacher ICT professional development that empower 'multiliterate' classroom practices. The 'industry partner' in this research is

the Suncoast Cyberschools, a network of schools located on the Sunshine Coast to the north of Brisbane. They are first round trial schools for the New Basic Project and provide a significant contribution to research in that they are a cluster of schools that have an established learning community.

The project will involve in-depth research to develop a conceptual understanding of what is required of teachers and students by the concept of 'multiliteracies' and then design and implement effective and well-researched model/s of ICT professional development that will result in transformative 'multiliterate' classroom practices. In this first year of research, the project has sort to establish a baseline of current teacher ICT classroom practices and beliefs associated with professional development as well as the current conceptual understandings of multiliteracies. Initial data was obtained through interviews with computer coordinators and classroom teachers from seven of the ten schools. Further methodologies will be used to complete the baseline requirements.

The initial data obtained on current ICT practices and ICT professional development will be analysed in relation to the constructivist paradigm. The data obtained on the use of ICT in the classroom is important here as it reflects the educational beliefs that are held about ICT by the teachers which has implications for the professional development that would be sort. This paper is based on the premise that as the New Basic Project is grounded in constructivist principles then the professional development deemed effective by teachers involved with this project would employ constructivist pedagogical principles.

5. Interview Analysis

The interviews with Suncoast Cyberschools computer coordinators and classroom teachers took place during school time and ranged from half an hour to an hour duration. All of the participants received the interview schedule prior to the meeting so that critical thought would take place and a relaxed rapport could be established. The participants were chosen by their principals and were therefore recognised as effective practitioners within this frame. The initials used on the following transcript data have been anonymised.

As a part of the New Basics Project, each teacher is involved in the collaborative designing of a three-year curriculum plan. Teachers from each three year juncture, that is, years 1 to 3, years 4 to 6, and years 7 to 9 have meetings that involve 'backward mapping' the Rich Tasks in that juncture. The process of backward mapping ensures that the 'repertoires of practice', that is the cognitive, cultural, linguistic and social skills that need to be acquired developmentally in order to complete a Rich Task, as well as the 'operational fields', that is the New Basics, Key Learning Areas and other trans-disciplinary fields of knowledge that will have to be brought into play in order to complete the Rich Task, are catered for over the three year span. Consequently, the Rich Tasks play an important part in curriculum development. *The New Basics Technical Paper* (Education Queensland, 2000, p.55) states that a principle for the design of a Rich Task is that it is "sufficient in developmental, cognitive and intellectual depth and breadth to guide curriculum planning across a significant span of schooling". The following is an example of a Rich Task that is a part of the Year 1 -3 juncture: "Students will collect information about themselves, their school and their community. They will use this information to design web pages in

their websites and respond to questions electronically". The full format of this Rich Task can be viewed at <http://www.education.gov.au/corporate/newbasics/html/richtasks/year3/year3.html>

The professional development opportunities that teachers from a New Basic school receive in the initial phase of the Trial include a 3 day Rich Immersion Conference that introduces the New Basics Project as a whole and explains each of the three major features (New Basics, Productive Pedagogies and Rich Tasks), and a 3 day Productive Pedagogies Conference that focuses solely on the twenty strategies of the Productive Pedagogies. There is a suite of support material available for classroom teachers, principals and interested community members including three booklets designed by the New Basics Branch (Department of Education, Queensland, 2000a, 2000b, 2001c).

As the New Basic Project is steeped in a constructivist paradigm, the following analysis will employ the four principles of constructivist pedagogy identified above, namely demand for a 'high cognitive load', 'authentic tasks', 'autonomous learning' and a 'process emphasis' as analytic tools to explore what is deemed as effective ICT professional development within current school reform.

High Cognitive Load

A high cognitive load can be indicated by the presence of higher order thinking skills, such as synthesising, evaluating and problem solving within a complex activity. From a professional development standpoint, learning by drill or explicit instruction would constitute a low cognitive load where as learning by active exploration and experimentation would require a high cognitive load.

Following is an interchange between interviewer [I] and a teacher [NP] discussing professional development models that support teachers with implementing the Rich Tasks where NP has just explained that previous ICT professional development had been concerned with getting teachers to the minimum skill standards through looking at specific software and hardware types:

[I] Do you think that you will be running any workshops in regard to these new needs?

[NP] Definitely, it is at the request of the staff and it is a role that I am quite comfortable with.

[I] Do you see this role moving past this school? For all the Cyberschools?

[NP] I already operate outside the school in terms of being involved. We have a Cyberschools IT group, and have run a couple of sessions there.

[I] What did they involve?

[NP] We did a Powerpoint one last year. ...for the year 3 teachers, looking at webpages with Powerpoint.

[I] Have you mainly done skill based PD sessions?

[NP] At that level yes, at the school level. I also do 'have you seen this I will demonstrate that' and 'this is what you can do'.

[I] So come and discuss my planning?

[NP] Not planning normally, just what we can do with this piece of software. 'Have you seen this' kind of thing.

This interchange demonstrates the professional development in ICT as a skills acquisition approach. Here the teachers are requiring support to learn a new piece of software and the pedagogy delivered is explicit instruction. Later in the same interview the participant expanded on the reasons why this approach was adopted and the pedagogy required:

[NP] A lot of teachers still don't feel comfortable that they don't have the skills. They want someone there to hold their hand, show them, all those teaching and learning strategies that we use to get them going.

[I] And the best type of skilling professional development session would be?

[NP] Certainly hands on, with equipment and software that is generally available in schools. There is no use looking at software that is not available.

The Rich Tasks are seen as driving the professional development towards an acquisition of skills through expert instruction, synonymous with behaviourist learning theory (McInerney & McInerney, 1994, p.244). In the next example the interviewer was asking the participant if teachers were seeking professional development in how to integrate ICT into their units of work in the non-juncture years:

[MP] I think it depends on how the schools set out their pre Rich Tasks. In our school the Rich Tasks are narrow but not too narrow. I know of schools that have done that. They are doing the Story Rich Task so in grade 1 they have to do their fairytales in grade 2 they have to do a narrative and in grade 3 they do the Rich Task. Where as in our school we have said in grade 1 you could do nursery rhymes, fairytales, you could do a puppet play, sort of left a choice open. They will be, they are in the process of what we call backward mapping the Rich Tasks so even though you are aiming up here, it is sort of like a pyramid so there is a choice down here and that you are exposing them to that. Not necessarily that will be what they are doing up here. So if they are doing the craft one in art they still might be doing blowing bubbles weaving with paper but they are not actually doing a cultural craft. It could be just rolling paper and sticking it on M for Monkey. But it is written into that year 1 level that somewhere in there they will be doing some sort of paper

activity, paper folding or paper techniques

[I] So professional development in ICT do you think will be based on what you need to know in respect to the Rich Tasks?

[MP] To start with yes, only until the trial goes through and it becomes the curriculum. I think the more we do it and the more comfortable we become then we will start extending our experiences and the experiences of the children as we become more comfortable, so I guess in the beginning we will need professional development to do just those things that need to get us to the Rich Tasks. As we become more comfortable with that we will then start extending down the bottom and learning more ourselves and exposing the kids more and also as the kids are exposed to more themselves it stimulates us to expose them to more, to something different.

What seems to be the case here is that the backward mapping exercises are also influencing the integration of ICT in the non-juncture years, so if the children have to be able to do a webpage, an email, a Powerpoint in the year 3 Rich Task then these skills must be taught in the preceding years, which leads to an emphasis on a skilling approach. One reason for this skills training approach may be due to the context or stage in learning required by the teachers. Jonassen (1991, p.30) explains that constructivist learning environments are most appropriate at the advanced knowledge acquisition stage. He describes three stages as introductory, advanced and expert. At the introductory stage, initial schema is built about a skill or content area. The second stage, advanced knowledge acquisition, is where learners acquire advanced knowledge in order to solve complex, domain or context dependent problems. The final stage is expertise. Consequently, the teachers within this study may be at the introductory stage, requiring knowledge about a skill. At this introductory stage that learners are better supported by more objectivist approaches (Jonassen, 1991, p.31) and constructivist approaches would not be effective until the teachers have acquired more knowledge.

The teachers' demands for professional development are also reflected in their use of ICT in the classroom. In the following extract the interviewer was asking if skilling sessions that took place in the school computer laboratory were divorced from what later happened in the classroom:

[IM] I don't think they are divorced but I tend to think that we do offer an over emphasis on skills compared with the actual product and I feel that we need not to become overpowered by the need to make sure every kid is able to do every single thing because I have observed them and they teach each other so easily. It would be better if you have ten [computers] in a lab but it would also work well if you have six in a classroom. I do find that the kids don't have the problem that it is us that have the problem.

This example separates the tasks of learning how to 'use' a piece of software with the actual use of the software in some other learning context. The separating of these activities tends to decrease the cognitive load as the emphasis is on skilling through instruction instead of learning through exploration.

This separation may be due to the focus on the skills needed for the Rich Task ahead. However other examples of ways ICT are integrated into the curriculum were found to mirror or trial a Rich Task. For example this teacher explains a unit of work that integrated ICT effectively.

[MC] Well it was a trial for the New Basics. It was a travel Itinerary for year 6. Instead of students coming to Australia like in the Rich Task, we thought the students could organise a travel package for someone to go overseas. So they had to choose a country, and they had to come up with timetables for flights, hotels and costing and all that sort of business. It was bigger than Ben Hur. There were a few components to it. One of the components was an Excel spreadsheet so they could put on costs of flights, budgets and so on. Another one was that they had to do up a brochure, some maps and all sorts of things pulled out of the Internet.

[I] What's the point of the brochure?

[MC] At the end they had to do a presentation and they had to sell their package and the brochure was handed out and that sort of business. The Internet was brilliant. It was real life stuff. There were some sites used all the time and others were just stumbled across. Even finding out flights and looking at international time and money and conversions and all that sort of business, so much come out of that I mean.

[I] What came out? What were some of the outcomes?

[MC] Probably just awareness, cultural differences and children seem to be focused outside their community and understanding that. The year 4's concept of timing that somewhere else in the world is different in time even, little things came out. And just being familiar with the Internet and just having that experience with a real reason and their searches just became so much more

[I] Refined?

[MC] Refined, compared to get on and see and they started to realise

[I] They were searching not surfing

[MC] Yes exactly, little things that came out.

The participant here describes a task that required a high cognitive load. ICT was a tool to support thinking, and the process of learning how to use it was through exploration and experience itself. So does how a teacher uses ICT in the classroom have an impact on what type of ICT professional development they seek? Is the emphasis on achieving competency in the particular application for the Rich Task reducing ICT integration to skills training and therefore not consistent with constructivist

pedagogy? One of the key principles of progressive education has been that students should explore and construct knowledge, focusing on whole activities, projects and practices rather than discrete and isolated skills (Department of Education, Queensland, 2001a, p. 20). What can be seen here, in some current ICT classroom practices and professional development, is the decontextualising of activities into discrete and manageable skills.

Authentic Task

An authentic task can be indicated by its focus on the construction of knowledge, transdisciplinary inquiry, real world relevance and personal value. In a professional development sense, an authentic task may be the construction of a problem based unit of work that integrates ICT or a discussion involving critical analysis or the development of an ICT product that reflects on the process. In the following extract the interviewer asked the participant about any professional development that had an effect on how they teach in the classroom.

[MP] We have had the opportunity to go along in the afternoon to where classroom teachers have met at a central location. Teachers have been invited a long, just say you were showing Power Point and what you have done with your class. We all sit around, you explain what you have done, you might have examples of kids work, and ask questions, maybe 10 to 15 minutes and then we move to the next little table that has something. So it is a sharing time I suppose. They were classroom teachers and that was very interesting and helpful.

[I] What did you take away from that? How did that affect you in the classroom?

[MP] Lots of ideas and things like wow I have to learn Power Point. Oh I didn't know year 7s could buy shares by going through a particular program. Even though it was a year 7 thing that still interested me. Also seeing spreadsheets used in maths, just ideas.

[I] Did you go from saying that was a great idea to doing something about it?

[MP] Our local teacher here inserviced us on Power Point.

[I] Have you used it in your classroom?

[MP] Not yet. There are plans to this year.

This sharing session was an authentic activity for the participant as the ideas presented at the meeting had relevance, so much so that even though no use of the ideas had yet been applied, there were plans. Opening up avenues and stimulating ways to use ICT in the classroom is a valuable professional development activity. Following is a different type of professional development that has elements of an authentic task and reflects a personal understanding of how they learn:

[EE] I learn more professionally, when the principal comes into the room and comes up with a strategy and I think to myself I can do that so I get a lot out of being exposed to things. If you came into my room and said 'can I have a couple of your kids I want to try...'. I learn more that way than going and sitting in some fancy hotel and in a mass of people. And I think my children might as well so that is why I don't do a lot of chalk and talk to a whole group because I'd tune out. I learn by doing and I think they do too.

[I] Have you gone to any classrooms and watched others?

[EE] Yes when I was technology coordinator ... I went and visited other schools and high schools because they had labs and that and talked to other technology coordinators. I enjoyed seeing how they were doing it because the crux of it is how do you teach Johnny how to do something and can I do that as well.

[I] Is it the discussion that you have with other classroom teachers or watching?

[EE] Both. Like even learning support, like Key teachers, I often learn intervention methods and I learn more by seeing other Key teachers and watching them with learning support children and I come back with a billion ideas.

[I] So you come back and try these in the classroom

[EE] Yes and well I teach other teachers and show teachers at staff meetings and I find other teachers respond well to that.

This professional development activity has a number of stages. Firstly, the learner has a real need 'learning how to teach Johnny something'. This need is then met through observation and discussion with other teachers, followed by implementation of the new strategy or idea and finally reinforcement by teaching others. These examples illustrate elements of authentic tasks that are consistent with the constructivist principles. They all challenge existing cognitive structures and may lead to transformed practice.

Autonomous Learner

Autonomous learning can be indicated by the degree to which the learner manages their own learning (Perkins, 1991, p.19). Due to the high cognitive complexity of constructivist learning settings, the process of learning how to learn can be exacerbated. Therefore a further indication of autonomous learning is the role of the teacher as helper or guide, supporting the learner in their 'zone of proximal development'. From a professional development viewpoint, autonomous learning could be characterised by teaching oneself or learning how to learn, a mentoring relationship or even an online discussion list. In the following extract the interviewer asked the participant to talk about their experiences with ICT.

[EE] I have been a teacher for about 14 years and about 6 years ago I decided that I didn't know a lot about computers ... so I applied for a sponsorship for a Graduate Certificate in Computer Education externally and I did that for a year and I could have gone on to get a degree with another four subjects, but I chose not to. I just really wanted to know about teaching strategies, that has been on my big list. I can learn the computer myself, I can be given the equipment but teach me how to teach.

[I] So you could teach yourself the skills of how to use say Power Point but you wanted to know how to incorporate it effectively?

[EE] In small groups, or one on one. That was what I was looking for when I did it. I think I did learn those things because I do do a lot of small group work with the children.

Later in the interview, this participant expressed further value in autonomous learning style:

[EE] Yes that graduate certificate I did that was the best thing I did. The department flew me to Brisbane twice, can you believe it! But again being with all those teachers and you know that Connecting Teachers to the Future, that was on then and they did a lot of Internet stuff and I stayed on a [online] List and I learnt a lot. Getting on those Lists and getting ideas from others, I learnt a lot from that. I actually got off it but I should get on again, involved again. It is a pity they don't have a New Basics List. If someone was doing a Rich Task because I really have to get into that way of thinking and talking and instead of going to do my three days Productive Pedagogy conference or whatever and then I come back and need to live it more. That would be good to be on a Discussion List, helping with the language of the New Basics, and what people are thinking and doing.

It could be expected that this acknowledgment of the way one learns and the value placed on autonomous learning style would be reflected in EEs teaching practices in the classroom:

[EE] We obviously can't chalk and talk the whole time and expect them to learn the computer. We have to do peer tutoring. It would be good with an adult, one on one because that is what I find with the lack of computers, is the kids don't have the skills. I have learnt most of my computer skills sitting at home on my computer. Everyone leaves me alone while I am exploring, whether I am learning Publisher or Power Point, whatever it is. And I feel that is a different strategy and we have to adapt them to what we are trying to teach them.

[I] So knowing that you learn like that how can you incorporate that into the classroom?

[EE] Well small group work

[I] Pure exploration?

[EE] I am not going to sit on a computer, I wouldn't have time anyway, and continually guide, but it is like anything you teach, one might learn better sitting there exploring where as one might learn better with an activity. I have little work cards and like with the database I had them all set out and ... so it takes strategies as in grouping, peer modelling, small group, explicit teaching. Ideally it could be whole. I'd love a big screen with my computer up on there. We'd all love that. I'd love access to a computer lab where I could take the whole class and I could teach them how to use Publisher to make signs for instance but I haven't got that so I have to make the most of what I've got. I suppose what is available limits my strategies too.

There is an interesting twist at the end of this conversation. The participant obviously values an autonomous learning style for themselves and in certain instances for the children in the class, however, there is still a strong emphasis at the end of the discussion on the value of explicit instruction for skills transmission. One important element of autonomous learning is that it can be frustrating due to the complexity of the task or problem under examination. In a professional development situation, with limited time and in the context of rapid change within a new school reform, teachers may find a constructivist approach exasperating unless they are made aware that they are not only learning about the given task but they are learning a new theory of learning, one which they have to implement in the classroom. When asked what type of professional development teachers were seeking, on respondent replied:

[EP] They are looking for a myriad of things. They want to be able to enter internal monitoring, tracking of students on our network, how to work a spreadsheet for their own record keeping, they want to understand better ways of filing and organising the computer to make them more efficient workers. We still have some people here who are not reading their emails because they are afraid to log on. We are trying to get our Intranet up and running and there will be some who will hesitate with that for a while. They want to know more, like about Power Point with their kids and how to construct a website, the theory behind it. They have expressed the desire to know more but they are tired at the end of a very busy day. The desire covers like the use of the digital camera. That is being used more and more and integrating those photos with student work. Techniques, layout, design, connected to art, almost visual appreciation, critical literacy all that. Yesterday we were talking about sound track and we had the music teacher with us and budgeting and getting equipment to get children attuned to music so that by the time the children are in year 6 they can get a track to match a visual.

[I] So when they do their planning session, do they have 3 year planning sessions?

[EP] We have spent time as a juncture group 4, 5 and 6. We have had a whole day out recently backward mapping Rich Tasks. Then they take that away into their year levels,

they meet collaboratively in their year level, we use the New Basics planning structure, we have to plan a unit of work that might get this done [points to that year level section in backward mapping framework sheet]

[I] At that planning stage do the teachers need ICT professional development to enable them to integrate ICT effectively?

[EP] The first need is getting heads around content and being sure of that. Like what we are actually delivering in the classroom is required. I mean we are grappling with a new curriculum, so their first need is content and Productive Pedagogies, that they are using that. They might come back from camp and use a particular ICT skill to make a book based on the camp photos. So when they are about to do that they say I need someone to help me do this, I don't know how to do that.

[I] Do you think that the Rich Tasks have limited the use of ICT in the non-juncture year units of work?

[EP] I think it has expanded them at a greater rate than it would have if they weren't there. It has given a sense of urgency and a breath that wouldn't have been there else wise.

[I] Because in one you have to do a web page, another research on the Internet and email, but has it just limited ICT integration to those things in the Rich Task?

[EP] No I think that is covered by the ICT in other Rich Tasks. Each one of us has become so cognisant of the content of the Rich Tasks that we are able to memorise that. OK if our kids are going to publish that we have eight computers those kids are going to have to do that quickly so we have to be using our keyboarding techniques earlier.

[I] Is it driving it completely?

[EP] Is it driving it before? I can only compare that to before hand and the impetus wasn't great, it was happening slower like the typewriter that the kids use for keyboarding because we have a limited number of computers they are taking so long to tap out. That's causing us to think that we need more money spent on ICT instead of the children being faster and more efficient. So we are saying lets bring their keyboarding skills down to handwriting and asking for fluency on a keyboard. The need is more obvious now because you weren't being driven by an assessment item.

As expressed there is a whole range of professional development needs here that could be addressed through a constructivist approach. However, within this context, would the teachers see the value of the autonomous learning experience? Are the teachers receiving enough professional development in constructivist pedagogies to be able to integrate ICT after learning 'how to use' a piece of software

through a skills training approach? Another issue raised here and by a number of other participants is the possibility that the Rich Tasks themselves might be driving the way ICT is being used in the classroom.

Process

The process of learning can be indicated through the instructional process itself. How learners go about constructing knowledge is more important, from a constructivist perspective, than the product itself. Making thinking transparent, actively discussing thought processes, reflections and raising metacognitive awareness can be incorporated into any activity. In a professional development sense, writing individual professional development plans, reflection logs and even online discussions can clarify thinking and increase awareness of the learning process. Following is a response where the participant's emphasis is on the process as opposed to the product. The participant is talking about a unit of work that the children were involved in where they had to make decisions for themselves:

[IM] They had to do their presentation for the parents. They had to work out how they were going to do that. Were they going to do a Power Point display? Were they going to say a poem? They had to work that all out. The Power Point displays were bloody awful, that's probably because we haven't been in this game for a long time and the year 7s haven't done a lot of Power Point before and may have never seen some projected up. We never had a data projector so they had only seen them on a computer screen and when they went over to [school name] for the parent night and theirs was up on a big screen and no one could read their words, they think, well that didn't really work. So the big but was the independent learning came quite hard for some of them and they were the ones who really didn't manage. Quite probably they would have done better in the classroom but that's because we have only just got into the New Basics and Productive Pedagogies. There is quite a major problem about the kids being game enough to make a big decision by themselves, having a thought of your own and that you might be doing it wrong. I had terrible trouble getting them to choose their issue. It was a simple thing by looking at a huge list and looking at what is relevant to you in your small town but some kids found that very difficult. What I was saying before about perfection is that I'd rather see the kids get in there and had a go than believe we can get perfection. Who are we to tell them how to do it? We are not movie producers or graphic artist. We've got to stop telling them there are right ways of doing things and I wonder whether we have quite got that in the culture yet. That's one of the professional development problems. That people are hung up on the fact that the year 3 website might not be a good website. Well I don't think it really matters. I mean we'll do a crummy one this year and a better one next year and so on. I don't think we have to be perfect. I know that everyone not so much here at [school name] but at all the other schools, that year 3 web page had got everyone freaking. It is easier to do that than one of those old books. It gives the kids so much more variety, you are teaching them scanning, the digital camera, you're teaching them context for their stuff, sequencing and all in a little job that can be done in double quick time.

The process of learning is expressed here in retrospect to the children's performance in the unit of work

discussed. The development of independent autonomous learning can be supported by reflective practice on the process of learning. This emphasis on process is evident in the later section of this discussion, where the participant stresses the importance of having a go and learning from your mistakes over and over again. The emphasis then is not on the product, in this case, the best website or Power Point, but rather the process of learning where the students making choices and the teacher is directing not dictating. To include metacognitive strategies into a professional development experience may provide the impetus for use within the classroom.

6. Conclusion

ICT professional development within the context of school reform as implemented through the New Basics Project needs to be considered in terms of the needs and wants of the teachers within the setting, as well as the needs of the current reform agenda. What is apparent from the analysis of the teachers' interviews is the dissonance between the demand for skill based professional development driven from skill based curriculum goals for ICT, within a school reform based on a constructivist paradigm. As these needs are conflicting, which direction should professional development take? In attempting to establish the direction for professional development in ICT, two major issues have been raised. Firstly, would professional development focused on skills based training provide the impetus to support teachers use of ICT consistent with a constructivist pedagogy or would it lead to the use of ICT as a skill/drill approach in the classroom? Secondly, has the New Basics framework created an antithetical position in that the process of backward mapping from a Rich Task has limited the use of ICT to focus on the skills required to achieve the Rich Tasks, rather than instigating a constructivist learning environment that allows for the unlimited exploration of ICT? Both of these issues need to be discussed in order to ascertain further direction within this study.

To answer the first question in regard to the need for professional development in ICT one must look towards the required outcome of that professional learning experience. Within this context of school reform, one would assume that the learning outcome for the teacher would be to enable the use of ICT within a constructivist approach, that is, through active exploration within an authentic task that requires a high cognitive load and involves metacognition. However as can be seen from the interview data, currently teachers are seeking skill based training in the ICT applications present in the Rich Tasks, for example 'How to do a Web page or a Power Point' as well as the process of learning being focused on explicit instruction, indicated by one teacher's comment "they want someone to hold their hand, show them." Also some current classroom practices have been shown to emulate this 'training' approach where the need is to skill the child in the ICT applications needed for the impending Rich Task/assessment item. As noted earlier this demand for skill based professional development may be indicative of teachers being in Jonassen's 'introductory' stage of knowledge acquisition. If this were the case would such skill based professional development still enable the transition to a more constructivist approach to pedagogy in the classroom?

This question seems to suggest that a more constructivist professional development experience may be needed to enable a more constructivist approach to integrating ICT. Comments from the interviews

indicate interest in teacher sharing sessions, analysing units of work with protocols and observing other teachers' practice. However professional learning experiences that truly reflect constructivist paradigms involve the learner in managing their own learning in the process of autonomous learning. This process can be quite frustrating for the learner as they are being lead on a path that requires a high cognitive demand, being asked to discover a skill or concept by themselves instead of being told or stepped through the process. A constructivist approach however can involve not only conceptualisation or attainment in competency but an examination of the process of learning itself, the actualisation of constructivist pedagogy. Here may lie the power within this approach to professional development and could therefore provide the impetus for the implementation of similar learning experiences with ICT in the classroom. However it could be argued that the demands of the New Basics project itself leave teachers with insufficient time and energy to engage productively with constructivist professional development experiences. If teachers are unable to engage productively with constructivist professional development experiences then this raises questions about the effectiveness of the current professional development that teachers receive as part of the New Basic Project. It could be expected that if teachers were receiving professional development in 'Productive Pedagogies' and 'Rich Task' immersion then they will be confronted with a constructivist ideology and therefore be putting this philosophy into practice within their classroom. If this were the case then, skill training and raising competency levels might be an acceptable function of ICT professional development as application and integration into classroom practices would have been supported by the other professional development.

It would appear from the analysis section, that the professional development activity of backward mapping from a Rich Task to develop a three year curriculum plan may be limiting the use of ICT to those applications existing within the Rich Tasks as well as directing the form and function of ICT professional development. Comments from the interviews suggest that this apparent limiting capacity could be seen in a positive sense in that there are a certain number of ICT applications to become familiar with and that professional development "to do just those things that need to get us to the Rich Tasks" are necessary. Another positive viewpoint expressed is that the ICT applications within the Rich Tasks have in fact expanded the variety of ways ICT is currently being integrated into classroom practices Despite these positive approaches, to understand ICT professional development as a narrow set of skill requirements to complete a designated Rich Task cannot but contribute to limiting the way ICT is being used in the classroom.

This paper has considered the way ICT professional development is being understood by the teachers within a school based reform. One obvious finding is that the very nature of the reform does not ensure that professional learning experiences will reflect the same ideology. It can be established that there is a link between what is happening in the classroom and the professional development in ICT that is requested. This may not be the type of professional development that would have transforming capabilities. This paper does suggest that a more constructivist approach to ICT professional development may be most effective in supporting change in classroom practice.

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