What are the Learning Outcomes When Young Children Create and Use Their Own ICT Resources?

Liz Fitzsimons

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Abstract

Some researchers argue that the use of drills and skills software does little more than replace traditional forms of education with new technology. These researchers believe that technology can be used in ways to develop creativity and higher thinking skills through the use of open ended type software.

This research aims to find out how meaningful learning occurs when young children create and use their own resources. A case study was carried out in a New Entrant Year 1 class in which the children created five resources using a variety of software to support literacy learning. The resources were used in the classroom literacy programme and also shared with parents. Parents were surveyed as to the use of the resources in developing the home-school partnership and the value of the resources in enabling parents/caregivers to support their child at home.

The research found evidence of meaningful learning occurring as children worked to create the resources. Continuity of learning was evident in using the resources at school and at home. Parents found the resources strengthened home-school communication and enabled them to support their children at home with their learning.
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Background

I am a primary trained teacher, and have taught New Entrant / Year One children for the last sixteen years. I have been a teacher at Port Ahuriri School in Napier for the last eleven years.

When the Tamatech ICT PD cluster was initiated in 1999, I was selected to be one of the lead teachers for my school. I had already developed an interest in using Information Communication Technologies (ICTs). Being a lead teacher this gave me the opportunity to have professional development not only in the development of ICT skills, but primarily in the pedagogy of ICT and learning.

During my time in the Tamatech cluster I began to investigate ways in which ICT could be used with young children to support learning. At the same time our school was investigating using an Integrated Curriculum approach as a means of managing curriculum overload. When planning an Integrated Curriculum unit we looked at ways in which ICT supported the learning.

ICT was not regarded as an end in itself, or a set of skills to be learnt but as a means of supporting and enriching learning for children. The children learnt ICT skills as they were using the technology to construct meaning.

Port Ahuriri School has an ICT suite of seventeen computers. A librarian/technician manages our library information centre. Eight classes share the facility. We use the suite for class lessons and activities. Each classroom has at least one PC. Children in my class use the classroom computer for working on current projects which may involve using the internet, using resources they have created and some commercial software.

Over the years children in my classes have used ICTs to construct a number of resources. By resources I am referring to a variety of ICT creations which have been produced to support learning in literacy, numeracy and the integrated curriculum. Hyperstudio, PowerPoint, Photo Story 3. Movie Maker2, Paint, Word, and digital cameras are some of the software and ICT tools used. These resources are often made as a class but there are opportunities for individuals or groups to make their own.

My Interest

My interest in my research focus developed during 2005 when I saw there was a need for many children in the class to develop early literacy skills such as knowledge of letters and sounds, blends and word chunks etc. I planned that we would make some resources using ICTs to help children with this learning. While there are many commercial resources available I thought that if the children created their own resources, it would be more meaningful to them. The children would be involved in learning from the planning through to the creating using ICT tools and in using the
finished product. The product could be used to revisit learning and for further learning opportunities.

My class created a variety of resources, related to literacy, numeracy and the integrated curriculum. The resources were made available at home by burning a CD for each child. Over the past years I have burned CDs at the end of the year for children to take home to share with their parents. While I know that this has been well received I began to think I was not using the opportunity of sharing to its full potential. The CD was more like a memento of the year’s activities and work rather than a useful tool.

Last year I decided to add each new resource to the CD as soon as it was completed, which gave parents a far better picture of their children’s learning activities, and also provided support for parents to work with their children in specific areas. The CD also presented opportunities for discussion about topics of interest the children had been studying. A variety of resources were created and added to the CD such as a digital book about spiders and a favourite story with audio recordings both in Japanese and English for a Japanese child who had very limited English.

The children were highly motivated in using these resources because they were the producers. I received positive feedback from parents. This led me down the path of further exploring the home-school partnership and providing different opportunities for parents to support their children at home.

Core Interest

I want to find out if meaningful learning occurs when children use ICTs to create their own resources? How does the learning manifest itself? What are the benefits of using these resources and sharing them in the classroom and at home? By meaningful learning I am referring to learning in which the learner is actively engaged in constructing meaning through an authentic learning task. The literature review will explore theories of meaningful learning to gain a deeper understanding. I implemented a case study research to explore these questions. See Glossary for definition of meaningful learning.

Rationale

In my literature review I will discuss research which describes ways in which ICTs can enhance learning and conversely ways in which ICTs provide little more than drills and skills or opportunities for entertainment. If learning is enhanced when children create their own resources then I would expect evidence of meaningful learning to be found.
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Context

I chose a literacy context for my research for the following reasons:

• As with the Ministry of Education emphases and from my own experience I know that teachers consider literacy and numeracy to be key curriculum areas for New Entrant / Year 1 children.

• Parents have expectations of helping their children at home with reading homework.

Research Question

What are the learning outcomes when young children create and use their own ICT resources?

I investigated this research question through 2 sub questions. Further questions under each sub question will guide me to answering the research question and its sub questions.

1. How does meaningful learning occur when children use ICTs to create resources to support their learning?

• What is the nature of the engagement when children make their own resources?

• How do children show evidence of new learning?

• How do children articulate what it is that they are learning?

• How do children show that the learning is authentic?

• What cooperative behaviour do the children display?

• What are the learning outcomes when children use the resources they have created?

• Does further usage of the resources lead to a continuation of meaningful learning?

• How do children show that ownership is important?

• Who is the audience when children make their own resources?

• How does sharing the resources strengthen school-home communication?

• How do the resources enable parents/caregivers to support their child?
A Review of the Literature

Introduction

My research investigates if and how meaningful learning occurs when young children use Information Communication Technologies (ICTs) to create and use their own resources. It also looks at whether there are benefits for sharing these resources with the home-school community. This review will present some of the key educational theories underpinning meaningful learning and how this relates to the use of technology. It will look at the use of ICTs in supporting learning for young children. As my research involves working with New Entrant-Year 1 children, I will look at the literature on early childhood and other pertinent literature. Lastly it will examine home-school communication in relation to technology.

Meaningful Learning

When researching information on meaningful learning one of the key theories is the constructivist theory. Jerome Bruner, (as cited in Jonassen, Peck, & Wilson, 1999) called the process of experiencing phenomena, relating it to prior experiences and then interpreting, reflecting and reasoning about it as “meaning making.” Meaning making is at the core of the philosophy of constructivism. Proponents of the constructivist theory believe that knowledge is not transmitted but constructed.

Jonassen et al. (1999) believe, “that teaching is a process of helping learners to construct their own meaning from the experiences they have by providing those experiences and guiding the meaning-making process.”(p.3)

Jonassen et al. (1999) outline five attributes of constructivism which are interrelated, interactive and interdependent. They believe if technologies are used in such a way that these attributes occur then they are promoting meaningful learning.

1. **Active**: “Real learning” takes place when children are engaged by a meaningful task. They interact with objects and the environment and then observe the results of their interactions.

2. **Constructive**: The active and the constructive are interdependent. The learner has begun from an existing experience or belief and the new experience has caused some variance in understanding. For meaningful learning to occur the learner needs to reflect on the observations and make a shift in thinking.

3. **Intentional**: As humans we are goal oriented. When learners can verbalise a learning intention and actively seek to achieve it, they make meaning because they are fulfilling a goal.

4. **Authentic**: Learning is meaningful when children are engaged in real life situations. When problems are presented in a meaningful context, learning is more likely to transfer to other situations. Learning should engage children in higher order thinking.
5. **Cooperative:** We live, work and learn in communities. In the real world we naturally find others to help us solve problems. Meaningful learning requires working together and having conversations to solve problems.

In another article, Jonassen, Carr, & Yueh (1998) discuss the role of technology in meaningful learning. They say that traditionally, technologies have been regarded as a means of instruction, similar to the traditional role of the teacher. Computer applications have been conveyers of information. Interaction was often limited to pressing a key to continue receiving information or to give a response to a question. The computer usually provides feedback regarding the learner’s response in respect to “correctness” of the answer. As a teacher of five and six year olds I have seen commercial software to develop early literacy skills such as alphabet knowledge that does exactly this. The child soon realizes that if enough keys are pressed, eventually the right answer will be achieved and he will be rewarded by a happy animation. By contrast Jonassen et al. (1998) state that;

> Technologies should not support learning by attempting to instruct the learners, but rather should be used as knowledge construction tools that students learn with, not from. In this way, learners function as designers, and the computers function as Mindtools for interpreting and organizing their personal knowledge. (p.24)

Papert (as cited in Cook, 2003) also sees the benefits of using computers with young children; but as with Jonassen et al. (1998) does not want them to replace traditional forms of education. “The computer opens opportunities for new forms of learning that are far more consistent with the nature of the child. How absurd then to use it impose old forms.” In his article about games, children and learning, Papert (1998) challenges educators to use computers to provide authentic learning opportunities for children, rather than to employ them to be deliverers of fragmented pieces of information such as maths tables in the disguise of a game. In similar thinking to Jonassen et al. (1998) Papert sees children as designers.

Papert & Harel (1991) advocate constructionism as opposed to constructivism. The two theories have many similarities in that the learner is constructing his own knowledge. However, the difference with the constructionist approach is that the learner is “consciously engaged in constructing a public entity, whether it’s a sandcastle on the beach or a theory of the universe.” While these examples do not necessarily employ computers they say that constructionism is about learning and computers offer a varied range of excellent contexts for constructionist learning.

Another theory which is very consistent with the constructivist theory and has the components necessary for meaningful learning as outlined by Jonassen et al. (1999) is the engagement theory. Kearsley & Shneiderman (1998), define the engagement theory:

> By engaged learning, we mean that all student activities involve active cognitive processes such as creating, problem-solving, reasoning, decision-making and evaluation. In addition, students are intrinsically motivated to learn due to the meaningful nature of the learning environment and activities. (p.20)
Kearsley and Shneiderman developed this theory of learning while working in
distance and electronic environments as a conceptual framework for learning and
teaching with technologies. There are three main components to the engagement
theory and these are described by: Relate-Create-Donate.

The first component, ‘Relate,’ reinforces the collaborative approach to learning.
Kearsley & Shneiderman (1998) say that “Research on collaborative learning suggests
that in the process of collaboration, students are forced to clarify and verbalize their
problems, thereby facilitating solutions.” (p.20)

‘Create’ implies that the learning activity is project based and looks at learning being
a creative and purposeful activity. Students have a sense of ownership or control over
their learning because they have to “define the nature of the project.”

‘Donate’ implies that the activity will have an authentic focus, it will be useful. While
Kearsley and Shneiderman were considering older students when they developed this
theory I feel that the underlying concepts are just as relevant to young children.

Educators of young children would be wise to consider Vygotsky’s theory of the Zone
of Proximal Development and it’s implications for teaching and learning. Vygotsky’s
theory (ZPD), relates to the difference between the child’s existing abilities; what the
child already knows, and what he/she can learn with the help from an adult or peer
when engaged in social behaviour. In essence this takes the child beyond his present
capabilities and through guidance or scaffolding moves the child to a different but
achievable level of understanding.

Yet another leading researcher in early childhood and technology, Siraj-Blatchford
(1993) believes that the constructivist and the Vygotskian theories together can form a
pedagogic model which can be applied throughout Design and Technology education.
Ausbel (as cited in Siraj-Blatchford (1993), reminds us of the importance of prior
knowledge and teaching to the needs of the individual. “The most important single
factor in influencing learning is what the learner already knows.” As a New Entrant
teacher I am aware that children enter school with a range of backgrounds and prior
knowledge and need a learning programme planned to move them on from that point.
The School Entry Assessment (SEA) is a valuable tool in this programme planning
process as are the learning stories from the child’s early childhood centre.

These theories have a common thread. They all support meaningful learning. The
learner is actively making meaning rather than the teacher looking upon the learner as
an empty vessel that needs to be filled. I will use the attributes of the constructivist
theory as the framework for finding evidence of meaningful learning occurring in my
research.

How can ICT Support Learning for Young Children?

Some people may ask why we should bother using technology to enhance learning
with young children. Bolstad (2004), in her review of New Zealand and international
literature on the role and potential of ICT in early childhood found there were three
main reasons:
1. ICT already affects the people and environments that surround young children’s learning. It is part of children’s physical and social worlds.

2. ICT offers new opportunities to strengthen many aspects of early childhood education practice.

3. There is support for the development and integration of ICT into educational policy, curriculum, and practice across the whole education sector. (p.3)

The New Zealand Curriculum Draft for consultation 2006 (Ministry of Education, 2006 b) states “Information and communication technology (ICT) has transformed the world in which young people live, and e-learning (that is, learning supported by or facilitated by ICT) has similar potential to transform classrooms.” (p.25)

However there are some opponents to using ICTs to support young children’s learning. Vail (2001), associate editor of Electronic School, reports in her article, “How Young is Too Young?” on a group of teachers, researchers and early childhood educators who joined together to form an Alliance for Childhood. These people believe that there is a risk that computers will result in a number of negative effects to child development including social isolation, lack of imagination, repetitive stress injuries, poor concentration and poor language and literacy skills. In her report on New Zealand and international literature, Bolstad (2004) says that there is no clear evidence to support such claims and that, “....when used appropriately, ICT can be a useful tool for supporting children’s learning and development.”

One of the main concerns of the Alliance is the potential risks to children’s ability to imagine. Almon, (as cited in Vail, 2001), states, “Images on the computer are so powerful that children feel unable to bring their own images out.” (p.4) Almon has a point here if children are going to be constantly subjected to; “Helpful rabbits and singing hamsters. Dancing crayons and counting cats.” (p.4) However if we agree with the theorists who advocate ‘meaningful learning,’ as outlined previously, children will be creating their own images. There is a range of software applications which allow children to create their own images and I have seen them used successfully with young children. Liang & Johnson (as cited in Van Scoter & Boss, 2002) state;

Young children are increasingly using authoring programs, such as KidPix or Hyperstudio, to tell stories in pictures and words. Such programs allow children to enhance their projects and writing with graphic images, sound, speech, motion, color, and scanned images that engage the senses and enhance the learning experience. (p.13)

Van Scoter & Boss (2002), also support this notion and describe the learning opportunities that technologies provide;

When used wisely, computers and other technologies give children opportunities to collaborate and socialize, to use language in meaningful ways, to engage their senses in play and discovery, and to connect with the wider world beyond the classroom. (p.30)

With similar concerns to that of the Alliance for Childhood, there is a growing concern amongst some people that there is a development of “edutainment” software
which is technology that is entertaining while at the same time supposedly educational. These programmes combine text, bright visual images, animations and sound and are very appealing. Bloom & Hanych (as cited in Okan, 2003) argue this leads many people to make the mistake of equating learning with fun. By equating learning with fun we are giving the message that if students are not enjoying themselves then they are not learning. McKenzie (2003), in his article “Beyond Edutainment and Technotainment,” challenges schools to make thoughtful choices with technology.

We must make wise choices that focus on student outcomes worth achieving, upon value added rather than glitz, glimmer and gimmicks. We are moving past edutainment and technotainment to a new form of literacy combining the best of the old with the best of the new. (p.28)

I agree with McKenzie that we must be making wise choices. However, if the attributes of the constructivist theory as outlined by Jonassen et al. (1999) are present, the technology is likely to be used appropriately. When children use technology to construct their own ideas by combining text, bright visual images, animations and sound they can be involved in meaningful learning that can also be enjoyable and fun. According to Jonassen et al. (1999)

… students cannot learn from technologies. Rather, students learn from thinking-thinking about what they are doing or what they did, thinking about what they believe, thinking about what others have done and believe, thinking about the learning processes they use-just thinking. Thinking mediates learning. Learning results from thinking. (p.2)

I believe teachers first need to consider why they are using technology. Questions to consider include what thinking is being promoted, and how is that thinking going to be facilitated. This influences the choice of the learning task. If these questions are reflected upon, teachers of young children are more likely to employ technologies to support meaningful learning. Siraj-Blatchford & Siraj-Blatchford (2001) give guidance for early childhood practitioners in regard to using appropriate technology in education and state;

The use of ICT in the early years has the potential to enhance educational opportunities for young children. Appropriate ICT can encourage a great deal of purposeful and exploratory play. Among other things it can encourage discussion, creativity, problem solving, risk-taking and flexible thinking. (p.4)

My interest is to see children using ICT to create resources to support learning. This research focuses on children using ICT to develop resources to support literacy learning. Siraj-Blatchford & Siraj-Blatchford (2001) state; “Primary schools are increasingly opting for computer suites; this discourages the integration of ICT with the rest of the curriculum for the children. Children need to see ICT used in a meaningful context and for real purposes.”(p.6) While computer suites may not be ideal, I feel that this statement is a little unfair to schools. Many primary schools have budget constraints and while computer suites may not be desirable, it is for some schools a way of providing an equitable opportunity for all classes to use the technology.
We have a suite of 17 computers at our school and each classroom has one or two computers. When considering the environment in which this learning takes place, I believe there is still a place for ICT suites, born out by my observations during my research, where a number of children can have access to computers at the same time. This provides opportunities for developing skills, within a meaningful context. The fact that a class may need to move to a suite to construct a product should not discourage the integration.

There appears to be a scarcity of literature on young children using ICTs to create their own resources. In their article, Lankshear & Knobel (2003) review the research from North America, Britain, and Australasia, specifically with the 0-8 year’s age group in regards to literacy and technology. The research confirmed that the early childhood group was the most under-researched. However, in Bolstad’s key findings from her review of New Zealand and international literature, Bolstad (2004) states that studies show that, “ICT provides a variety of ways for children to weave together words, pictures and sounds, thereby providing a range of ways for children to communicate their ideas, thoughts, and feelings.”(p.viii)

Home-School Partnership

I wish to investigate if children’s sharing the resources that they have created with their parents strengthens home-school communication, and whether parents feel that this provides opportunities for supporting their child in learning. Siraj-Blatchford, et al 2001 (as cited in Siraj-Blatchford & Siraj-Blatchford, 2001), when talking about the educational involvement of parents state;

Research also suggests that home-school communication leads to better understanding and more positive attitudes by teachers and parents about each other’s roles. Many studies have shown that when parents, teachers and children collaborate towards the same goals it leads to improved academic performance of children. (p.8)

(Siraj-Blatchford & Siraj-Blatchford, 2001) consider Epstein’s large-scale, longitudinal studies conducted in the United States. From this, five main types of home-school improvement were identified. I believe numbers 2 and 4 could be improved through the sharing of resources created by children.

1. Parenting skills, child development, and home environment for learning.
2. Communications from school to home.
3. Parents as volunteers in school.
4. Involvement in learning activities at home.
5. Decision making, leadership, and governance.

Siraj-Blatchford (2002) states, “Communication between professional educators and parents is crucial in the early years and Information and Communications Technologies (ICTs) have a great deal to offer in supporting it.” The potential of
technology to strengthen home-school communication is recognised in the e-learning action plan for schools, “Enabling the 21st Century Learner” (Ministry of Education 2006 a) when it states, “Schools can also use ICT to strengthen communication with families and whanau….” (p.16)

Kervin (2005) investigates whether technology can support home-school communication. She looks at the expectations of home and school and explores the possibilities for home-school communication. One of the important issues that she brings up is the possibility of inequality in access to the technology. Alternative ways of sharing need to be investigated. These may include; parents having access to a computer through the extended family, providing hard copies of work, or presenting material using a variety of software. Van Scotter & Boss (2002) also see technology as a means of fostering communication with families and the wider world and conclude their guide by saying:

> When it is used appropriately, with thoughtful planning and clear goals in mind, technology can be a powerful tool to motivate and stimulate creativity and learning, and foster connections with families, the community, and the broader world. (p.51)

Through my literature research I have found significant and confirming evidence that ICT can support meaningful learning for young children. Despite the fact that some people have suggested to the contrary, I believe that through careful planning teachers can manage the negative aspects and provide meaningful learning opportunities.

### Methodology

#### Overarching Methodology

The present study is a qualitative research project. I used a case study approach and took the role of a participant researcher. While the obvious limitation of the study is its small size, I chose this form of research because it gave me the opportunity of looking closely and in depth at aspects of meaningful learning as they occurred when children constructed resources using ICTs. Bell (1999) explains this by saying, “The great strength of the case study method is that it allows the researcher to concentrate on a specific instance or situation and to identify, the various interactive processes at work.” (p.10). I worked with the whole class but my case study group comprised of six children. I focused my data collection on this small group within the context of the whole class. By presenting a narrative account of what happened over the time I was working with these children I will provide detailed information which other teachers can relate to and use in their own classroom practice.

#### Method

I worked with a New Entrant / Year 1 class and their teacher at Port Ahuriri School. Port Ahuriri is a decile 7 school and draws from a diverse population. Considerations that were addressed were the needs of the children, the classroom and school wide timetable, and access to equipment such as the digital cameras and the availability of
the library and computer suite. As stated in the introduction I chose a literacy context for this research. The literacy needs of the children were considered as I worked closely with the teacher to plan units of work.

I carried out an initial pilot study in the first term of 2006. The Pilot Study made me aware of limitations regarding my data collection. As this was a New Entrant class the number of children increased during Term One. At the commencement of my case study in Term Two 2006 there were 27 children in the class and more children visiting. This was a large group of very young children to work with when trying to obtain specific data. While gaining an overall picture of what was happening I would not be able to collect sufficient specific data. If I was to continue to work with the whole class for the case study, I needed to focus my data collection on a smaller group. Hence, a group of six children were selected as my case study group. By examining the learning journeys of the six children during my case study, I have been able to provide a snapshot of the class’s journey also. I have also included data from other class members where available and where appropriate.

Four weeks through Term Two the class was divided and another New Entrant class started. 17 children remained in the original class and I continued to work with them.

I worked with the children in all aspects of creating the resources from the introduction to the planning and the construction. The initial work was classroom based. The children worked in the ICT suite to complete the main body of the work for the resources. However there were times when children continued their work on the classroom computer. During the case study the children created five resources which were shared with their families, friends and the school wide community.

Participants

This research was carried out at Port Ahuriri School where I had been a teacher for a number of years. I had developed relationships with the teachers and staff, parents and wider community of the school. I had worked closely with the teacher in whose class I carried out the research as for many years we have run adjoining parallel New Entrant / Year 1 classes. As stated in the Method the class grew during the first term until it was necessary to begin a new class four weeks after term two began. The youngest children moved to form a new class and the older children remained in the original class. These children would all have had at least one term at school and some had started the previous year. The case study group was chosen from this group and comprised four girls and two boys. These children were chosen by the class teacher as being representative of the class. Of the six children, one child did not have a computer at home. Children were chosen who had a good attendance at school.

Ethical Considerations

My research met CORE Education Ltd ethical guidelines. Consent was gained from the school principal and the teacher with whom I was working. Although my case study focused on six children, I gained parental consent for all the children in the class. This enabled me to use data collected from other class members to give a fuller
picture of the project. I was also able to include all parents in the two surveys. As new children entered the class their parents were informed of the project and consent was gained. I kept parents informed of the project through letters and the actual work of the children. The class teacher was fully informed and involved in each step of the study and was aware of any communication between myself and the parents. Examples of the consent forms are included in the appendices. I chose to work with the whole class for the following reasons:

- I wanted all the children in the class to have the opportunity of making the resources.
- The constructing of the resources became an integral part of the literacy programme and involved a lot of collaborative class work such as brainstorming descriptive language and working on story sequencing.
- By working with the whole class I felt that I could present a more realistic account to other teachers.

All participants in this research have been given pseudonyms to retain anonymity.

Sources of Data

During my research I gathered data from a number of sources.

- I video recorded the children working in the computer suite when they were creating the first three resources. The length of the recording varied depending on the time required to do the work. Ten lessons were videoed in the suite. Other video footage was filmed outside when the children were using digital cameras and in the classroom when they were recording their oral stories.
- The classroom teacher recorded observations during the pilot study and of the case study children. Where possible she recorded what the children said. She recorded her own reflections after the first four resources had been completed.
- The classroom teacher was interviewed at the end of the case study.
- My own reflections were recorded after each lesson.
- The case study children were interviewed informally on three occasions during the case study.
- A number of photographs were taken whilst the children were working.
- All parents of the class were surveyed by way of a questionnaire at the end of the pilot study and the case study. These surveys contained questions relating to whether they felt the resources strengthened home-school communication and also whether parents felt resources such as the ones created could support them with helping their children at home with learning. See Appendices D & E.
• Parents of four of the case study children were interviewed informally after they had viewed and had the opportunity to use the CD for some weeks.

• One of the critical pieces of data was the actual work accomplished by the children. This was recorded on CD Rom at the end of the pilot study and the case study and was the means by which the resources were shared with parents and whanau. See Appendices H & I for examples of work.

Analysis

Through my review of the literature in which I investigated different theories of meaningful learning, I have used the five attributes of the constructivist theory outlined by Jonassen et al. (1999) to provide an analytical framework to find evidence of meaningful learning. From my readings I developed a set of indicators for each of the attributes. The indicators were used for the pilot study and subsequently refined. A new indicator for the active attribute, ‘high concentration’ was used after observing the children working with the cameras. The refined indicators can be found at the beginning of the Findings section of the case study. By examining the data collected from the various sources I looked for evidence of these indicators occurring. If there was conflicting evidence, it has been noted.

Different data sources have been used to look for indicators of different attributes. For example the active attribute can be seen when the learner is engaged in a meaningful task. The learner interacts with objects and the environment and then observes the results of their interactions. The video footage and the teacher observations were the main data sources for collecting information regarding this attribute.

I also wanted to know if sharing the resources strengthened home-school communication and whether the resources enabled parents to support their child in learning. Because all the children in the class were involved in making and sharing the resources with their parents, I have surveyed all the parents rather than just the case study children. By doing this I have a larger pool of information to draw on and therefore have increased the validity of the information gained from the analysis.

While there is some quantitative data drawn from the parent’s surveys much of the evidence is qualitative and has been analysed thematically.

Findings

Pilot Study

In Term One I carried out a Pilot study. This gave me an opportunity to get to know the children as many of them were new to school. It also gave me an opportunity to assess the difficulties that might arise in the case study such as access to equipment and data collection.

The class comprised of 24 New Entrant Year 1 children. I met with the classroom teacher to discuss her programme for the term and we planned a unit of work in which
the children and teachers would use ICTs to create a resource to support learning. As the curriculum context for this research is literacy we were looking at ways in which the class could collaboratively produce a resource which would give them opportunities for oral and written language. The use of the resulting resource would provide further literacy opportunities and would be shared with parents.

As many of these children were emergent readers, the class teacher wanted to give them opportunities for relating letters and sounds in an authentic context. The unit study was “Me and My Family,” and we decided that the children would make a resource about their first days at school. Children would choose significant people places and objects around the school related to the letters of the alphabet and present these in the form of a digital story. The digital story would be a made up of a number of photos combined with text and audio clips. Photo Story 3 software would be used to present the story.

This was an authentic learning situation. The children would construct a product presenting their knowledge and understandings to a real audience, -their parents and whanau. The activity was complex. Children needed to learn new skills such as use of the cameras, and audio recording, in order to produce the product. The context was meaningful. The children were going to tell about themselves and their school day.

We began by posing a problem to the children. We talked to the children about the fact that many of their parents worked and were not able to see them at school. We asked for ideas about ways in which we could share what happened at school with parents. The children suggested writing, drawing, telling and taking photos. The children were excited about the activity. The children were going to construct a resource about something that was part of their daily lives.

The children already had recent experience with the cameras during a morning when they had been working on a range of activities, including painting, drawing, writing and constructing. I introduced the cameras and talked about how they were another way of recording. We had looked at the correct handling and using of the cameras and the children had taken turns photographing each other working on the activities. The children enjoyed using the cameras and so it was not surprising that they were keen to use the cameras to make the resource.

As a class group the children discussed the alphabet letter names and sounds and related them to significant objects, people and places at school. Sometimes two or three photos were required for each letter.

We had access to three cameras for the actual photo shoot day. Hence, the children were divided into three groups, each group having an assisting adult. Each group had a number of locations around the school to take their set of photos. The photos were printed in black and white with each child having at least two photos to talk about. The children worked in pairs to practice telling their stories. While the classroom teacher had reported that the children were confident sharing their own experiences in daily news groups, this was a more structured activity and needed some practice. The activity was followed by written language where the children took the photos to their table and wrote the story they had practiced with their partner. The classroom teacher and I worked with individual children; further discussing the pictures and helping them to them construct their captions for oral recording.
I assembled a short Photo Story book consisting of six photos and asked a group of children to record their stories to go with their photos. This was a trial run to show the class what we were going to make. It was interesting to see the range of oral language ability within the six children. One child had difficulty pronouncing “tr” while another child was very confident and used a more complex sentence structure than the other children. It occurred to me that Photo Story 3 software would be excellent to use as an assessment tool for oral language. It is easy to use and the children enjoyed the activity and were quite confident. I think the fact that they had a photo of themselves actually doing something to focus on helped them not to feel self conscious.

I collated all the photos into a digital story book using Photo Story 3. The children practised reading their written captions to each other and the group. They then recorded an audio clip of their captions. Sometimes this required two or three attempts as this was a new activity for most of the children. They were fascinated by hearing their own voices.

The Photo Story book was burnt onto CD. I added the free software Media Player 10 which is necessary to view Photo Story 3. The book was also made into a PowerPoint presentation. The book could then be printed in hard copy for those children who didn’t have access to a computer, and it could be made available in the school and class libraries. It also provided an option for parents with older computers who may not be able to install Media Player 10 but probably could play a PowerPoint presentation. All children took home either the CD in a colourful case with an attractive cover, or a hard copy. A letter with instructions for downloading and using Media Player 10 to open the Photo Story 3 was sent home. A parent questionnaire was sent home at the same time.

**Data Collection for Pilot Study**

The resource made during the pilot study was mainly classroom based with some time spent in the playground taking photos. The data collection was not as structured as in the subsequent case study. Data was collected through video footage, informal interviews with the children, parent surveys and the students’ actual work. The class teacher recorded observations in a narrative form either during or immediately after the lesson. I recorded my reflections after each lesson.

This provided me with an opportunity of trialling a number of data collection techniques, learning some of the pitfalls and refining my data collecting methods for the case study. During this pilot I discovered that my observation sheet for the class teacher was not user friendly and some of the indicators were difficult to observe. I refined my observation sheet and indicators for the case study.

**Summary of Pilot Study Findings**

From my readings I developed a set of indicators for each of the five attributes of the constructivist theory believed by Jonassen et al. (1999) to be present in meaningful learning.
These indicators were used for the teacher observations sheet and as I analysed other data sources to guide me in answering my research questions:

1. **How does meaningful learning occur when children use ICTs to create resources to support their learning?**

Table 1: Indicators for Attributes of Constructivist Theory

<table>
<thead>
<tr>
<th>Five attributes: Pilot Study</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active attribute:</td>
<td>Children talking to each other about activity using affirming statements.</td>
</tr>
<tr>
<td></td>
<td>• <em>Children talking to each other using affirming statements.</em></td>
</tr>
<tr>
<td></td>
<td>• <em>Hastened excited speech patterns.</em></td>
</tr>
<tr>
<td></td>
<td>• <em>Animated happy faces, laughing</em></td>
</tr>
<tr>
<td>Constructive attribute:</td>
<td>Children using prior experience to assist with the new learning experience.</td>
</tr>
<tr>
<td></td>
<td>• <em>Referring to and sharing past experiences.</em></td>
</tr>
<tr>
<td></td>
<td>• <em>Showing or modelling from past experiences.</em></td>
</tr>
<tr>
<td></td>
<td>• <em>Questioning or observing new understanding</em></td>
</tr>
<tr>
<td>Cooperative attribute:</td>
<td>• <em>Modelling</em></td>
</tr>
<tr>
<td></td>
<td>• <em>Explaining</em></td>
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<td></td>
<td>• <em>Sharing ideas</em></td>
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<tr>
<td></td>
<td>• <em>Taking turns</em></td>
</tr>
<tr>
<td>Authentic attribute:</td>
<td>• <em>Participation</em></td>
</tr>
<tr>
<td></td>
<td>• <em>Sharing ideas</em></td>
</tr>
<tr>
<td></td>
<td>• <em>Recorded drawings</em></td>
</tr>
<tr>
<td>Intentional attribute:</td>
<td>• <em>We are making</em></td>
</tr>
<tr>
<td></td>
<td>• <em>We are learning about</em></td>
</tr>
<tr>
<td></td>
<td>• <em>We are showing that</em></td>
</tr>
<tr>
<td></td>
<td>• <em>I know.....</em></td>
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</tbody>
</table>
Details of the findings of the pilot study can be found in Appendix F. The findings show evidence of the children demonstrating Jonassen’s et al. (1999) attributes of meaningful learning.

The children were actively involved in making the resource. While the data showed evidence of the indicators as stated under the active attribute, the teacher and I noted the children showed high concentration on a number of occasions when working with the cameras. Having observed this ‘high concentration,’ I included it as an indicator for the active attribute in my case study.

The constructive attribute was visible as the children used their existing alphabet letter to sound knowledge to link significant people, places and objects around the school to construct their alphabet digital story. They applied the skills learnt in the initial lessons with the cameras to photograph some clear images for the book. They constructed new understandings and developed skills in audio recording. They discovered the importance of speaking clearly and reflected on this as they listened to their recordings, sometimes choosing to have another attempt.

The class worked collaboratively to plan the resource from working with the cameras to deciding on the content of the digital book and discussing the photos in pairs to plan their audio stories. The teacher and adult helpers noted that the children worked well together and willingly helped each other when taking the photos. There was video evidence to support this.

This was an authentic learning opportunity for these reasons:

- The children were enthusiastic about the project because the context was meaningful to them and they showed this through their high level of participation.
- The project was challenging in that the children were learning to use new technology and the actual construction of the resource required the children to employ higher thinking skills.
- The children were making a resource for a real audience, their parents.

The discussions and transcripts showed that the children were aware of the learning intentions. Many parents were aware of the project through their children talking about it at home.

2. What are the learning outcomes when children use the resources they have created?

All parents were surveyed. The survey asked questions regarding whether the resources helped parents to feel more informed and whether they were useful in supporting their children at home with learning. Of the 24 parents that were surveyed 15 returned the questionnaire which equates to a 63% return rate.

100% of the parents who returned the form said that the resource enabled them to feel more informed about their child’s day at school and that resources such as the one sent out could be beneficial in supporting children at home with their learning. One parent pointed out the difficulty with old computers not being able to cope with new
software. However that problem was addressed as the resource was available in three forms.

The children showed that ownership was important through the excitement that parents reported when their child shared the resource and the high usage of the hard copy book in the classroom reported by the teacher. 86% of parents said that their child showed pleasure in showing the resource and was able to point out his/her own contribution.

The information gained from the pilot study enabled me to reconsider some practical aspects for the case study such as indicators for the data collection, the number of children in the case study and the software that would be used.

**Case Study**

For my case study I worked with the whole class but, as outlined in the introduction, my data collection focused on six children who were chosen by the class teacher as being representative of the class.

The aim of the case study was to work with the class as a participant researcher to create a number of resources using ICTs to support literacy learning. These resources were shared with the children’s peers, the school community and parents and were made available for children to use at school and at home. The resources were made available in digital and hard copy form. Most of the resources used Power Point and were burnt for parents on CD as a Power Point Show as this was the most accessible way for a number of parents to view them. Media Player 10 which is required to view Photo Story 3 was burnt on the CD and parents who were happy to download it could then view the Photo stories. The needs of individuals were taken into account. One child who did not have a computer was able to view the resources as a DVD and as a hard copy.

A brief explanation of each resource discussing similarities and differences will be given here in order to give a picture of the literacy focus and the ICT tasks the children undertook.

**Learning Objective**

I worked with the class teacher to plan an integrated unit of work with a literacy focus in which ICTs would be used to create a number of digital resources.

The context was an author study of Lynley Dodd. The literacy learning objective for the children was to develop awareness and use of descriptive language in their written and oral language. There was also a focus on visual language through a study of Lynley Dodd’s illustrations and the use of photography in the children’s own work.

Lynley Dodd’s picture books were chosen for the following reasons:
Most of the children had already experienced the books either at home or at their preschool.

The story characters are domestic animals and children of this age show high interest in them as many have pet dogs and cats themselves. Hence the context is meaningful.

The language has strong structure in its rhyme and rhythm. The children readily join in the reading of these books as they enjoy the language patterns.

The language is very descriptive and provides opportunities for discussion of meanings and extension of vocabulary.

The children were to construct resources which had a real purpose. The resources would be presented to an audience: school assembly and their parents and used as reading material in the class programme. The actual making of the resources was complex. The children would be required to design and create, problem solve, thus employing a number of thinking strategies.

The children were encouraged to develop independence in using the technology and to develop their cooperative and collaborative skills. The resources were created for and by the children. My role as participant researcher was to plan, and facilitate the making of the resources and to assemble the final product. The children used a variety of software applications: Power Point, Photo Story 3, Paint, and ArtRage. The children used digital cameras and made audio and written recordings.

A Brief description of the Resources

Resource 1: Animal animations

The children each contributed to a digital book as part of the language study of the animal characters in Lynley Dodd’s books. The objective for this resource was for children to each make a Power Point slide depicting their favourite animal character with an emphasis on using rich descriptive language. The activity included photography, drawing and animating an animal and recording a caption in written and audio form.

The children were immersed in the literature of Lynley Dodd, especially her animal picture books. They brainstormed their increasing knowledge about the book characters, retelling the stories with an emphasis on the descriptive language.

The children were then ready to make their PowerPoint slide. The steps involved in the making of the slide were explained to the children and an example of an animation was shown to set the scene. They revisited their photography skills learnt during the pilot study and chose suitable places in the school grounds to photograph as backgrounds for their slides. They drew pictures of their animals and plants using Paint and inserted them into their slides. Each child animated their animal character, wrote a sentence using descriptive language and recorded the text. They made an
audio recording of the text focusing on speaking accurately, clearly and fluently. Examples of animal animations are shown in Appendix H.

Resource 2: The Smallest Turtle

This resource built on the skills the children had learnt in the previous resource. The objective for this resource was to continue exploring descriptive language and to focus on the sequence of a story. The children were to retell Lynley Dodd’s story, “The Smallest Turtle,” in their own words, sequencing the story and using descriptive language. The children were to work cooperatively to make a class resource.

The class worked together in shared writing to retell the story of “The Smallest Turtle,” using a large storyboard. Instead of using photography for the background the children painted the background using ArtRage. Other steps were similar to the first resource in that the children drew and animated the animal characters from the book. The text from the storyboard was inserted and the class worked cooperatively to edit and improve the text focusing on descriptive language. As with the first resource the children made audio recordings.

This resource was printed as a hard copy for the class library, and burnt on the CD to be shared with parents. Each slide was printed and laminated and used as a sequencing activity in the literacy programme.

Resource 3: Individual books

This resource required the children to revisit and build on the skills they learnt when making the first two resources. The objective was for children to make their own individual digital book about a topic of their own choice. The books were to be printed as hard copies to be used as a reading resource in the class and burnt on CD as an e-library for the children to use at home and at school.

The book was to have six slides and the children were to think about the sequence of their story and the use of descriptive language. They planned their book using a storyboard and then recorded the text in both written and audio form. The children drew the pictures using Paint. Although the steps involved many of the skills they had learned in the previous resources the children were further challenged in that they were responsible for assembling their own book using a blank template. Examples of 2 case study children’s individual books are shown in Appendix I.

Resource 4: Photo Story 3 My Cat Likes to Hide in Boxes

This resource was made over two days and developed from the children’s enjoyment of the book. “My Cat Likes to Hide in Boxes.” The children enjoyed the repetition of the language. The objective was to make a moving digital book retelling this story with innovation on text. The children made cat masks and enjoyed sharing the book orally a number of times. After we had discovered the countries using a class set of
globes the internet was used to find the flags of the countries mentioned in the book. The children coloured in flags for the countries. The children played the parts of the cats. Once again the children made audio recordings.

**Resource 5: Keeping Ourselves Healthy Poster**

The last resource was made in Term 3 when the class was studying a new topic: ‘Health and Safety.’ The objective was to give the children an opportunity to work collaboratively. The children were to work in pairs to create a poster depicting an important health rule. They had to agree on the rule they wanted to present and photograph each other demonstrating the rule. There was a continued emphasis on literacy as the children discussed their ideas and made written recordings of their health messages. They had to write a caption which gave a clear message. The children worked together at the computer to insert the photos and the text and give their poster a background colour. The resource was printed, laminated and displayed in the class to remind the children of the important health rules.

**Indicators for Data Analysis: Case Study**

The data was analysed in terms of my two main sub questions:

1. **How does meaningful learning occur when children create resources to support their learning?**

2. **What are the learning outcomes when children use the resources they have created?**

Some of the evidence is quantitative but most of the evidence is qualitative. As the attributes of meaningful learning are interdependent and interrelated, (Jonassen et al. 1999) some evidence may fit into more than one area. For example a child might be showing the constructive attribute by explaining or modelling how to perform an ICT task to another child. At the same time the child would be displaying the cooperative attribute. The refined indicators, (following the pilot study) have been used to analyse the data. Please see Table 2.
Table 2: Refined Indicators for the Attributes of Meaningful Learning

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Indicators: Pilot Study</th>
<th>Indicators: Case Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active:</td>
<td>• Children talking to each other using affirming statements.</td>
<td>• Talks about the activity.</td>
</tr>
<tr>
<td></td>
<td>• Hastened excited speech patterns.</td>
<td>• High concentration</td>
</tr>
<tr>
<td></td>
<td>• Animated happy faces, laughing.</td>
<td>• Shows enthusiasm for the learning activity</td>
</tr>
<tr>
<td></td>
<td>• Talks about the activity.</td>
<td>• Refers to or uses skills from prior experiences</td>
</tr>
<tr>
<td></td>
<td>• High concentration</td>
<td>• Questions to gain understanding.</td>
</tr>
<tr>
<td></td>
<td>• Shows enthusiasm for the learning activity</td>
<td>• Shows new learning.</td>
</tr>
<tr>
<td>Constructive:</td>
<td>• Referring to and sharing past experiences.</td>
<td>• Refers to or uses skills from prior experiences</td>
</tr>
<tr>
<td></td>
<td>• Questioning or observing new understanding</td>
<td>• Questions to gain understanding.</td>
</tr>
<tr>
<td></td>
<td>• Showing or modelling from past experiences.</td>
<td>• Shows new learning.</td>
</tr>
<tr>
<td>Authentic:</td>
<td>• Participation</td>
<td>• High participation.</td>
</tr>
<tr>
<td></td>
<td>• Sharing ideas</td>
<td>• Knowledge or interest of context.</td>
</tr>
<tr>
<td></td>
<td>• Recorded drawings</td>
<td>• Dialogue and work outcomes.</td>
</tr>
<tr>
<td>Intentional:</td>
<td>• We are making</td>
<td>• Use appropriate language. We are learning about….</td>
</tr>
<tr>
<td></td>
<td>• We are learning about</td>
<td>• Shows joy/satisfaction of accomplishment.</td>
</tr>
<tr>
<td></td>
<td>• We are showing that</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• I know…</td>
<td></td>
</tr>
<tr>
<td>Cooperative:</td>
<td>• Modelling</td>
<td>• Modelling</td>
</tr>
<tr>
<td></td>
<td>• Explaining</td>
<td>• Explaining</td>
</tr>
<tr>
<td></td>
<td>• Sharing ideas</td>
<td>• Sharing ideas/taking turns</td>
</tr>
<tr>
<td></td>
<td>• Taking turns</td>
<td></td>
</tr>
</tbody>
</table>
Active Attribute:

“Real learning,” Jonassen et al. (1999) takes place when children are engaged by a meaningful learning task. They interact with objects and the environment and then observe the results of their interactions.

These indicators were drawn from the type of engagement I expected to see when the children were working on the computers.

- *Talks about the activity.* Talks either to peer or assisting adult. Eyes directed on the screen or pointing etc.
- *High concentration.* Physical signs of high concentration. The body is reasonably still, the face intent on the screen.
- *Shows enthusiasm for the learning activity:* happy face, laughing, talks excitedly.

In the data analysis a percentage is given for the ‘high concentration’ indicator as seen in the video footage. The video was viewed minute by minute and a chart was marked according to the indicators displayed. If a child showed high concentration for more than 30 seconds of the minute then he/she was given credit for high concentration. There were many instances when a child was showing high concentration continuously for several minutes. The classroom teacher also looked for the above indicators in her observations. If a child was talking about the activity this was recorded. The constraints regarding the data collection from the video recordings and the also the classroom teacher have been stated in the methodology.

Constructive Attribute

The active and the constructive are interdependent. The learner has begun from an existing experience or belief and the new experience has caused some change in understanding. For meaningful learning to occur the learner needs to reflect on the observations and make a shift in thinking.

- *Refers to or uses skills from prior experiences.* Talks about or shows prior learning.
- *Questions to gain understanding.* Shows puzzlement or confusion.
- *Shows new learning.* Through own work, modelling to peer or adult or verbal explanations.

Evidence was gathered from the video footage and the teacher observations. Evidence was also gained through the interviews with the children and the children’s finished products.
Cooperative attribute

We live, work and learn in communities. In the real world we naturally find others to help us solve problems. Meaningful learning requires working together and having conversations to solve problems.

Because it was difficult to hear what the children were saying when viewing the video I have acknowledged the cooperative/collaborative attribute being evident if the children were working cooperatively in the following ways:

• Modelling: Showing peer by physically working through steps, with a verbal explanation.
• Explaining: Verbally giving instructions and pointing to the screen.
• Sharing: Sharing ideas, taking turns.

The teacher also used these indicators for the cooperative attribute for her observation sheet. The teacher’s reflections and my own journal also provided evidence.

Authentic attribute

When problems are presented in a meaningful context, learning is more likely to transfer to other situations. Learning should engage children in higher order thinking. I looked for the following indicators:

• High participation. See indicators for the Active attribute.
• Knowledge or interest of context.
• Dialogue and work outcomes.

Authentic learning is complex and contextual. The context, that is the Lynley Dodd author study, was chosen for a number of reasons as outlined in the case study objectives. The activities were complex; they would challenge the children in their thinking and would require them to learn new skills. There was a purpose for making the resource. It would result in a product that could be used by the creators and presented to a real audience.

Intentional attribute

As humans we are goal orientated. When learners can verbalise a learning intention and actively seek to achieve it, they make meaning because they are fulfilling a learning goal.

When the children are able to articulate the learning intention in their own language they will:

• Use appropriate language. We are learning…I can…I know.
•  *Show joy/satisfaction of accomplishment.* May be shown through facial expressions or through oral statements.

Evidence was gathered from the video footage and the teacher observations. Evidence was also gained through the interviews with the children.

**Findings for Case Study**

In my findings I will include the meaningful learning that has occurred through two lenses; the literacy lens and the ICT lens. My research looks at the meaningful learning that occurs when children use ICTs to create their own resources. It then seeks to find out what the learning outcomes are when children use these resources. More examples of evidence of each of the attributes can be seen in appendix G.

From the video footage, teacher observations and reflections, children’s and parent’s transcripts and my own journal, I have drawn together the relevant data. Different data sources have been more useful in obtaining evidence for certain indicators. For example for indicators of the active attribute the video footage has been the main data source, along side the teacher’s observations and my journal. Data sources to show evidence of new learning include the actual work, the children’s transcripts and the teacher observations.

I will now present findings related to each of the indicators of the 5 attributes. The indicators show that the 5 attributes of constructivist learning are demonstrated and thus the occurrence of meaningful learning

1.  *How does meaningful learning occur when children create resources to support their learning?*

**Active Attribute**

“How real learning” takes place when children are engaged by a meaningful learning task. They interact with objects and the environment and then observe the results of their interactions.

**Indicator 1: Talks about the activity.** Talks either to peer or assisting adult. Eyes directed on the screen or pointing etc.

There is limited evidence of what the children are actually saying from the video clips. This is because of the background noise. However, from the observations of both myself and the assisting adults I know there was a great deal of conversation occurring about the work. Because the video camera was angled towards the case study children, the voices of the children sitting to the side are much clearer. There is a lot of evidence of talk regarding the actual work from these children. The conversations are often quite animated, with exclamations of delight, surprise, puzzlement and satisfaction.
The graph (Figure 1) shows the average number of incidents of talking about the activity, as seen on the video footage for each of the case study children. All the averages were taken over 7 or 8 videos except Millie’s average which was computed over 3 as she was absent for several lessons.

Figure 1 Active attribute: Talking.

I have recorded evidence of children talking to each other under active, only if the talking can be heard or if they or are physically showing evidence that their talking is related to their work. For example, pointing at the screen or directing their gaze at the screen or at their peers work.

Some children seemed to enjoy talking about their work more than others. Zach and Katie particularly enjoyed the discussion. Katie was very sociable. She appeared to be able to work in a very cooperative way; showing at times high concentration, then talking, modelling, explaining and then back to high concentration. Katie and Zach appeared to talk a lot about their work when they were seated together. Given Millie’s absences, her average for talking may not be a true indication.

Casey did not initiate a lot of conversation. She worked quietly and consistently. Occasionally she appeared to wait for help. She was also observed, on a number of occasions, asking for help from her peers and teachers.

Jack is a very articulate boy who can be very talkative in the class. This was not so evident in the suite.

The video footage shows examples of children talking very constructively about their work. There are examples where they are explaining what they are doing, or giving instructions about the next step, problem solving, or giving positive feedback about each other’s work. Some of these conversations are quite lengthy.
The teacher recorded similar findings. Zach and Katie appeared to communicate more than the other children. The talking included asking for help, talking about own work, giving instructions and talking about the actual content of the work. The fifth resource where the children were working in pairs to make a poster is not included in these findings. However the video footage which was taken incidentally as I moved around the computer suite shows a great deal of constructive talking about the activity.

Indicator 2: High concentration: Physical signs of high concentration. The body is reasonably still, the face intent on the screen.

The graph (Figure 2) gives an indication of the incidence of high concentration as seen on the video footage. The percentage indicates the average percentage the child showed ‘high concentration’ over the total number of video sessions for each child. The percentage was calculated from the number of minutes the child showed ‘high concentration’ out of the number of possible minutes in each video session. A child was credited with high concentration if he/she demonstrated high concentration for over 30 seconds of a minute. During that minute the child may also have talked. As Katie and Emma were very efficient workers they sometimes finished before the end of the video session. Therefore the scores are only an indication and need to be considered alongside the written comments.

Some children, whose behaviour can be very wriggly and easily distracted in class, were more focused when working on the computers. Jack and Adam are two that stand out because in the class they can be quite disruptive. Both these boys were very absorbed in the tasks and were able to sit still for significant periods of time. Adam showed high motivation and often chose to work on the computers at lunch time. The day I showed the children how to use ArtRage, he was found in the computer suite using the software to make his own drawing.
What are the Learning Outcomes When Young Children Create and Use Their Own ICT Resources?

There are a number of videos which show evidence of children displaying high concentration. One such is Jack as he paints his burning sun. The video description reads, “Jack sat intently watching the screen and drawing a burning sun for his background page of The Smallest Turtle.”

**Indicator 3: Shows enthusiasm for the learning activity:** happy face, laughing, talks excitedly.

On viewing a number of videos, when the class was working in the computer suite, I observed that children expressed enthusiasm for the activities. There was talking which was neither loud nor very quiet, with intermittent exclamations of delight at discovery of achievement. Success was also expressed through laughter. The children’s faces appeared smiling or more serious depending on the task. There was the occasional very animated face such as Jack’s when he was describing his work. When I was working with the children they were happy and enthusiastic. There were occasions, for example, when the children had just learnt to animate their animals, they burst out laughing with delight. (Video 24/05/06) This response was also evident when we went to view the animal animations resource for the first time in the library. The children were also very amused by their voices, especially Adam who put a lot of expression into his audio recording.

Once the first resource was available on the network, there was frequently, a group of children sitting around the class computer listening and watching. Hardcopies of the resources were also regularly in use in the classroom and in the school library.

**Constructive Attribute**

The learner has begun from an existing experience or belief and the new experience has caused some change in understanding. For meaningful learning to occur the learner needs to reflect on the observations and make a shift in thinking.

**Indicator 1: Refers to or uses skills from prior experiences.** Talks about or shows prior learning.

“The most important single factor in influencing learning is what the learner already knows,” Ausubel (as cited in Siraj-Blatchford, 1993). The ICT component of the unit depended on firstly developing awareness of the rich language Lynley Dodd uses in her books. By the time the first resource was introduced the children had a strong language base. They had become very familiar with the descriptive language through listening to, sharing and retelling the stories. They had explored the meanings of words such as ‘rapscallion’ and ‘magnificent’ and enjoyed saying and using them. The context of stories of domestic animals meant that the children had prior knowledge grounded in their own childhood experiences. The children shared their own experiences of family pets and related them to the animals in the stories. The constructing of the resource enabled them to draw on their knowledge and understandings to create something of their own.

The importance of prior knowledge was very evident when children were drawing a plant picture for a Power Point slide. We can sometimes take for granted that children have knowledge and understandings.
My journal states: 22/05/06 When the children were drawing their plants it became obvious that they were unsure what a plant really looked like. A lot of children drew a green blob and maybe attempted to draw a few flowers on the top. We decided that this was a good opportunity for the children to look more closely at plants. We went on a walk in the school grounds and found several different types of plants. We thought about how we would draw them and practiced drawing in the air. We will go back and revisit our plant pictures and some children may choose to refine their own drawing. This has added a day to the making of the resource but the learning that is taking place as a result of it is so important.

The children were able to draw on their prior knowledge developed during the pilot study when using the cameras. It was interesting to see children remind each other of important aspects such as the green focusing light. Although most of the children had some prior knowledge of the computers, for many it was limited more to using the games that may be available in homes or the literacy and numeracy software at school.

The six case study children’s own stories give a picture of how they used their prior knowledge to make new connections:

Zach and Millie had had some experience in using Paint from their previous class, as they had started school at the end of the previous year, and were aware of the school set up. They quickly remembered how to log on and how to use Paint. Zach demonstrated his knowledge by helping others.

Katie had little access to computers at her preschool but had experience at home in playing games and exploring Paint. She quickly developed further skills.

Emma had limited access to computers at her preschool but enjoyed using the technology at home, mainly using it to play educational games. She quickly developed further skills.

From Jack’s conversations he was familiar with the technology from his home experience and confident in using it.

Researcher: “How do you think you are getting better at drawing?”

Jack: “Because sometimes people like to practice at home on computers and I practice a lot at home drawing pictures and my cat. I practice a lot of doing it and writing.”

Casey had virtually no prior experience of using the technology and seemed to be the least confident in using it. She did not have a computer at home but did have access to one at her grandmother’s. Casey sought help either from her peers or the adults more frequently than the other case study children.

Indicator 2: Questions to gain understanding. Shows puzzlement, or confusion

Because the attributes are interrelated, evidence of one attribute will appear within the discussion of another. Several instances where questions were asked have been noted in the active attribute under talking about the activity.
The children were asking each other and the assisting adults for guidance, especially when using the technology, or to confirm their understandings. Evidence of this can be seen through the video footage and the teacher’s observations.

This is an excerpt from the class teacher’s reflections: “Children were asking questions both of each other and the adults assisting. Many children also talked about what they were doing – again, to each other and to the adults.”

Some children needed more guidance than others and with the case study group; Casey is asking questions from both the adults and her peers more frequently than the other children. She did not have the prior knowledge of computers to draw from.

**Indicator 3: Shows new learning.** Through own work, modelling to peer or adult or verbal explanations

There were many instances where children built on skills and showed transfer of knowledge to new learning and the work output is evidence of this.

My reflective journal indicates the growth in the children’s ability using the technology. Here are some examples:

17/5/06 “Worked in the ICT suite with the children making animal animations. Interesting to note the confidence some children are now showing in using the technology.”

24/5/06 “I was amazed at how quickly these children are developing skills. There was a lot to remember and they managed very well. They were required to open their class home drive and follow the path through to their own folder. They then had to insert their background photo, insert their plant and animal pictures, animate their animal pictures and bring their plant picture to the front so that their animal moved behind. All children needed some assistance at some stage of this procedure but they were all able to follow many of the steps. This confirms my belief that young children are very capable if they are interested.”

7/6/06 “I was amazed at how much better the children have become at controlling the mouse. Once again we had all children finish their drawings. The children are not starting again as much as they used to and are setting their own expectations higher.”

12/05/06 “The quality of the paintings using ArtRage and the drawings of the turtles etc has improved dramatically. This is high quality work from five year olds and one just turned six year old. Children are developing better control of the mouse and their drawings are becoming more detailed.”

After a discussion on how colours would help us recognize the animal characters in our slides I noted:

18/05/06 “Adam who had put a lot of effort into his work yesterday, decided he wanted to change the colours. This is one of the beauties of ICT. You can go back and change or add to as your learning develops.

Evidence of the new learning was shown through other data sources. E.g. In a video (18/08/06) of two children taking photos, Emma is having difficulty photographing
her partner for a ‘Keeping Ourselves Healthy’ poster in which they want to show the importance of exercise. Her partner is bouncing a ball and every time he moves she also moves. After looking at the resulting photo she takes another photo with her partner posing as she has discovered that it is easier to photograph a stationary person.

Zach often demonstrated new learning using the technology through his verbal explanations and modelling for other children. He developed an awareness and use of descriptive language:

*Researcher*: “What was your favourite word?”

*Zach*: “Ummmm mighty magnificent.”

*Researcher*: Tell me about Scarface Claw?

*Zach*: “He’s the roughest and toughest in town.”

The class teacher commented on Millie’s huge progress in story writing. She noticed Millie was including descriptive language into her own writing. The story below is Millie’s retell of Lynley Dodd’s “Wake up Bear.” 6/06/06: The story was written independently and showed a good use of sound to letter analysis in her attempted spelling. The published story reads: “Monkey tickled Bear. Bear twitched a little then a lion came. The lion roared a loud roar. It made everybody shout. Then elephant came and squirted Bear.”

During the case study Casey showed marked improvement in her ICT skills. When she had a problem she learnt to ask for help and her confidence improved. Evidence of this can be seen on the video footage and the teacher observations.

Jack showed transfer of learning through his written work. His individual book showed the use of descriptive language learnt in the initial resource included into his own story about his pets. “My cat is a boisterous cat. My cat is a kick-up-a din cat.”

Jack showed development of ICT skills. His drawing developed in detail. His gulls were very detailed. In his interview Alex reflects on his gull drawings. “They were a little bit wrong because I did one all black and I couldn’t get out of it and I only did one piece white.”

New learning was very evident through the audio recordings. The improvement in confidence the children exhibited was noticeable. Audio recording gives immediate feedback to the learner and allows for reflection and self evaluation. While I was working with the children on their audio recordings, there were many occasions when a child would say, “too slow,” or “not clear” or “I missed that word out” and would want to have another turn.

One child who is presently working with a speech language therapist used the audio recording as a learning opportunity to its full advantage. Instead of feeling threatened by this difficult activity he showed determination and perseverance and very much wanted to articulate his story clearly. He had several attempts at recording and the playback allowed him to reflect on the areas he needed to work on. Evidence of his efforts can be heard in the finished resources.
When the class teacher was asked if the output in the Animal Animations book was what she had expected she replied, “Better than I expected. I was just amazed. They all managed the animations so confidently. I think it was the confidence that blew me away. They really expected that they could do it. And so they did.”

**Cooperative Attribute**

We live, work and learn in communities. In the real world we naturally find others to help us solve problems. Meaningful learning requires working together and having conversations to solve problems.

Although the resources were made collaboratively as a class, the children worked on individual components for the first three resources. Some children quickly became confident in using the technology and began supporting the children sitting beside them. These confident children were also often faster at completing the task and so when finished would move to where someone needed support. These children were also able to model to the class and give verbal explanations.

**Indicators 1 & 2**

- **Modelling**: Showing peer by physically working through steps, with a verbal explanation.

- **Explaining**: Verbally giving instructions and pointing to the screen

  My journal states: 15/06/06 “All children are developing in confidence and this was very evident in the way they were working cooperatively. I have been waiting to see this happen and it was definitely evident today. I also saw a number of children discussing their work. They are excited by what they are doing.”

  The class teacher wrote in her reflections after the children had made the little books: “The degree of expertise gained by some children, to follow the series of steps required to complete this resource was amazing. I observed many instances of children willingly helping other children by explaining and modelling the required steps.”

  Although there were instances of all the children modelling or explaining to another peer, three children stood out within the case study group as being very able in working cooperatively.

  - The class teacher noted five specific occasions when she observed Zach assisting other children with their work. The video titled “Modelling” (6/06/06) shows Zach assisting another child.

  - Emma was very able to visualize and verbalise pathways. The class teacher noted four specific occasions when she observed Emma assisting other children with their work.

  - The class teacher noted Katie assisting other children on three occasions. However, this is not an accurate picture of Katie’s contribution. She was
consistently offering help when needed and very willing to model. Video titled ‘Explaining,’ 20/06/06) shows Katie modelling the steps required from logging on to accessing the Room 5 home drive and her own folder and beginning the next part of her little book. Video titled ‘Helping,’ (22/06/06) shows her helping Zach with a problem.

**Indicator 2: Sharing:** Sharing ideas, taking turns.

The final resource required the children to work with a partner to construct a poster. This was not part of the author study as it was made at the beginning of Term 3 in which the learning focus was health. The resource is described in the case study. This was the first time the children were required to create a resource with a partner.

My journal states: “Both the class teacher and I were delighted at how well the children worked together. They used their joint knowledge to solve many little problems. There was very little need for teacher input and it was very pleasantly manageable. The children decided on the context of their poster and then took photos and constructed the caption before going to the suite to assemble it.

The noise level was buzzy but focused. Every group had completed the activity within approximately thirty minutes. I heard children discussing their favourite colours for the background and agreeing on a colour. While often in each pair there appeared to be one more able child it was also obvious that the other child in the pair had different knowledge which enabled the job to be done. The children showed delight in their achievement. They were able to see their work printed and ready for display before they went home.”

Video titled “Poster,” (18/08/06) shows two children working together to assemble their poster. They firstly think they have finished the poster and get very excited and then they discover that they haven’t done the background. A conversation follows about their favourite colours and they decide on red as this is a common favourite colour. They help each other out with the procedure of changing the background and finally the less able child shows the more able child how to retrieve the text that she inadvertently deleted. This was indicative of the way all the children worked that day.

**Intentional Attribute**

As humans we are goal orientated. When learners can verbalise a learning intention and actively seek to achieve it, they make meaning because they are fulfilling a learning goal.

**Indicator 1: Use of appropriate language.** We are learning…I can…I know..

The learning intentions were clearly outlined at the beginning of the unit and we regularly revisited them. The children knew why we were making the resources. My journal states:

23/5/06 “We started the day with some fantastic words that we might put in our resources. Saying the words over and over and feeling the pattern of them reminds the children of why we are making this resource.”
In my interview with the class teacher I asked how she thought creating the resources had contributed to the children’s awareness and use of rich language.

“Well I think it really kept the children focused on the development of rich language. They knew they were expected to come up with the goods as far as rich language went, so they did.”

A group of principals visited the children to see what they had been doing. We met in the computer suite and the children accessed their work. One of the principals was quoted as saying, “They knew exactly what they were on about; reason for writing their own book, photography, artwork, animations, oral language and did you see how they just waited so well for their turn?”

The children showed understanding of the learning intentions in the interviews. I continued to visit the class on a weekly basis and to facilitate lessons during term 3. On the 31st Aug Jack approached me and said “I’m using rich language in my writing.” He seemed very pleased with himself and I asked him to show me his book. One of his recent stories read: “My friend is a playful dog. She is a dog with a marvellous red nose. She has a beautiful red tongue too.”

Another story read: “Once upon a time there was a unicorn that was marvellous and beautiful with fur too. But along comes a tiger and it jumps on the unicorn. But the tiger missed the unicorn.”

Indicator 2: Joy/Satisfaction of accomplishment. May be shown through facial expressions or through verbal statements.

In my interview with the classroom teacher I asked her if she had noticed anything that made her think that ownership was important. She replied:

I certainly did. It showed up in the joy and excitement that was evident when their picture and their voice came up when viewing. ‘Oh that’s me!!’ Yes. They were very excited….That pride. That joy in their achievement.

The children often showed joy and delight at their accomplishments. They particularly enjoyed the animations and hearing their own voices. There were great whoops of delight when they accomplished their first animation.

They showed pride in their little books and these became very important to them because they were their very own. One of the parents reported that the CD had a special place by the computer and the ownership was very important. One parent said in the informal interview:

I think it is hearing themselves speak because how often do you get to hear yourself speak? They hear themselves and they are absolutely thrilled. I do reckon it’s more the voices than anything else. They love the fact that they’ve done that art work and look what they can make it do but I think you could turn it off and they could just sit there listening to themselves.
What are the Learning Outcomes When Young Children Create and Use Their Own ICT Resources?

**Authentic Attribute**

When problems are presented in a meaningful context, learning is more likely to transfer to other situations. Learning should engage children in higher order thinking.

*Indicator 1: High participation*

The children’s high level of participation is visible through the evidence of the Active attribute. By the third resource the children had developed many ICT skills. Some children were choosing to work on their book before school. When I asked the teacher if the children are still keen to use the resources at school she replied:

“They love the little books. Just love them. They love sharing them with each other. They love reading them by themselves and also share them with their buddies at buddy reading time.”

*Indicator 2: Knowledge or interest of context.*

The transcripts and the actual work provided evidence for indicators 2 and 3. Zach’s parent made this statement about his son’s art work.

He had pride in that…. what he enjoyed most was the stories that they made up as children, and as much the ones that the other children made up as well as his own. The more ownership there is the more he seems to enjoy it.

Millie was very proud of her work and in the parent interview Millie’s parent said that Millie talked about being an artist. Millie was asked which picture she like the best in her work.

*Researcher:* Have you got a favourite picture which makes you feel very happy?

*Millie:* “Ummm, that one.”

*Researcher:* That wasn’t an easy picture was it? …What have you had to draw?

*Millie:* “Ummm because …he slipped on the mat and he rolled down the stairs.”

*Millie* felt especially proud of the difficult picture she had drawn.

Casey also shows through her interview that she has found the learning fun. This extract also shows her awareness of the learning intentions.

*Researcher:* “Why did you like making the book?”

*Casey:* “Cos it’s fun making it”.

*Researcher:* “Why? What’s fun about making books?

*Casey:* “Drawing pictures and writing it.”

*Researcher:* “What’s special about those words Casey?”

*Casey:* “They’re rich language.”
Indicator 3: Dialogue and work outcomes.

Katie was very able in using the technology and was the first person to finish her little book. She chose to write about a cat and developed a repetitive pattern for her text and carefully included a descriptive word on each line. Her text reads:

“My Sneaky cat likes to hide in boxes.
My climbing cat likes to hide up trees.
My bouncing cat likes to go up on the couch.
My soft cat likes to get picked up.
My playful cat likes to play with strings.”

Emma talks about the effort she put into her drawings and her work is evidence of her awareness of rich language.

Researcher: “What made you get good at doing cats on the computer?”

Emma: “Because I tried and tried and tried.”

Researcher: “Can you read this last page for me?”

Emma: “And there was my cat and her name was Twinkle Sprinkle and she was a stripy cat.”

Jack also says in his interview that he had worked hard to achieve something special. “It’s because we worked really hard to make a story and we made it from the beautiful pictures and that’s why it’s so special.”

2. What are the learning outcomes when children use the resources they have created?

The resources were made available in a variety of ways. All the resources apart from the Photo Story 3 book, “My Cat Likes to Hide in Boxes” were made available as hard copy. The hard copies were initially kept in the class library so that they were readily available to the children who created them. They were to be accessioned as school library books later in the year. Previously made library books are displayed in the library and the librarian has reported frequent use of these.

All the children were given a CD to share with their parents and one child who does not have a computer had the Photo Story 3 book burnt on DVD. The children had access to the resources on their class computer and the school network. The resources have been shared at the school assembly to which parents were invited, with reading buddies, parents and friends.
The electronic resources are used as an independent activity in the literacy programme. The children read the printed little books as independent readers and use the sequencing activity of “The Smallest Turtle.”

Parents were surveyed after they had had access to the CD for approximately three weeks. The aim of the questionnaire was to consider some of the following questions. See Appendix E for case study questionnaire.

- Does further usage of the resources lead to a continuation of meaningful learning?
- How do children show that ownership is important?
- Who is the audience when children make their own resources?
- How does sharing the resources strengthen school/home communication?
- How do the resources enable parents/caregivers to support their child?

Fifteen parents were given the questionnaire. Fourteen parents returned the questionnaire. This indicates a 93% return rate. One of the reasons for sharing the resources was to ascertain whether sharing helped to strengthen the home-school partnership and also whether the resources provided an opportunity for parents to support their child in learning at home. Was there continuity of learning in the sharing and were children more likely to use this resource because they had been the creators?

The questions focused on the following aspects:

1. Home / school communication
2. Support for learning.
3. Responses of the children when sharing.
4. Continuity of learning

Findings will be discussed in relation to each of the questions used in my questionnaire.

*Question: Does this resource help you to feel more informed about some of the work your child does at school?*

100% Said that they felt more informed about some of the work their child did at school. The comments included:

- “I especially enjoyed ‘the making of’ video. It gave me an insight into all the work that has taken place.”
- “Yes. Because we can physically view the CDs and see the amount of work it has taken for Julie to create her stories and animations.”

Two parents, while saying that they felt more informed pointed out the limitations of the resource. One parent felt concerned that resources such as the one sent home
would replace traditional forms of communication such as pictures and worksheets and stated that she had felt reasonably well informed before. The other parent pointed out that the resource only showed a small part of the child’s day. The question on the survey does not look to take credit as the only provision for information and was worded…. “some of the work.”

**Question: Do you feel that such a resource provides a tangible link between school and home?**

100% said that the resource provided a tangible link between school and home. While this is a similar question to the previous it did bring up some new information regarding the home / school partnership. Some of the comments included:

- “It’s a good source of feedback; provides a progress report. So much to learn but the kids seem to pick it up quickly. Skills learned at school are used at home.”

- “It’s tangible and provides discussion.”

**Question: Was using the CD an enjoyable way to share your child’s work?**

100% said that the CD was an enjoyable way to share their child’s work. Some of these responses also indicate in what ways parents have been informed through the multimedia approach.

**What made it enjoyable for you?**

- “Sharing our son’s creativity and learning experiences.”

- “The excitement Millie showed at sharing her work with me. Seeing my daughter’s beautiful work.”

- “Hearing Julie’s voice on the audio and seeing her animated Scarface Claw and just being able to play her CD on our computer- very different to books.”

**Question: Did your child show enthusiasm in sharing his/her work with you?** This question was asked to gauge the importance of ownership. Here are some of the parent responses.

- “Very proud and keen to share the work. Also wanted us to see everyone else’s work and know who read which bit.”

- “…Also recognizes others who contributed. Explains how she got her ideas and what she did to produce them. Shows she understands the process of producing this work.”

- “Wants to watch it all the time.”
Question: Does the CD provide you with opportunities to support your child in his/her learning in literacy?

This question was divided into a number of sub questions and parents were asked if they had used the resource with their child:

- To discuss rich, descriptive language?
- As reading material? Has your child read, or have you read the books together?
- As inspiration for discovering books at the local library?
- As a way of encouraging your child to draw and write at home?

During the study, letters had been sent to parents outlining the objectives for making the resources and explaining some of the learning activities involved. A letter sent immediately before the CD was issued, explained how the resource could be used.

“We hope you will use this CD in the way it was intended. - As a resource to help your child in his / her learning. We hope you will encourage your child to use the CD as an electronic library. Your child can read along with the spoken word or by turning the sound off read the books independently.”

To discuss rich, descriptive language?

The parents had been informed in an earlier letter that the objective of making the resource was to develop rich, descriptive language. I was interested if discussion of rich language had arisen out of viewing the resource and the children’s own input. 57% had used the resource to discuss rich descriptive language. One parent gave no response. Here are some of the responses.

- “Our child’s vocab includes a lot more descriptive words. She will write her own stories at home. Her artwork is getting more colourful and images are interesting and relate well to the story.”
- “She will point out that a particular descriptive word is a “rich” language word.”
- “I was quite surprised at the words she used and the understanding of them.”

As reading material? Has your child read, or have you read the books together?

100% had used the resource as reading material. Here are some of the responses.

- “Zach is definitely showing an increasing respect for books and hopefully this will encourage him to improve on his reading. I’m sure this exercise had helped him to pick up and maintain his motivation”
- “We have quite a few of Lynley Dodd’s books at home and Jonathon was very excited about reading them and doing activities as a result of his work creating the CD.”
“Rosie has rediscovered our Lynley Dodd books, and is loving reading them with me…….”

As inspiration for discovering books at the local library?

43% had used the resource as inspiration to discover more books at the library. 21% did not respond. One parent noted that their family already went to the library regularly.

“We have looked for books in the library associated with her project. Bridget has done numerous drawings at home.”

As a way of encouraging your child to draw and write at home?

86% said that the resource had been used as a way of encouraging their child to draw and write at home. Of the two remaining parents, one parent said that her child had not required encouragement from her as she had been writing and drawing pictures obviously inspired by the work. The second parent said that her child was already an avid drawer and writer. Here are some responses:

“Julie is writing a lot at home and is pointing out Lynley Dodd books wherever we go.”

“I have seen her drawing pictures obviously inspired by her work at school, and using some of the language and also rhyme and rhythm from the stories without any encouragement.”

Question: Who else has your child shared the resource with? Please circle.

Mum  Dad  Siblings  Grandparents  Friends  Other relatives

The graph (Figure 3) shows the people who 14 children shared the resources with.

Figure 3 Sharing Resources.
Parents were asked if there were any further comments. One parent who visited the class one day when the children were working in the computer suite on their final resource made this final comment:

I was very impressed, when seeing the children at work on the computers, at the level of understanding they have of the programmes, and how to move between them, and save data, all without much adult help. They can do much more, and have so much confidence at it, than most people would think a 5 year old could have – and more than many adults I work with. But I was most impressed that the wonders of the software available to the children were used not for their own sake, but as a means to an end – learning. The drawing, typing, digital photography and putting these all together were used to emphasise and practise in a very exciting and creative way, the skills of writing, art, oral literacy, and of course the immense planning work needed to produce their creations.

**Limitations**

The resources can only be used if children have access to computers. While for this class it was not a huge issue, there were some difficulties for some children. One child could only see the resources produced with PhotoStory 3 as Power Point was not accessible on her computer. Hard copies were made available but this did not allow the child to share the multimedia qualities of audio and animations with her parent other than when her parent visited the classroom. Another child was only able to share the resources when she visited and had access to her grandmother’s computer. This is unlikely to lead to regular using of the resource as a learning tool but more of an opportunity to share work and inform parents.

Of the 4 parents that I had follow up interviews with approximately nine weeks after the CDs had been distributed, 2 parents said that their children were still using the resource regularly and that the CD was a very prized possession. One parent had had difficulties with his computer and voiced his concerns about using technology that was too advanced for old computers. The other parent said that her child was not allowed to load CDs without supervision and therefore probably didn’t look it at so much after the initial excitement.

For the resources to be used to support learning, parents may need some guidance into how to use them. As technology becomes more accessible and easier to use some of these limitations should be able to be overcome. Some parents may still regard the CD more of a memento rather than a resource to be used and further communication would be needed to change this.

**Summary of Findings**

The findings show evidence of the 5 attributes of the constructivist theory as outlined by Jonassen et al (1999) as the children used ICTs to create their own resources and demonstrate that meaningful learning has occurred. This evidence is backed by the Pilot Study findings.
The children showed evidence of the active attribute through their high level of engagement in the learning activities. They showed enthusiasm for the activities and this was demonstrated by their conversations and their willing participation both in the class based activities and in the computer suite. The children showed high concentration, sometimes for significant periods of time and the video evidence supports this. The parent surveys show that several children are continuing displaying the active attribute at home through their desire to use the resources and to create new work.

The constructive attribute was evident in the work output. Through immersing the children in Lynley Dodd’s picture books the children developed awareness of the descriptive language and began to use it in their own writing and oral language use. This descriptive language was then used in the ICT resources.

The teacher’s reflections state: “As their confidence in the use of the digital cameras and computers grew, under Liz’s guidance, I became amazed at the way their knowledge increased and the high standard of work they began to show.” As each resource built on the skills of the previous resource, the children used their prior knowledge to take them to the next step. Once new skills were introduced and developed, children within the peer group also provided the scaffolding for other children who needed support.

The cooperative attribute became very evident during the case study. As children developed confidence they demonstrated the cooperative attribute in a number of ways. They gave verbal explanations, they modelled ICT skills, and they shared their ideas and listened to each other.

According to Pramling-Samuelsson (2002) there are three ways of looking at peer cooperation.

1. Peer Tutoring: One child is the expert in a certain area and tutors the other child novice.


3. Peer Collaboration: Children of similar or equal ability working together to solve a problem.

In the making of the resources for case study I saw instances of these three types of cooperation and collaboration at work.

Although the children worked together to achieve a group outcome for the main resources of the case study, they worked individually on the computers to construct their part of that resource. During this time there were some children who began to show ability in using the technology very efficiently. They became ‘self appointed tutors.’ They would willingly share their knowledge with other children who needed assistance giving verbal instructions and pointing at the screen. There were also many instances observed in the video and other data collections of children talking about their work and giving each other feedback.
Evidence of peer collaboration was particularly noticeable in the making of the final resource where the children worked in pairs to construct a resource. Evidence of this collaborative working can be seen on the video footage.

The authentic attribute was very evident. The context was meaningful and this is demonstrated by the fact that when given the opportunity to make a book of their own choice of topic, most children chose to write about their own pet cats and dogs. The children as stated in the active attribute showed a high level of participation. They were excited about making resources for a real purpose and this is demonstrated by the high usage of the resources after they were completed. The activity was complex. The children needed to learn many new ICT and literacy skills. The case study transcripts show that the children found this hard learning fun and the pride described in the children’s transcripts and the parent surveys also supports evidence of the authentic attribute.

The children demonstrated the intentional attribute through their ability to explain the learning intentions. Evidence of this can be seen in the transcript from the teacher’s interview, my journal and the children’s transcripts. The children showed delight and pride in their achievements and this was noted in many of the parent surveys.

The evidence from the parent surveys in which parents report on the use of the resources at home indicate that the resources provide further learning opportunities.

The teacher’s observations of children using the resources in the classroom also show that further learning is occurring through the use of the electronic e-library, the hard copy little books and the laminated sequencing activity.

93% of the parents returned the questionnaires. Two key questions for parents were:

- Does this resource help you to feel more informed about some of the work your child does at school?
- Does the CD provide you with opportunities to support your child in his/her learning in literacy?

100% parents replied positively to these 2 questions. This report shows evidence that meaningful learning does occur when children use ICTs to create and use their own resources. The Venn diagram (Figure 4) shows the interaction between the children, resources and the parents.
Figure 4. Pictorial Representation of Findings

Discussion

Relationship of Findings to initial questions

My research sought to find out how meaningful learning occurs when children use ICTs to create and use resources. By using the 5 attributes of the constructivist theory as outlined by Jonassen et al. (1999) which they believe need to be present for meaningful learning to occur, I developed a set of indicators for which I looked for evidence as children created and used the resources. The evidence showed a strong presence of the 5 attributes.

For this research a group of six children were selected as representative of the class and the data collection, that is the video camera and teacher observations, focussed on them while I worked with the whole class to construct the resources. By working with the whole class, all children had the opportunity of being part of the project. Some of their stories have been added to the data to gain a fuller picture of what happened. The research has been presented in the context of a real teaching situation. However through doing this there were also limitations to the data collection. Through working with the whole class, I have not been able to gather as much detail about individual children, as if I had been working with only the case study children. There were times when working in the computer suite that the noise level was such that it was difficult to hear exactly what the children were saying on the video recordings.
Some parents may value the resources after the initial pleasure of sharing them more as mementos and useful as informing them about their child’s work rather than an interactive tool for learning. For resources to be used to purposefully at home parents need guidance in using them. Letters accompanied the CDs with suggestions on how they could be used. However, I believe that the sharing of the resources with parents could be enhanced if there were opportunities to work along side them. In this way the needs of the individual child can be met more successfully.

Relationship of findings to literature and or practice

The literature review discussed theories of meaningful learning. These theories are consistent with the constructivist theory. Advocates of these theories do not see the value of software that provides drills and skills practice for children. Rather they advocate software that is open ended and provides opportunities for creativity and higher level thinking skills.

In his paper Clements (1998) discusses the issues surrounding using different types of software. He talks about the value of discovery based software where children have opportunity to explore, but says that research has shown that children are more focussed in their work when they have a project which allows them to use this open ended software.

This research project has used software that has encouraged children to explore creative possibilities and challenged them to develop new skills and knowledge and understandings. I believe this has implications for teaching practice. Rather than using drills and skills type software, children can become the designers. It encourages children to develop their creative abilities and the learning begins at the planning stage through to the construction of the resource. Learning is meaningful because children are creating something of interest and value to them.

This research has focussed on creating resources to support literacy development however; I believe that it could have been applied to any curriculum area with a similar result. Open ended software provides unlimited opportunities for children to express themselves in all aspects of literacy: oral, written and visual, if we allow children to be the producers.

Conclusion

Implications

In New Zealand we are beginning to implement greater use of technology to enhance learning in the Early Childhood sector. ICT clusters have been initiated and this has huge implications for this sector. Research has shown that when used appropriately ICT “can encourage discussion, creativity, problem solving, risk-taking and flexible thinking.” (Siraj-Blatchford, J. & I. 2001). However they go on to say “it does demand that practitioners are well trained and skilled in the appropriate uses of ICT with young children.”p.4
As new and more intuitive software becomes available the potential for using it with young children will increase. As educators, we need to let young children explore software with creative possibilities rather than limit them by our own capabilities.

ICT provides opportunities for young children to develop social behaviours. When the children worked in pairs to create the final resource for this research the collaboration was very evident through the constructive conversations to problem solve, the taking of turns, the discussion and agreement on e.g. choices of colours and the obvious enjoyment of producing something together. Clements (1998) allays fears that some people have that children can become isolated when working on computers. He says that research has found that computers can actually serve as “catalysts for social interaction.” p.2

Suggestions for Further Research

As communication systems advance and become faster and more accessible for many parents, the potential of using resources made by children not only to inform parents but also to enhance learning must improve. This research used CDs to communicate the work but with many schools now having on line learning environments there will be more efficient ways of sharing. The philosophy of schools today is a partnership between parents and educators. This partnership is sometimes difficult to maintain for a number of reasons. Technology has an important role in helping to develop the partnership.

Summary

As educators we must be open minded about the possibilities that technology provides rather than trying to use it to replace traditional forms of education. We need to provide opportunities for young children to become risk takers, problem solvers, creative thinkers and collaborative workers. Technology has an important role in helping young children to achieve this end.
What are the Learning Outcomes When Young Children Create and Use Their Own ICT Resources?

References


What are the Learning Outcomes When Young Children Create and Use Their Own ICT Resources?


Glossary

Constructivism: A theory of learning in which knowledge is constructed not transmitted.

Meaningful Learning: The learner constructs new understandings through active engagement in an authentic learning task. The learner is goal driven and has opportunity for working cooperatively.
Appendix A

Parent Information and consent Form

2nd March 2006
Port Ahuriri School
Lever St
Napier

Dear……………………,

You may be aware that this year I am working as an e-learning fellow under the guidance of
the Ministry of Education and CORE Education.

The focus of the fellowship year is to produce a piece of original research in the area of
teaching and learning with ICT. The purpose of my research project is to find out: When
young children have ownership by making their own ICT resources, does it lead to more
meaningful learning, and what are the impacts on learning, when children use ICT
resources that they have made? I am intending that these resources will be shared at home
with you.

My research plan has been reviewed and approved by my supervisor at CORE, Dr Michael
Winter.

This letter is to request your participation in my project. To enable me to do this I will be
working on a regular basis with Mrs Gardner and the children in room 5. I will be taking a
series of lessons using ICT with the whole class but there may be occasions when I will work
with small groups of which your child may be a member. These lessons will be directly
related to the class programme. I am looking forward to working with the room 5 children and
intend to plan some fun learning activities involving ICT for them.

In my research I wish to include information and opinions from the teacher, parents and
children. This will be in the form of videotapes of the class during lessons, together with
informal interviews and surveys during the course of the project. Any data I collect will
remain confidential to me and members of the CORE Education research team. The data will
be stored securely for no more than three years at my residence and then will be destroyed.
However unidentifiable extracts may be used as examples of work.

The information gained from the data will provide the basis for my final project and may be
seen by my supervisor and the CORE Education research team. Your child’s name or image
will not be used in any publication coming from the research without your prior written
permission (pseudonyms will be used to refer to individual students). Every effort will be
made to ensure the anonymity of the students in the research.

I am carrying out this project under the supervision of Dr Michael Winter, who can be
contacted at CORE Education on 03 3790751. He will be pleased to discuss any concerns you
may have about your child’s participation in this project. In addition, I am available to talk
with you regarding any general queries you may have. My contact number is 06 8446212.

Liz Fitzsimons
2006
What are the Learning Outcomes When Young Children Create and Use Their Own ICT Resources?

Thank you for taking the time to read and consider this information. Please complete and return the form if you consent to both yourself and your child participating in the research. I am excited about the opportunity of working with Mrs Gardner and the children in Room 5. I hope that you will also benefit through sharing the resources at home with your child.

Yours sincerely,

Liz Fitzsimons

Consent Form For Parents/ Caregivers

I have read and understood the information in this letter dated 2\textsuperscript{nd} March.

I consent to my child taking part in the project and to Liz Fitzsimons using the following sources of data in her e-fellowship project.

- Written and electronically stored examples of my child’s work and learning activities.
- Some recorded interviews with my child about his/her learning.
- Some recorded interviews with me as a parent about my child’s learning.
- Video tape recordings of learning activities.

I also understand that I may withdraw my child from the research at any time.

All raw data collected for the research will be kept confidential to Liz Fitzsimons and the research team at CORE Education. Some anonymous, non-attributable examples of student work or other data may be used in publications of the research.

We have a computer at home. Yes/No

We have access to a computer Yes/No

Child’s name:..........................................................

Signature:..........................................................

Date:.............................................................
What are the Learning Outcomes When Young Children Create and Use Their Own ICT Resources?

Appendix B
Principal Information and Consent Form

27th February 2006
26 Hetley Cres
Taradale
Napier

Dear Glenn,

As you are aware I am working as an e-learning fellow under the guidance of the Ministry of Education and CORE Education.

The focus of the fellowship year is to produce a piece of original research in the area of teaching and learning with ICT. The purpose of my research project is to find out: When children have ownership by making their own ICT resources, does it lead to more meaningful learning and what are the impacts on learning when children use ICT resources that they have made?

My research plan has been reviewed and approved by my supervisor Dr Michael Winter.

This letter is to request your participation in my project. To enable me to do this I will be working on a regular basis with Marion and the children in room 5. I will be taking a series of lessons using ICT with the whole class but there may be occasions when I will work with small groups. As part of my research I would like to investigate the impacts of sharing these resources with parents and the possible benefits of the resources being part of the homework to meet specific learning needs.

I intend the data collection component of my research to commence in week six of term one.

In my research I wish to include information and opinions from Marion, parents and children. This will be in the form of videotapes of the class during lessons, observations, journal entries, informal interviews and surveys during the course of the project. The information gained will be analyzed and may become part of my final work. Any information I collect will remain confidential to me and members of the CORE Education research team. The data will be stored securely for no more than three years at my residence and then will be destroyed. However unidentifiable extracts may be used as examples of work.

The data collected will provide the basis for my final project and will be seen by my supervisor, the CORE Education research team, the Ministry of Education and other
interested community and educational groups. Any child’s name or image will not be used in any publication coming from the research without his/her parent’s prior written permission (pseudonyms will be used to refer to individual students).

I am carrying out this project under the supervision of Dr Michael Winter, who can be contacted at CORE Education on 03 379 0715. He will be pleased to discuss any concerns you may have about this project. In addition, I am available to talk with you regarding any general queries you may have. My contact number is 06 8446212. Thank you for taking the time to read and consider this information. Please complete and return the form if you consent to yourself participating in the research.

I have attached a copy of my research plan.

Yours sincerely,

Consent Form for Principal:

I have read and understood the information in this letter dated 27\textsuperscript{th} February. I give consent for the school to be involved in the research as outlined and to Liz Fitzsimons using the data gathered as outlined in this letter in her e-fellowship project.

Signature:

Date:
Appendix C

Teacher Information and Consent Form

Port Ahuriri School
Lever St
Napier

Dear Marion,

As you are aware this year I am working as an e-learning fellow under the guidance of the Ministry of Education and CORE Education.

The focus of the fellowship year is to produce a piece of original research in the area of teaching and learning with ICT. The purpose of my research project is to find out: When children have ownership by making their own ICT resources, does it lead to more meaningful learning and what are the impacts on learning when children use these ICT resources that they have made?

My research plan has been reviewed and approved by my supervisor Dr Michael Winter.

We have discussed previously how I will be working with you and your class but this letter is a formal request for your participation in my project. I would like to work on a regular basis with you and the children in room 5. I will be taking a series of lessons which we will plan together. These lessons will be directly related to the class programme, and will involve using ICT with the whole class. As part of my research I would like to investigate the impacts of sharing these resources with parents and the possible benefits of the resources being part of the homework to meet specific learning needs for some children.

I intend the data collection component of my research to commence in approximately week six of term one.

In my research I wish to include information and opinions from you, the parents and children. You will be asked to assist with videotaping of the class during lessons, with observations and journal entries during the course of the project. The data gained will be analyzed and may become part of my final report. The data will be stored securely for no more than three years at my residence and then will be destroyed.

However unidentifiable extracts may be used in publication and conference presentations as examples of work.

The data collected will provide the basis for my final report and will be seen by my supervisor, the CORE Education research team, teachers and other interested
educationalists. Any child’s name or image will not be used in any publication coming from the research without their parent’s prior written permission (pseudonyms will be used to refer to individual students).

I am carrying out this project under the supervision of Dr Michael Winter, who can be contacted at CORE Education on 03 3790715. He will be pleased to discuss any concerns you may have about this project. In addition, I am available to talk with you regarding any queries you may have. My contact number is 06 8446212 Thank you for taking the time to read and consider this information. Please complete and return the form if you consent to yourself participating in the research. I am really looking forward to the opportunity of working with you.

Yours sincerely,

Consent Form for Teacher

I have read and understood the information in this letter dated 27th February. I give consent to be involved in the research as outlined and to Liz Fitzsimons using the information gained in her e-fellowship project.

Signature:

Date:
Appendix D
Pilot Study Questionnaire

Questionnaire: Term 1 2006

Our First School Days

How does sharing the resources strengthen school / home communication?

- Does this resource help you to feel more informed about your child’s day at school? Yes / No
  Please comment:
- Was this an enjoyable way to share your child’s work? Yes / No
  Please comment:
- Did your child show enthusiasm in sharing the resource? Yes / No
- Who did your child share the resource with?
  Please comment:
- Did your child show pleasure in showing his/her own work? Yes / No
  Please comment:
- Did he /she make comments to indicate that he /she had taken the photo or recorded the story? Yes / No
  Please comment:
- Do you consider that resources such as the ones on the CD could be beneficial in supporting your child at home with his / her learning? Yes / No
  Please comment:

Any further comments:

Thanking you,

Liz Fitzsimons
Appendix E  
Case Study Questionnaire

Parent Questionnaire

Please read and complete the questionnaire and return to school by 21st July.

*The aim of this questionnaire is to find out whether and how sharing ICT created resources with parents strengthens home/school communication and provides opportunities for parents to support their child in his/her learning.*

*As explained in a previous letter the objective of creating the resources was for the children to develop an awareness of rich language and to use this language in their written and oral language.*

Your opinion is important.

<table>
<thead>
<tr>
<th>Does this resource help you to feel more informed about some of the work your child does at school?</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please give your reason for the answer above.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Was using the CD an enjoyable way to share your child’s work?</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>What made it enjoyable for you?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do you feel that such a resource provides a tangible link between school and home?</th>
<th>Yes / No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Please give your reason for the answer above</td>
<td></td>
</tr>
</tbody>
</table>

| Does the CD provide you with opportunities to support your child in his/her learning in literacy? |  |

| Have you used the resource with your child to |  |
| --- |  |
| Discuss rich, descriptive language? | Yes / No |
| As reading material? Has your child read, or have you read the books together? | Yes / No |
| As inspiration for discovering books at the local library? | Yes / No |
| As a way of encouraging your child to draw and write at home? | Yes / No |
What are the Learning Outcomes When Young Children Create and Use Their Own ICT Resources?

Please give some examples.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Did your child show enthusiasm in sharing his/her work with you?</td>
<td></td>
</tr>
<tr>
<td>Was he/she keen to share?</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Was he/she happy, laughing, pointing?</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Did she/he talk about his/her contribution to making the resource?</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Did she/he want to view the resource a number of times?</td>
<td>Yes / No</td>
</tr>
<tr>
<td>What else did he/she say or do?</td>
<td></td>
</tr>
</tbody>
</table>

Who else has your child shared the resource with? Please circle.

- Mum
- Dad
- Siblings
- Grandparents
- Friends
- Other relatives

Has your child’s interest in reading Lynley Dodd’s and other books heightened?

- Yes / No

Is he/she more aware of the language used in the books he or she has read? How does he/she show this?

Any Further Comments:

Thank-you for spending the time to complete this questionnaire. The aim of this research is to improve learning outcomes for your child. Your input is greatly valued and appreciated.

Kind regards,

Liz Fitzsimons

Appendix F
Findings from Pilot Study.

The data was analysed in terms of my two main sub questions:

1. How does meaningful learning occur when children create resources to support their learning?

This resource made during the pilot study was mainly classroom based with some time spent in the playground taking photos. Data was collected through video footage, informal interviews with some children, teacher observations, my own journal recordings, parent surveys and the students’ actual work. The class teacher recorded observations in a narrative form either during or immediately after the lesson. I recorded my reflections after each lesson.

From my readings I developed a set of indicators for each of the attributes of the constructivist theory as outlined by (Jonassen, Peck, & Wilson, 1999). These five attributes will be present if learning is meaningful. These indicators were used by the teacher when she made her observations and as I analysed other data sources.

The indicators for the attributes were as follows.

<table>
<thead>
<tr>
<th>Five attributes: Pilot Study</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active attribute.</td>
<td>Children talking to each other about activity using affirming statements.</td>
</tr>
<tr>
<td></td>
<td>• Children talking to each other using affirming statements.</td>
</tr>
<tr>
<td></td>
<td>• Hastened excited speech patterns.</td>
</tr>
<tr>
<td></td>
<td>• Animated happy faces, laughing.</td>
</tr>
<tr>
<td>Constructive attribute:</td>
<td>• Children using prior experience to assist with the new learning experience.</td>
</tr>
<tr>
<td></td>
<td>• Referring to and sharing past experiences.</td>
</tr>
<tr>
<td></td>
<td>• Showing or modelling from past experiences.</td>
</tr>
<tr>
<td></td>
<td>• Questioning or observing new understanding</td>
</tr>
<tr>
<td>Cooperative attribute:</td>
<td>• Modelling</td>
</tr>
<tr>
<td></td>
<td>• Explaining</td>
</tr>
<tr>
<td></td>
<td>• Sharing ideas</td>
</tr>
<tr>
<td></td>
<td>• Taking turns</td>
</tr>
<tr>
<td>Authentic attribute:</td>
<td>• Participation</td>
</tr>
</tbody>
</table>
What are the Learning Outcomes When Young Children Create and Use Their Own ICT Resources?

<table>
<thead>
<tr>
<th>Intentional attribute:</th>
<th>Active Attribute.</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sharing ideas</td>
<td>‘Real learning’ takes place when children are engaged by a meaningful learning task. They interact with objects and the environment and then observe the results of their interactions.</td>
</tr>
<tr>
<td>• Recorded drawings</td>
<td>These indicators were drawn from the type of engagement I expected to see.</td>
</tr>
<tr>
<td></td>
<td>• Children talking to each other using affirming statements.</td>
</tr>
<tr>
<td></td>
<td>• Hastened excited speech patterns.</td>
</tr>
<tr>
<td></td>
<td>• Animated happy faces, laughing.</td>
</tr>
<tr>
<td></td>
<td>While other activities using ICTs would lend themselves to children talking to each other about what they were doing, this was not very evident when the children were taking photos. Any talking was more of a collaborative nature and will be dealt with in that section.</td>
</tr>
<tr>
<td></td>
<td>When the children were using the cameras they displayed high concentration, through a serious face with a still body. They were very engaged in the activity as they interacted with the camera and the subject being photographed. When they viewed their picture on the LCD screen thereby observing the results of their interaction the children often showed signs of pleasure through a smile or comment.</td>
</tr>
<tr>
<td></td>
<td>The teacher made this observation “The children were intent on their task and completely focused on how to use the camera. They were very serious and determined to get it right”. My own journal reflections agree with this.</td>
</tr>
</tbody>
</table>
|                       | The video data showed similar evidence. While the children’s faces showed happiness or delight after taking the photo, intense concentration was more evident whilst the children were actually taking the photos. This could be attributed to the new learning experience and the need for the child to be still while taking photos. The children were also videoed during the recording of their stories. Once again they were very focused and showed high levels of concentration by still bodies and faces focused on the screen. However, having observed this intense concentration, I will include it as an indicator for the active attribute in my case study.
I also noticed while children showed interest in taking photos and in seeing the results, they readily accepted the change of roles from observing adults being the photographers to children being the photographers themselves. Technology is part of children’s lives and children readily adapt to using it.

**Constructive Attribute**

The active and the constructive are interdependent. The learner has begun from an existing experience or belief and the new experience has caused some variance in understanding. For meaningful learning to occur the learner needs to reflect on the observations and make a shift in thinking.

- **Referring to and sharing past experiences.**
- **Showing or modelling from past experiences.**
- **Questioning or observing new understanding.**

The children enthusiastically set about the task of relating the letters of the alphabet to objects, places and people. Through collaboratively using their prior knowledge of letter links, e.g. a-apple, they were able to decide which photos they would take to represent the letters.

The teacher noted that the children made comments about the cameras belonging to their parents or grandparents. Many had some idea how to take photos and very quickly learned to use the camera. A few children said they had used cameras previously.

My journal also records that some children were keen to relate their experiences of cameras, whether they had taken photos, or simply that their parents possessed a camera. During the actual taking of the photos the children showed evidence of the constructive attribute although it was difficult to record. They would sometimes look at their photo, discover that the image was headless or blurry, and have another attempt. There was a lot of talk by the children about “holding down the button until the green light appears.” The green light indicated that the lens was focused. This was new learning for them and they discovered that by focusing, the photo would not be blurry.

In the transcripts of interviews with ten randomly selected children, each child was able to reflect on their learning and articulate something they had learnt. All children referred to something they had learnt about the camera including; “You don’t wobble it and you don’t touch the lens,” and “How to turn it on and you push the button half way down until a green light appears.” “You had to point the camera where the people are.”
Cooperative Attribute

We live, work and learn in communities. In the real world we naturally find others to help us solve problems. Meaningful learning requires working together and having conversations to solve problems.

- Modelling
- Explaining
- Sharing ideas
- Taking turns

A limited amount of video footage was taken during the pilot. Two instances of cooperative behaviour were evident on the video record. The first instance is where a child is showing another child how to use a camera and the second when a child is checking that the camera strap is around another child’s hand. However the classroom teacher has recorded that,

The children were quick to help each other as the need arose. Whenever anyone looked unsure or insecure about the task one of the other children came to their assistance. They worked really well when it came to taking turns.

Because the children were spread out at different locations around the school when taking the photos, I asked the assisting adults what they noticed about the children’s behaviour. My journal records that, “the adults reported that the children showed enjoyment in the activity and the children appeared to be working cooperatively with each other.”

Authentic Attribute

Learning is meaningful when children are engaged in real life situations. When problems are presented in a meaningful context, learning is more likely to transfer to other situations. Learning should engage children in higher order thinking. Children show willingness to share knowledge of context:

- Hands up
- Sharing ideas
- Recorded drawings

During the lesson where the children were discussing the photos, the classroom teacher observed that while some children were very eager to talk about the task, others needed encouragement. All the children participated when working in small groups. This data was obtained early in my research, and I realized that these indicators were not the best for showing authentic learning. In authentic learning we are talking about the complexity and the context of the activity, these indicators need to be refined.
The task was real and challenging for the children. They were motivated. As has been noted in literature review the attributes of meaningful learning are interrelated, interactive and interdependent and indicators for other attributes will also indicate the presence of authentic learning.

**Intentional Attribute**

As humans we are goal orientated. When learners can verbalise a learning intention and actively seek to achieve it, they make meaning because they are fulfilling a learning goal.

The children are able to articulate the learning intention in their own language.

- *We are making*
- *We are learning about*
- *We are showing that*
- *I know.....*

The teacher observations recorded that the children were very keen to explain why they had been taking photos. They said such things as, “We are making a book to show our parents what we do when we start school”.

I recorded that, “I asked the children what we were going to do? Several children showed through their answers that they understood the activity. “We are going to make a book that we can take home to show our parents and we are going to take photos about what we do at school.”

The transcripts of the pilot study interviews show that all ten children interviewed understood and could articulate the learning intentions. A typical response of a child asked why we made the movie was; “We wanted to tell our Mums and Dads what we do at school”.

The children’s awareness of the learning intention to record their story using a clear speaking voice was evident in the way that they either asked or readily agreed to try re-recording after listening to their first attempt. Some children were able to say why they thought they should record again: “I missed out that word,” or “Too fast.”

2. **What are the learning outcomes when children use the resources they have created?**

Data for this sub question has been gathered from the parent surveys. It has also been provided from the classroom teacher in the form of anecdotal notes and from talking to the school librarian.

**Parent Survey analysis**
I received 14 responses to 23 questionnaires. The resource was completed in the last week of the school term and a CD was burnt for each child. A parent questionnaire was attached to each CD. Some parents returned the questionnaire before the holidays. I sent another survey immediately after the holidays to those parents who had not replied.

The main aim of the survey was to find out whether sharing resources made by children enhances home-school communication and whether resources are effective in supporting parents in helping their children at home. The questions which gave me relevant information were:

- **Does this resource help you to feel more informed about your child’s day at school?**

100% of the parents who returned the form said that the resource enabled them to feel more informed about their child’s day at school.

Some of the comments were:

- Showed some activities I didn’t know about and gave the “flavour” of my child’s school days.
- It is quite difficult to get an articulate answer to, “What did you do at school today?”
- It showed some of the class activity. I’d forgotten about queuing for the water fountain.
- We have conversations about what he enjoys at school and the CD is a great record to show his family who are not able to share this time with him.
- It’s nice to have something tangible to discuss with my child about their school day.
- I can see her participating in a project with other students.

My journal records, “I spoke to a father who was very delighted with the resource. He talked about the excitement his little girl had displayed in showing him the CD and that it had opened doors for talking about school and friends. He said that his daughter recognized the other children’s voices and talked about the children in the photos. He was very keen for more opportunities to share resources at home.”

- **Do you consider that resources such as the ones on the CD could be beneficial in supporting your child at home with his / her learning?**

Of the 14 surveys returned 100% said that the resources such as the one sent out could be beneficial in supporting children at home with learning.
These were some of the comments.

- This learning was great fun with the potential to further challenge our very active learner.
- An extension to (or evolution from) traditional methods.
- Most definitely.
- It’s beneficial for children to review their projects and things they have achieved.
- Almost anything on the computer is interesting to our child especially programmes involving him. Because of that he is more keen to learn. He’s having fun at the same time.

Through the parent questionnaires I looked for evidence that sharing resources was important.

- **Who did your child share the resource with?**

All parents replied that their child had shared it with the immediate family. Three parents indicated that the resource was shared with grandparents and friends. The classroom teacher reported that the resource was regularly shared both on the computer and as a hard copy. The book was processed as a school library book and is being issued to children.

The children shared the movie with their parents at a school assembly. The classroom teacher reported that several parents made very positive comments immediately after the assembly and at the parent interviews that were held soon after.

If the learning activity is authentic then the context is relevant to the learner. The learner would have a sense of ownership and pride because of this relevant context. Two of the questions in the parent questionnaire related to ownership.

- **Did your child make comments to indicate that he/she had taken the photos or recorded the story?**

86% of the parents who replied said yes. Here are some of the comments.

- A very detailed account was given.
- My child showed great pride in the work outcome achieved.
- She enjoyed taking photos. Wasn’t hard to do.
- He indicated the photo he took of the kids in the library and he also indicated to us when he heard his voice.
- She knew all the voices and told us when her turn was coming.
She said she did one but the other kids did two or more.

Told us about the day the pictures were taken, and how she got to take some photos.

- Did your child show pleasure in showing his/her own work?

86% of the parents who replied said yes. Here are some of the comments.

- Enthusiasm is not a problem.
- Great pleasure.
- He showed his pleasure by laughing, hugging and talking to us about the CD
- A lot of pleasure and enjoyment.
- Very excited.

Parents were asked if there were any further comments.

This produced two comments which I will consider for future work.

- Probably has some technical limitations for technology challenged parents, particularly if the initial movie did not play. Really basic step by step options, and confirmation it was virus free!
- MP10 requires either Windows XP (have 2000) or MacOS10.3 (have10.1) so have not watched movie yet. Look forward to it.

These are valid concerns. I had considered the difficulty of parents accessing the software. I took advice from my IT partner. As a result, I decided to present the book as a Power Point show as well as a Media Player 10 file, reasoning that most parents would have access even if they were unable to see it as a movie. There was also the option of printing as a hard copy for two children whose parents did not have access to a computer. However by burning the movie as a DVD the children were able to view the movie on their TV.

Appendix G
Supplementary Findings for Case Study.

1. How does meaningful learning occur when children create resources to support their learning?

Active Attribute

“Real learning,” Jonassen et al. (1999) takes place when children are engaged by a meaningful learning task. They interact with objects and the environment and then observe the results of their interactions.

Indicator 1: Talks about the activity. The following table shows evidence of the case study children talking about the activities.

<table>
<thead>
<tr>
<th>Child</th>
<th>Comments</th>
<th>Video Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emma</td>
<td>Emma is a quiet girl who did not initiate a lot of conversation.</td>
<td>Video (6/06/06) Talking about work with Zach.</td>
</tr>
<tr>
<td></td>
<td>Video (20/06/06) Talking with Katie about next step.</td>
<td>Video (20/06/06) Giving instructions about inserting picture.</td>
</tr>
<tr>
<td></td>
<td>Video (20/06/06) Giving instructions about inserting picture.</td>
<td></td>
</tr>
<tr>
<td>Zach</td>
<td>Zach is very sociable and shows that he sometimes does not manage his time well. However he was very enthusiastic about the work and particularly enjoyed discussing it with Katie.</td>
<td>Video (17/5/06) Zach showing teacher how to clear image. Talking to Casey about her work.</td>
</tr>
<tr>
<td></td>
<td>Video (29/05/06) Zach talking to Katie about work.</td>
<td></td>
</tr>
<tr>
<td>Katie</td>
<td>Katie appeared to be able to work in a very cooperative way; showing at times high concentration, then talking, modelling, explaining and then back to high concentration. Katie and Zach appeared to talk a lot about their work when they were seated together.</td>
<td>Video (17/05/06) Katie discussing how to get the tool box back with another girl.</td>
</tr>
<tr>
<td></td>
<td>Video (29/05/06) Katie talking to Zach about work.</td>
<td>Video (29/05/06) Katie talking to Zach about work.</td>
</tr>
<tr>
<td></td>
<td>Video (7/06/06) Katie talking about her turtle picture.</td>
<td>Video (7/06/06) Katie talking about her turtle picture.</td>
</tr>
<tr>
<td></td>
<td>Video (20/06/06) Talking with Emma about next step.</td>
<td>Video (20/06/06) Giving instructions about inserting picture.</td>
</tr>
<tr>
<td></td>
<td>Video (20/06/06) Giving instructions about inserting picture.</td>
<td>Video (23/06/06) Two Girls Talking. Katie and Casey having a discussion about Casey’s work.</td>
</tr>
<tr>
<td>Millie</td>
<td>Video evidence of Millie is limited as she was either absent or not visible.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Video (7/06/06) Talking about her turtle with Katie and saying she would like to do one like that.</td>
<td></td>
</tr>
<tr>
<td>Casey</td>
<td>Casey did not initiate a lot of conversation. She worked quietly and consistently. Occasionally she appeared to wait for help. She was also observed asking for help from her peers and teachers on a number of occasions.</td>
<td></td>
</tr>
</tbody>
</table>
What are the Learning Outcomes When Young Children Create and Use Their Own ICT Resources?

| Jack        | Jack is a very articulate boy who can be very talkative in the class. This was not so evident in the suite.  
|            | Video (6/06/6) Jack talking to Casey about his burning sun. Later giving an explanation to class teacher.  
|            | Video (7/06/06) Jack asked for help from teacher. |

**Indicator 2: High concentration.**

This table shows examples of the case study children showing high concentration while working on the computers.

| Emma        | Emma was very motivated. She appeared to be absorbed in her work.  
|            | Emma was also a very efficient worker and achieved work of high quality.  
|            | Video (6/06/06) Emma very engrossed in activity. Sitting very still.  
|            | Video (7/06/06) Emma very engrossed in activity. Finished activity quickly. Work of very high standard. |

| Zach        | Zach showed one of the lower scores for High Concentration. However he was often engaged in on task talking. The fact that he was on task is born out by the way in which he was able to give clear instructions when someone needed help. |

| Katie       | Katie was highly motivated. As stated in indicator 1 Katie was very sociable and was able to interchange between talking about the activity to significant periods of high concentration. She was the first child finished her individual book and it is obvious how that happened when watching her on video.  
|            | Video (20/06/06) Katie changing between helping another child and continuing her work. |

| Millie      | There is limited video evidence of Millie as she was absent or not visible on several of the occasions that the lessons were videoed. However the teacher’s observations show evidence of Millie’s high concentration. Millie particularly enjoyed drawing the pictures for the resources and put great effort into her art work. |

| Casey       | Casey was very engaged and showed the highest score for High Concentration. She occasionally appears to need help on the video and after receiving it continues with her work. |
What are the Learning Outcomes When Young Children Create and Use Their Own ICT Resources?

Examples:
Video (20/06/06) Casey is very focused on writing a caption.
Video (6/06/06) Casey very engrossed, very still. Later in the video appeared to be waiting but may have finished.

Jack
As outlined in the case study profile, Jack is rather an active child in the class and so it was surprising to see evidence of Jack sitting very still for significant periods of time, very engrossed in the activity.
Example:
Video (6/06/06) Jack sat intently watching the screen and drawing a burning sun for his background page of The Smallest Turtle.

Constructive Attribute

The learner has begun from an existing experience or belief and the new experience has caused some change in understanding. For meaningful learning to occur the learner needs to reflect on the observations and make a shift in thinking.

Indicator 3: Shows new learning. Through own work, modelling to peer or adult or verbal explanations.

There were many instances where children built on skills and showed transfer of knowledge to new learning and the work output is evidence of this.

My reflective journal indicates the growth in the children’s ability using the technology.

Emma
Emma’s drawing and writing progressed rapidly. She was quick to acquire new technology skills. Her literacy skills developed and her drawings developed in detail. Transcript of Emma explaining her cat.

Researcher: “What makes him a sneaky cat?”
Emma: “Because his tail is going up and down and you can see his mouth is going like sneaky and then his eyes are getting sneaky.”

Katie
There were many examples where Katie demonstrated new learning through modelling and verbal explanations. Part of her interview transcript reads:

Researcher: You must have worked very hard and very fast did you?
Katie: “That is because I listen to you a lot of times.” …..I learnt to listen to people. I’ve learnt to spell some words…..Special words. She seemed to be aware of the reason for her success.

Cooperative Attribute
We live, work and learn in communities. In the real world we naturally find others to help us solve problems. Meaningful learning requires working together and having conversations to solve problems.

Although the resources were made collaboratively as a class, the children worked on individual components for the first three resources.

**Indicators 1 & 2**

- **Modelling**: Showing peer by physically working through steps, with a verbal explanation.
  
- **Explaining**: Verbally giving instructions and pointing to the screen.

<table>
<thead>
<tr>
<th>Zach</th>
<th>The class teacher noted five specific occasions when she observed Zach assisting other children with their work.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The video titled “Modelling” (6/06/06) shows Zach assisting another child.</td>
</tr>
<tr>
<td></td>
<td>Zach became the self appointed person to check that all the computers had been logged off. In the video titled “Logging off,” (7/06/06) Zach can be seen going from one computer to the next checking that they are logged off.</td>
</tr>
<tr>
<td></td>
<td>In another video Zach is giving step by step verbal instructions on how to animate a turtle. (9/06/06)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Emma</th>
<th>Emma was very able to visualize and verbalise pathways.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The class teacher notes four specific occasions when she observed Emma assisting other children with their work.</td>
</tr>
<tr>
<td></td>
<td>Video (24/05/05) Emma is modelling to the class how to make the background transparent.</td>
</tr>
<tr>
<td></td>
<td>Video (20/06/06) Emma is giving instructions for inserting a picture as background with Katie.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Katie</th>
<th>The class teacher noted Katie assisting other children on three occasions.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>However, this is not an accurate picture of Katie’s contribution. She was consistently offering help when needed and very willing to model.</td>
</tr>
<tr>
<td></td>
<td>Video titled “Explaining,” (20/06/06) shows Katie modelling the steps required from logging on to accessing the Room 5 home drive and her own folder and beginning the next part of her little book.</td>
</tr>
<tr>
<td></td>
<td>Video titled “Helping,” (22/06/06) shows her helping Zach with a problem.</td>
</tr>
<tr>
<td></td>
<td>Video titled “Cooperation” (15/06/06) shows her having a discussion with Casey about Casey’s work.</td>
</tr>
</tbody>
</table>

**Authentic Attribute**
When problems are presented in a meaningful context; learning is more likely to transfer to other situations. Learning should engage children in higher order thinking.

**Indicators 2 & 3**

- **Knowledge or interest of context.**

- **Dialogue and work outcomes.**

Evidence of these indicators have been shown together as they are difficult to separate in that if a child is showing interest or knowledge it is quite likely to be through dialogue or work output.

Below are some excerpts from the transcripts which indicate how the children felt about their resources.

| Zach          | Researcher: “How did you feel about your animal animation when you saw it today Zach?”  
|              | Zach: “Proud.”  
|              | Researcher: “Proud! What made you feel proud?’  
|              | Zach: “My animation.”  
|              | Researcher: “Tell me about your animation.”  
|              | Zach: “Umm.. it was… It sounded cool.” |
| Katie        | Researcher: “Can you tell me what you think you did really well in your book?”  
|              | Katie: “My writing and my pictures.”  
|              | Researcher: Tell me about your pictures.  
|              | Katie: “It’s really artisting because the principals said great artist.”  
|              | Researcher: “So you feel that you’re an artist?”  
|              | Katie: “Yep.”  
|              | Researcher: “What did you like about making that book?” (Smallest Turtle.)  
|              | Katie: “Drawing the pictures and animating it.” |
| Millie       | Researcher: “What did you like about it? Tell me some more.”  
|              | Millie: “I liked my writing and my pictures.”  
|              | Researcher: Right. So the pictures and the writing made you feel happy. Have you got a favourite picture which makes you feel very happy?  
|              | Millie: “Ummm, that one.”  
|              | Researcher: Why did you write about Slinky Malinki, Millie?  
|              | Millie: “Because I like how he slides along.”  
|              | Researcher: So you like the character of the cat do you? What sort of a cat is he? He’s a …. |
Millie: “Sneaky cat.”

| Jack          | Researcher: “What do you like about the book you made; your little book?”
|              | Jack: “I think it’s good.”
|              | Researcher: “Why is it good?”
|              | Jack: “Because the pictures are good and I got some of the words right….I got some rich language in it.”
|              | Researcher: “Some rich language. What do you mean by rich language Jack?”
|              | Jack: “Like……. Kick up a Din and stuff like that and boisterous.”

Emma

| Researcher: “Do you like having your own, very own book?”
| Emma: “I’m going to make a shop and give them away and I’m going to keep one.”
| Researcher: “Can you tell me why you made a book about cats?”
| Emma: “Because I like cats. I have a cat at home.”

2. What are the learning outcomes when children use the resources they have created?

The resources were made available to be used at school and at home. Parents were surveyed after they had had access to the CD for approximately three weeks. Fifteen parents were given the questionnaire. Fourteen parents returned the questionnaire. This indicates a 93% return rate.

The survey questions focused on the following aspects:

1. Home / school communication
2. Support for learning.
3. Responses of the children when sharing.

Does this resource help you to feel more informed about some of the work your child does at school?

100% Said that they felt more informed about some of the work their child did at school.

Some of the comments included:

“It shows what the children have achieved and how well they have achieved.”
“Bridget has talked at home a lot about this project. She has been very informed and excited about what she was doing.”

“It enabled you to see instead of just hear what they are up to in school.

“I loved seeing the work the children are doing.”

“Jonathon came home and talked about the work you were doing with Lynley Dodd’s books and was excited……… Great to be able to watch what they have created.”

**Do you feel that such a resource provides a tangible link between school and home?**

100% said that the resource provided a tangible link between school and home.

While this is a similar question to the previous it did bring up some new information regarding the home / school partnership.

Some of the comments included:

“Let’s us share with others also.”

“The CD is a tangible link as it comes home to be shared with family.”

**Was using the CD an enjoyable way to share your child’s work?**

100% said that the CD was an enjoyable way to share their child’s work. Some of these responses also indicate in what ways parents have been informed through the multimedia approach.

**What made it enjoyable for you?** Some of the comments included:

“Interactive as compared with a painting.”

“Sharing it with my daughter and appreciating the opportunity she has had to use IT resources.”

“To see our child work the programme on the computer. She is quite competent and happy to use the computer. To see her recognizing her contribution and others is exciting to see.”

“To see the work involved and the pride in what they had done.”

“Being able to actually view the pictures the children have created. Very attractive visually. Jonathon was really excited showing us his own story.”

“Fantastic, put Casey totally in control. She showed us the CD and explained how it was done.”

“It is just such an awesome, impressive collection of carefully and proudly put together work.”

**Did your child show enthusiasm in sharing his/her work with you? This question was asked to gauge the importance of ownership.**
Here are some of the parent responses.

“She knew everyone’s voice in the CD and what they did. Bridget enjoyed telling us all about them.”

“We talked about what he drew and why he drew it that way. What part of the story he liked. What photos he took.”

“We had to show everyone as soon as we could get there. So much excitement!”

**Does the CD provide you with opportunities to support your child in his/her learning in literacy?**

**Discuss rich, descriptive language?**

Although parents had been informed in an earlier letter that the objective was to develop rich, descriptive language this was more likely to have arisen out of viewing the resource itself and the children’s own input.

57% had used the resource to discuss rich descriptive language. One parent gave no response. Here are some of the responses.

“It may be a bit much to ask of him at this stage but he does find some words more amusing than others and is also making a greater effort in improving his speech.”

“Seems more aware of the rhythm and rhyme and repetition – sometimes makes up tunes to go with the rhythm.”

“Using words found in Lynley Dodd’s books in his own speech.”

“Used more in everyday conversation.”

**As reading material? Has your child read, or have you read the books together?**

100% had used the resource as reading material.

Here are some of the responses.

“Daughter enjoyed reading the stories to a friend visiting from Auckland during the holidays.”

“Wants to watch it all the time.”

“Yes. She knows the stories off by heart. She says the descriptive words very well now.”

**As inspiration for discovering books at the local library?**

43% had used the resource as inspiration to discover more books at the library.

21% did not respond.

**As a way of encouraging your child to draw and write at home?**

86% said that the resource had been used as a way of encouraging their child to draw
and write at home. Of the two remaining parents, one parent said that her child had not required encouragement from her as she had been writing and drawing pictures obviously inspired by the work. The second parent said that her child was already an avid drawer and writer.

Here are some responses:

| “Rosie has rediscovered our Lynley Dodd books, and is loving reading them with me. I have seen her drawing pictures obviously inspired by her work at school, and using some of the language and also rhyme and rhythm from the stories without any encouragement.” |
| “Has spent more time back on the drawing programmes on the computer which hadn’t been used for some time.” |
| “Well, it’s more that she wants to be on the computer all the time. Her confidence has increased so much.” |

Appendix H

Liz Fitzsimons
2006
Resource 1: Animal Animations

Our Favourite words and characters from Lynley Dodd’s picture books.

Slinky Malinky is a rapscallion cat and he is sneaky.

Schnitzel von Krumm has a very low turn and he is a boisterous dog.

Pittery potter, skittery scattery, zip!
A round the corner came Zachary Quack.

Slinky Malinky is blacker than black. He has bright green eyes.

Slinky Malinky, that rapscallion cat, he stole and he lurked in the shadows.

Slinky Malinki, wicked of eye was creeping through the lavender.

Fierce and brave Scarface Claw hustled a spider out of its web.

Appendix I

Katie’s Book.

Jack’s book