



EdNA Online

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A U S T R A L I A

APPROPRIATE EDNA SERVICES FOR CHILDREN EIGHT YEARS AND YOUNGER

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Executive Summary

This report recognises that the use of digital resources in early childhood settings in Australia is a recent phenomenon and one that exists within a context of controversy about the appropriateness of such use and within a context of complex and differing regulatory and provision frameworks. Notwithstanding these contextual factors, the report takes as given the position that all young children need to express themselves and make sense of their world with digital media, artefacts and tools just as they do with traditional media (paper and sand), artefacts (paintings and constructions) and tools (brushes and spades). Digital resources offer children other ways to play, to interact with other children and adults, to control their environments and solve problems, to be creative and to represent their ideas with symbols, words, sounds and images. As such they need to be an integral component of the early childhood curriculum along side traditional manipulative print resources.

The primary function of the report was to provide education.au with advice about online resources for young children. In order to frame the advice, serious attention was given to the situating of good practice with digital resources within current knowledge of how young children learn, the nature of the early childhood curriculum, and the role of early childhood educators. The key element of good practice was the use of digital resources within effective learning environments supported by effective teacher interactions. Effective learning environments that include the use of digital resources are based on:

- ?? the needs, interests and abilities of the children, taking into account the diversity of children's backgrounds and stages of development;
- ?? the broader curriculum processes and goals which emphasis significant ideas (e.g. culture and social systems) across rapidly changing details and contexts;
- ?? the integrating of the digital resources with traditional manipulative and print resources across the total learning environment and within particular play areas and learning centres;
- ?? the social nature of learning and the role of language and interactions with peers and adults within this social process;
- ?? the use of digital resources to support young children in their direction of their own learning experiences; and
- ?? the use of digital resources to create open-ended learning experiences which include communication, exploration and risk-taking.

Effective teacher interactions are based on careful observation and include warmly encouraging both risk-taking and persistence, and asking questions that challenge children's thinking.

An analysis of current online resources for young children identified a growing number of sites that were labelled as children's sites. In terms of the overall resources for young children on the Internet the following four findings represent an overview of current provision within Australia.

The current proliferation of commercially orientated sites for young children dramatically outstrips the number of public sites where children can play, explore and look up information free from advertising, manipulation or exploitation. Suitable public sites are hard to find, and Australian public sites even harder.

At the present time there are no Australian public institutions, apart from EdNA that provides a comprehensive service for children, families or educators which evaluates and lists quality, safe sites for young children.

At the present time there is no public policy framework, nor are there community initiatives, in the area of advocating the development of quality, safe Australian sites for young children. While overall the number of public safe sites for children is growing; more often than not these sites are most suitable for middle childhood (9-14 year olds).

At the present time none of the key public cultural and scientific institutions in Australia, such as botanical gardens, museums, zoological gardens and art galleries, broadcasting organisations have created quality educational sites where young children can work and play or design and make within conceptually rich “worlds”.

Of the sites that were found to be relevant to young children, a diversity of purposes, quality and content existed. A classification system was developed to help conceptualise the nature of these sites.

The four main types of sites were:

- 1) Design and make sites
- 2) Work and play sites
 - a) Activity and game sites
 - b) Explore and investigate sites
 - c) Information sites
- 3) Communicate and share sites
- 4) Online project sites

While taking account of the nature and purpose of an online resource, the following general criteria were applied to the content and design of the site:

- ?? the open-endedness of the activities afforded by the site;
- ?? the appropriateness of the challenges provided by the potential activities;
- ?? the opportunities for collaboration with peers within the setting and/or with others through online communication and sharing;
- ?? the overall quality of the information and experiences;
- ?? the ability to cater for diversity and to challenge stereotypes;
- ?? the appropriate integration of sound, text, graphics and animation;
- ?? easy navigation;
- ?? efficient technology; and
- ?? safety.

Using these criteria the following findings were made about current online resources for young children. Overall the range and quality of resources for independent use by children under five are poor. Currently, the higher quality digital resources that are appropriate for independent use by this age group already exist as CD-ROM based software. Most Internet experiences for this age group will continue in the short to medium term, to be mediated if only in part, by parents and educators. Communication and sharing, in particular will remain joint activities until voice recognition and transmission are better-developed technologies.

For the 5-8 year olds, the quality and range of resources were patchy, yet there were sufficient sites of quality to enable educators working in the early year of school to effectively integrate digital resources from the Internet into their curriculum. Of uniform high quality were the online project sites, both in terms of the range of projects offered and the quality of the actual projects. Design and make sites could not compete with their CD-ROM based counterparts. Appropriate work and play sites, particularly information sites, while patchy in quality, existed in sufficient numbers to make a validated collection of quality sites viable and extremely useful to educators. Communicate and share

sites, *per se*, may continue to have little place in educational settings as their roles are already fulfilled by email and online project sites.

When considering advice on the organisation of online resources for young children, it was recognised that any online collection would serve multiple purposes and therefore need multiple representations. Educators consulted in the study, felt it was important that any such collection serve both the needs of young children themselves as well as their educators. Given the current controversy that surrounds the use of digital resources and the lack of use by early childhood educators, the key organisational feature of a collection would need to be the embedding of the children's resources within meta-resources and an online community that would help create these meta-resources and support colleagues using them. The recommended information to be used to categorise children's sites was: the nature of the sites (see classification system above), the safety of the site; the portability of the site; and the overall quality given its purpose. The recommended design features of the representation of the collection were: a sense of place, a welcoming feel, easy navigation, and quick access to alternative views for particular purposes, and sophisticated searching functions for the regular and expert users.

Based on the above approach, sets of findings and advice the following recommendations are put to education.au limited:

- ?? Continue to provide a collection of quality safe educational sites for young children. The collection should concentrate on exploratory sites, information sites and online project sites.
- ?? Focus on sites for young children under five as well as children between the ages of five and eight.
- ?? Provide additional information about the sites, beyond content and age group that will facilitate more effective selection by early childhood educators. Such information might include nature of site, mode of uses, safety, and overall quality.
- ?? Act as an advocate and broker for the development of quality educational exploratory and information sites for young children by key national cultural institutions.
- ?? Add value to its collection of validated young children's sites by embedding it within an online professional community. This would involve two overlapping services: the development of 'meta-resources' for each of the resources it provides for young children and the development and maintenance of an online community of early childhood educators.
- ?? Invite pre-service early childhood teacher education faculties to explore ways that pre-service students can become early members of the community and as part of their coursework and practicum requirements contribute to the development of the meta-resources.
- ?? Explore ways and means of publicising its services to early childhood educators.
- ?? Create a virtual space which will not only attract early childhood educators to the site but also encourages them to remain and 'visit' the various collections and participate in the community of educators.
- ?? Welcome young children to a place where they can explore and take risks within a safe and managed environment. This environment needs to be modifiable by educators to meet the needs and interests of the children with whom they are working.
- ?? Use a metaphor to create a visual image of the virtual space that intuitively signals to children and educators where they can go to visit and use the provided resources.
- ?? Within the children's part of the site, provide visual cues that lead to various representations of collection.

1 Introduction

The use of computers within early childhood educational settings in Australia is a relatively new phenomenon. Since the mid-seventies there have been school education initiatives at the national, state and system levels. These have ensured that, today, children in all schools in Australia, have access to computers in their schools. Not surprisingly, the initial focus of policy in the '70s and early '80s was directed to secondary schooling and focused on learning about computers and related technology. Over the ensuing decades, syllabuses around Australia included statements about using computers for teaching and learning across the curriculum, as well as learning about and using computers within the framework of Technology as a Key Learning Area. These curriculum changes, combined with continuing programs of hardware provision and professional development have ensured that the use of digital resources has spread from the senior years to the early years to schooling. Within the last five years, this wide spread use has come to include access to and use of Internet resources.

Notwithstanding this achievement, in the minds of many educators, the use of digital resources in education has been seen as more appropriate for older children. Often children in the early years of schooling have had little access either because their teachers have believed that it was not important or appropriate in their curriculum or that the limited computer hardware available within the school had been directed towards older children. This phenomenon also applies to the recent provision of access to the Internet and its use for teaching and learning.

Computer use with very young children (birth to five years of age) in early childhood settings is even less common than in the early years of schooling and Internet use is almost non-existent. This is partly due to the complexity of service provision, funding, and regulatory frameworks within the early childhood education sector in Australia and partly due to the continuing controversy surrounding the appropriateness of computer use with young children (see Appendix A).

Historically, within this sector there have been few curriculum policy initiatives that have had wide spread adoption across the national early childhood education sector, nor government initiatives that have provided additional resources across this sector. Curriculum initiatives that have succeeded have done so through links with regulatory frameworks, for example, where the use of the Internet is included as an outcome indicator in curriculum documents. Such indicators, however, tend to only be present in the curriculum for upper primary school. Given these conditions, it is not surprising that few children in 0-5 early childhood settings have access to or use computers. Possible exceptions to this would be in those states where preschools are part of the public school system. Yet even within these settings, there is little evidence that large numbers of educators are committed to the use of digital resources for learning or that the children in these settings regularly use digital resources.

Nevertheless, exposure to the digital world is a "fact of life" for an increasing number of young children. The most recent Australian Bureau of Statistics (1998) study of Household Use of Information Technology revealed that 48% of Australian homes whose oldest child is in the age range 0-4 years have computers. This proportion increases to 54% for homes whose oldest child is in the age range 5-9 years, and 71% whose oldest child is in the age range 10-14 years. Significantly, the number of households with Internet access increased four-fold over the period 1996 to 1998, with 1.1 million households now connected to the Internet. One third of these connected households were households with children.

This report takes as given the belief that all young children need to express themselves and make sense of their world with digital media, artefacts and tools just as they do with traditional media (paper and sand), artefacts (paintings and constructions) and tools (brushes and spades). To deny some children access to the wide range of media, artefacts and tools that are common place in the worlds in which they live is to perpetuate social and educational inequalities. Traditional 'print' media, artefacts and tools are considered not only appropriate but essential components of the early childhood setting, they are the primary resources for leading the young child into a world of ideas, symbols and representations. In today's early childhood settings, digital media, artefacts and tools are also essential. These digital resources offer children other ways to play, to interact with other children and adults, to control their environments and solve problems, to be creative and to represent their ideas with words, sounds and images. As such they need to be an integral component of the early childhood curriculum.

The ensuing task for educational authorities in Australia is to provide professional development and appropriate resources to the early childhood sector that challenge early childhood educators to reflect on their beliefs and practices, and to design and support learning environments where young children can effectively interact with the digital resources in ways that enhance their learning and development. In order to assist education.au (EdNA Online) to better serve the educational authorities and early childhood educators who are striving to meet this challenge, this paper addresses a number of objectives relevant to the use of digital resources in early childhood settings.

1.1 Objectives

This paper:

- ?? identifies the key elements of good practice of early childhood educators in relation to the use of the Internet with children under 8 years;
- ?? comments on the availability of good Internet resources for children under 8 years;
- ?? identifies and prioritises the key requirements of educators for the organisation of Internet resources for children 0-8 years;
- ?? identifies options to improve the service delivered by EdNA Online to users in this area; and
- ?? provides advice on and identifies purpose for elements of an Early Childhood pathway on EdNA.

1.2 Methods

In order to gain a holistic picture of the issues, this paper is based upon the views of all of the stakeholders in early childhood education—early childhood educators, system representatives, academics, researchers, policy makers and advisers, parents, and children.

The following strategies were used to collect background information and empirical data:

- 1) A literature search of Australian and international research, policy and professional literature on the educational use of the Internet with under eights (In addition, telephone and email contact was made with a number of key researchers both within Australia and internationally).
- 2) A one-day workshop in Sydney of the steering group and invited early childhood educators to explore theoretical, research, policy and practical issues associated with young children's use of the Internet and current thinking on EdNA pathways.
- 3) Individual phone calls to selected early childhood educators to explore curriculum and pedagogical issues facing educators using the Internet with children under eight.

- 4) A focus group of parents whose young children regularly use computers and/or the Internet in their home or communities exploring children's current uses and parental views on children's use in home and educational settings.
- 5) Two focus groups of young children who regularly use computers/Internet in their homes and educational settings exploring children's own practices and views on appropriate, useful and enjoyable Internet activities. One group included children from a school setting, the other a group of children from a day care setting.
- 6) Telephone and/or email contact was made with system consultants and educators working in the area of early childhood curriculum and the use of new technologies in each State. The discussion centred on system-level curriculum issues facing early childhood educators using online resources, curriculum plans for integrating online activities across the curriculum, and requirements for EdNA Online services.

These data were collected over a four-week period from mid-May to mid-June 1999. For details of the study participants see Appendix B. The one-day workshop, parent focus group and the two focus groups with children were recorded on audiotape and transcribed for analysis. Notes were taken during the individual telephone interviews. The data were then examined to identify issues related to the five study objectives.

In addition to seeking the views of the stakeholders in early childhood education, a search of EdNA site and the wider Internet was undertaken to identify and evaluate appropriate educational, recreational and popular culture sites relevant and appropriate for young children, in the age groups 0-5, and 5-8 years, and identify trends in the and nature and provision of sites.

1.3 Report Structure

The following sections of this paper are organised in line with the study objectives. The first three of these sections deal with the broad issues of:

- ?? identifying the key elements of good practice in the use of the Internet in early childhood educational settings (Section 2);
- ?? identifying the characteristics of good Internet resources for, and evaluating the availability of good resources (Section 3);
- ?? determining the requirements for good organisation of Internet resources for children under 8 years old and early childhood educators (Section 4).

The final section of this paper (Section 5) deals specifically with issues related to the provision of EdNA Online services.

2 Good practice in the use of the Internet with young children

2.1 The context for good practice

In order to be able to identify the key elements of good practice in the use of digital media in early childhood educational settings, it is essential to understand how young children learn and to acknowledge the role of curriculum and early childhood educators.

2.1.1 How young children learn

Young children learn through interacting with their environment and people in a social and cultural context. They actively construct their own knowledge by engaging in experiences where they have opportunities to explore and manipulate objects, representations and ideas, and where their learning is supported and scaffolded by peers and adults. Play is an important part of young children's learning as it provides many opportunities for young children to experience and discover, develop concepts, make and test predictions and hypotheses and refine their understandings. While young children need opportunities to explore and discover unassisted, they also need experiences where adults mediate their learning. Peers and adults mediate children's learning by at different times challenging, confirming and extending on children's developing understandings of concepts and processes.

Children learn what is appropriate in order to participate within their society and culture and learn by observing and imitating others and by exploring their environment. Repetition is important as children need opportunities to revisit experiences and concepts, to practise skills and processes and refine understandings of concepts.

2.1.2 Appropriate curriculum

Appropriate curriculum caters for children's need to actively construct their own understandings while acknowledging the essential role that interactions with peers and adults play in children's learning. For children under eight, curriculum is best if it is child-centred, catering for individual strengths, needs, interests and learning styles.

Children learn best when they can choose from a range of experiences that are open-ended and responsive. When experiences are open-ended children can participate in ways that are relevant to them and at their level. Open-ended experiences cater for different learning styles and multiple intelligences.

Providing children with choices means that they are able to select experiences that reflect their interests and to be in control of their learning. When children are intrinsically motivated to participate in experiences that are relevant and meaningful to them they are actively engaged in learning. Engagement results in new learnings as children investigate issues that are of importance to them.

Young children seek to make meaning of what surrounds them in their environment as part of this investigation. Since most young children in Australia live in literacy saturated communities, they learn various literacies as social practices within their family and community. They see significant people in their lives using literacy for various purposes. Young children are likely to explore literacy in its many forms, such as environmental print (eg. road signs, advertising, food packaging,); personal

print (eg. birthday cards, notes to people, shopping lists); and digital media (eg. television shows, email, Internet, computer games). Appropriate curriculum for young children includes the multiple literacies with which young children are familiar (Makin *et al.*, 1999). Their literacy learning is reflected throughout their play as they participate in sound and word games, retell stories and jokes, read and write for their own purposes, critically read toy catalogues, represent their experiences in drawings and so on, using both print and digital media.

While most long day care centres and preschools take a child-centred approach to curriculum, schools have often tended to take a traditional approach to learning that emphasises educators transmitting knowledge to children (Schools Council, 1992). More recent approaches emphasise children's active involvement in exploring issues, asking questions and constructing their own knowledge (SNAB; Jones, Valdez, Nowakowski and Rasmussen, 1995). Definitions of learning have moved from traditional views of rote learning and assimilation of knowledge to a focus on "engaged learning" that involves student interactions, connections and collaborations (SNAB; Jones *et. al.*, 1995). The ability to think creatively and critically as well as the skills necessary to access new knowledge and solve problems will be essential requirements for the 21st century (SNAB; Snider and Gershner, 1997). These processes, rather than the acquisition of a set body of knowledge are at the core of current curriculum. To be meaningful digital resources need to support this new type of engaged, collaborative learning of key processes.

2.1.3 The role of the early childhood educator

The role of the early childhood educator is to observe children's interests and development and plan appropriate experiences that foster these. Whereas traditional approaches view the early childhood educator as a transmitter of knowledge, current child-centred approaches stress the multiple roles of educators, including facilitator and co-learner (SNAB). In a child-centred approach, teaching strategies need to be adjusted for individual children. At times there may be a need for high levels of adult involvement with demonstrations and direct instruction, at other times children may require support and scaffolding and at other times it may be appropriate to leave children to play and explore unassisted.

Vygotsky's social constructionist theory of learning, which stresses the importance of children being challenged to work within their zone of proximal development, means that adults have a significant role in children's learning. In particular, early childhood educators need to provide experiences that have an appropriate level of challenge and need to develop strategies that scaffold children's learning.

The role of the educator in extending children's early literacy is a particularly crucial one. Educators provide resources and identify relevant experiences that present literacy learning potentials, as well as interact with children in individual ways. Literacy learning experiences include exploring food packaging with children at snack time, using the Internet to identify whether the creature the children found outdoors is a lizard or small snake, providing resources such as various types of paper, "textas", and drawing packages such as Kid Pix for drawing and writing areas, and placing resources such as computers in the office dramatic play centre. There are many literacy learning opportunities throughout the child's day where they can be assisted to further learn about literacy in a way that is integrated into their play and takes account of the child's social, cultural and linguistic background.

The nature of digital media such as the Internet challenge accepted definitions of literacy and literacy behaviours (Leu, 1997; Reinking, 1995) in terms of the isolated and fixed nature of texts, the assumed logical flow of information processing, and the processes of reading and writing being seen as separate aspects of literacy. El-Hindi (1998) defines literacy as "being able to make sense of and

navigate through several forms of information including images, sounds, animation and ongoing discussion groups”. Being literate at the beginning of the 21st century means integrating spoken, read and written texts, navigating electronically information sources; responding critically to information (including images, sounds, animation and written texts), and communicating with email as well as communicating by phone or in person.

It is well recognised that being literate in the area of digital media is rapidly becoming be a key competency for young people. It is also apparent that:

...to realise the potential of learning technologies to maximise student learning outcomes we need to bring about a paradigm shift. Schooling...is not about getting shiny new tools to keep doing the same things in the same ways. Nor is it a resources grab pandering to a cargo cult mentality—a sort of new age version of “whose mum’s got a whirlpool”—whose school has its own web page? (Rout, 1997, p.5)

What, then, will schooling 2001 be about? What is the best way of supporting children to become competent and literate in the era of digital technology? The first question to be answered in this study, thus, is “What are the key elements of good practice in the use of the Internet in early childhood education?”

2.2 Key Elements of Good Practice

Clements (1999) in a recent review of research on technology and young children, argues that appropriate computer based experiences need to develop from “the art and science of teaching and learning” rather than demonstrating “technologically advanced bells and whistles disguising ordinary activities”. In order to achieve this, the early childhood educators who participated in this current study identified two key areas which require consideration—creating effective learning environments for young children using digital media, and engaging in effective educator interactions to promote young children’s learning with digital media.

2.2.1 Effective learning environments

In early childhood settings, the organisation of the learning environment is central to the high quality of the program offered. The environment due to its design and available resources, is regarded as the third teacher (Greenman, 1988). The environment provides the predictable yet flexible opportunities for the child to engage in play and in pursuing their own focus as they decide on areas in which to participate and which resources to access in their play. They might include areas such as block area, dramatic play, art area, construction area, and science areas.

Digital media has unique potential as a flexible and relevant resource within the learning environment. A number of issues connected with the development of good environments for the use of digital media in early childhood educational settings were raised by the informants in this current study.

These issues include:

- ?? the pedagogical approaches needed to shape the use of digital resources;
- ?? the learning goals and outcomes to be achieved;
- ?? the embedding of digital resources within learning environments;
- ?? digital media use as a social activity;
- ?? using digital media in child directed experiences; and
- ?? using digital resources in ways that create open-ended learning experiences.

These will be discussed in turn below.

2.2.1.1 Pedagogical approaches need to shape the use of digital resources

Educators who participated in this study identified the central importance of continuity between philosophical and pedagogical approaches and digital resources in order to provide appropriate curriculum for young children. Educators commented that digital resources needed to reflect current understandings of learning and learning environments. These include the recognition that children mature at different ages and have different interests and different learning styles; and that there is a need to create a balance between familiar/new topics and processes for the child and a balance of predicability and appropriate repetition.

Planning the integration of digital resources into curriculum for young children starts in the same place as all appropriate planning for young children - with the child. Clements (1999) argues that the children, their diversity of backgrounds, interests, and developments need to be considered along with the variety of environments in which they learn. Thus, the starting place for good practices, as expressed by one informant, is “so good practice (with digital resources) comes out of a philosophical perspective of how kids work (learn).”

For this to occur, the design of the learning environments needs to be progressively layered so that individual child and groups of children can actively investigate further to satisfy their learning focus, strengths, needs and interests in appropriate and challenging ways. In designing these learning environments, early childhood educators need to actively seek the integration of everyday manipulatives, print and digital resources. Clements (1999) provides the framework for such integration within early childhood mathematics thus:

The starting point for the curriculum lies in identifying mathematical concepts and processes from the children, their experiences and interests. Educators then provide experiences that reflect and elaborate on the mathematical aspects of the child's experiences and interests. When children and adults create models of these experiences, the representation provides children with cognitive building blocks for.... (p.10)

For further detail on one example of successful integration of digital resources into the early childhood mathematics curriculum, see *Building Blocks* (Clements, 1999). This example reflects ways in which mathematics and digital resources are integrated to promote and extend young children's learning.

2.2.1.2 Learning goals shape use of digital resources

In the focus groups and interviews, educators asserted overwhelming concerns that children's use of digital technology is to be purposeful in the sense that it needs to relate to specific learning goals or have a particular focus. The focus of the experiences in the learning environment is crucial for children whether or not they are using traditional or digital resources. Current curriculum directions for young children focus on many significant processes, for example, learning to learn, learning to be critical thinkers, readers, and mathematicians, as they access information from a range of sources to become creative and resourceful problem solvers. They also include learning to initiate, develop and maintain meaningful relationships with others; to appreciate, understand and build upon the diversity of human society and its environments; to investigate, analyse and to take action to get their own needs met within their own communities; as well as to develop positive attitudes and values. These learning processes are increasingly being utilised in more diverse areas of the early childhood curriculum. For instance in the field of mathematics there is less emphasis on children engaging in drill and practice of isolated facts, and more on children using manipulatives, print and digital resources to talk about and solve problems and undertake investigations in geometry, number and patterns. This leads to a mindful curriculum, relevant to children and their ever-changing worlds.

The current approach to early childhood curriculum emphasises significant ideas across rapidly changing details and contexts. Developing an understanding of these ‘big ideas’, which include change, culture and social systems, is more important in the long run, than developing defined sets of knowledge. One educator who participated in this study expressed this in terms of it being crucial that children get past the novelty and develop understandings and competence with process— “Beyond ‘Isn’t this exciting?’ they are also understanding what they are doing”.

When digital resources are introduced into the early childhood curriculum, they primarily need to be used in the service of these broader curriculum process and curriculum goals while at the same time meeting the needs and interests of the child. In many ways, these broader goals help shape the way digital resources are used, rather than what they are used for. As one educator said, using digital resources is “about process *and* content... the interaction between the two is very important.”

2.2.1.3 Embedding digital resources within learning environments

Educators participating in this study were unanimous in their emphasis that digital media needed to be integrated into the curriculum to be most useful to children. They saw digital media as another resource to be utilised alongside traditional resources within the learning environment to promote children’s learning. Educators did not view the Internet as the authoritative and appropriate source of all knowledge for all things, however they stated good practice meant that educators needed to know good sites with reliable content and the ways to integrate them with other learning experiences within the day.

Effective integration of digital resources in the learning environment is reflected in their timely, flexible and varied use within the total learning environment. As dictated by the degrees of engagement shown by the children and the defined curriculum goals, digital resources can be judiciously moved around and integrated within the play areas/learning centres of the environment. This may mean that the computer is part of the art area for a couple of weeks offering tools for drawing and designing as well as providing access to art works related to families for the children to investigate. When moved to become part of dramatic play area, an appropriate Internet site or piece of software with factual information or exploratory environments in relation to skeletons and broken bones can support children’s role playing in the hospital context. This could lead to further investigation through access to various Internet sites, or paper-based texts of what makes healthy bones etc. When moved to become part of the science area the Internet could provide the communication channels and information for children to participate in a whale watch project, working with children from other schools. In some settings the computer and its related resources cannot be easily relocated to the various areas. In these settings it may be possible to bring the “area” to the computer. Changing the displays and props with the changing use of the computer helps shape children’s perceptions. They do not see it as a “computer corner” but rather as part of the “writing area” or “art area”. In these ways digital resources are utilised to extend and elaborate on the program in an integrated way along side other learning experiences and resources. The use is not a focus in itself, and children will not be “doing computers”. The educators who participated in this study agreed, saying, for example, “Access (to digital media) is supported by teachers, but it’s not to say go away and use it as an isolated activity... it’s not just isolated from other experiences... having the Internet activities... related to the other activities is part of the matrix and that goes to all sides— purposefulness, related use and supported by parents and educators when needed.”

Research suggests that this approach of combining digital and traditional resources within a learning environment is a powerful framework for learning and development. Haugland (1992) found that

children engaging in appropriate learning experiences using digital resources alone, improved in many areas such as intelligence, non-verbal skills, long term memory and manual dexterity. However, he also found that children who used a range of traditional and digital resources also improved in verbal, problem solving and conceptual skills. It seems the child's play and active learning using a wide variety of learning media, artefacts and tools, including digital ones, can improve learning and development.

2.2.1.4 Using digital resources is a social activity

Educators in this study saw that the computer provided a major focus for much child interaction and learning prompted by peers and educators. Sometimes peers provided the modelling, scaffolding and challenge for further learning, and sometimes it was the educator. Whether children were using the digital resources or not, they would learn from the modelling by educators and peers where it was presented within a context of need /relevance to the child.

Since young children learn so much through social interactions with both peers and early childhood educators, it is essential to examine the role of experiences using digital resources in promoting talking and learning. Ten years of research has identified that the use of digital resources for learning acts as catalyst for social interaction (Clements, 1999). Muller and Perlmutter (1985) found that children interacting with peers at a computer talk nine times as much as when they complete puzzles. Importantly this talk is mainly task-related. Genishi, McCollum and Strand (1985) found that almost all (95%) of children's talk, whilst engaged in Logo experiences, was actually about Logo. Clements and Nastasi (1992) have also found that children would rather work with a peer than work alone and they would develop new friendships around the computer where there was more and spontaneous peer teaching and helping each other. Mixed age groups provide more experienced and diverse models of learning to less experienced children (Arthur *et al*, 1996).

Since young children talk so much about what they are doing, social activity and social interaction is an important aspect of the collaborative learning that young children engage in around the computer. The nature of children's social interactions is influenced by the characteristics of the digital resources they use for learning. Collaboration is encouraged through the use of resources that create open-ended experiences, in contrast, turn taking as well as competition is promoted by drill and practice experiences (Clements, 1999). As a consequence the child's learning is influenced as well as their language.

The use of digital media as part of a literacy program, for example, results in moving literacy away from a solitary activity into a social activity, as children within the room and across the city, county and world can collaborate and communicate with each other (El-Hindi, 1998). The educators who participated in this current study noted that when using digital technology, children "learn from peers and siblings more than from anyone else. So that modelling, the exposure to anticipation, is, for instance, to draw a friend into what you are doing." The social interactions that children engage in assist and challenge each other's learnings in literacy.

A number of educators in this study particularly recognised the value of children having access to "sites which show how other children have solved problems, let's share, for example, focus on what other children are doing. When kids ask questions of other kids, kids who created their own pages then they became the resources and a wealth of material is generated."

2.2.1.5 Using digital resources in child-directed experiences

Educators in this study indicated that digital resources need to support children in their direction of their own learning experiences. They need to be able to investigate their own interests. The educators in this study "...believe from an early childhood perspective that our role is not to 'teach' children, but to be conduits for children, enabling them to explore issues, to further develop ideas."

As in any learning experience, where the child directs and controls their own use of the media, artefacts and tools, they are likely to be developing at their own pace, not rushed or required to learn or complete set activities (Arthur *et al*, 1996). When the children direct their behaviours and learning, they choose and complete experiences to their own satisfaction. As a result, creativity and problem solving are more likely to be associated outcomes rather than artefacts that aspire to adult standards. When the children actively explore the environment and resources and satisfy their curiosity as they make meaning, they are internally motivated, make their own decisions and develop their sense of competence and control. This contributes greatly to the development of their independence as well as positive self-esteem and self-concept. Child directed experiences using digital resources are yet another way of showing respect for the child and their developing ability to make choices and direct their own learning.

When planning child directed experiences with digital resources, the planning needs to start from careful observation of the child. The resources that young children use and explore need to be relevant to the child. As one participant expressed, "the child makes the decision where to go". When the digital environment incorporates concepts, processes, attitudes and values that are relevant, known and understandable to the child, they are likely to be very interested and intrinsically motivated to respond, listen, read and investigate further. Relevance to and appropriateness for the child often reflect environments or elements within environments that are known to the child and relate to their experiences and interests as well as their family, language/s, culture/s and lifestyles.

When digital resources create learning environments that are of deep interest to the child, the child responds in ways that reflect closer attention, higher levels of understanding and greater intrinsic motivation. The arousal of interest provides the impetus for children to pursue particular experiences for considerable lengths of time, to endure and weave around the constraints that may be appearing as they seek to find out more about a particular idea or to revisit and extend a particular experience. The child's own interest in the experience provides the incentive and their own purpose for deep engagement and direction in their own learning (Cambourne, 1988). The child becomes very sensitive and aware of the nature of anything to do with the interest.

The power of children's interest in the use of the Internet was readily recognised by the educators who participated in this study, for example, one educator commented that "kids want to find European soccer results through sites on the Internet; it's a passionate interest".

Planning for computer based experiences that relate to children's interests is part of effective planning. The participants in this current study recognised that it is the educator's role to prepare the environment, to make "bookmarks... so they know where to find things. It's a support as well as knowing where to find things that interest them, rather than children being left to get frustrated." As Bredekamp and Rosegrant (1992, p.39) state "Considering children's interests does not mean indulging children or abdicating responsibility", it does mean harnessing the high levels of responsiveness and engagement shown by the child. Jones, Valdez, Nowakowski and Rasmussen (1995) include this as one of the characteristics of engaged learners, namely children showing they are energised by learning.

When children are excited by their learning, when they are passionate about their interests, they keep on investigating, listening, talking, designing, constructing, asking questions, reading and writing. Children do respond positively and actively to experiences that respect and extend on their interests. They are not able to stop themselves learning (Beecher, 1998). “That is not to say that a particular child [using the Internet] may say from time to time ‘Oh that’s boring’ compared to the faster pace of an electronic game that they’re used to playing, but reading a book or watching TV is different to playing a game and [the goal is] children who can move comfortably between those based on their own dispositions...”

2.2.1.6 Digital resources need to be used in ways that create open-ended learning experiences

In this study, educators saw that it was important to provide open-ended learning experiences with digital resources. Children need depth in the resources, that is, many layers of meaning to explore, rather than fixed or limited resources. Digital resources need to be responsive to the child’s actions, and to be interactive in order to maintain the child’s interest.

Digital resources for child-directed experiences need to be open ended, in order to cater for the ways and directions in which young children learn. Young children can repeat and practice similar/same experiences many times. They do this as they develop greater understandings, more refined development, from gross approximations towards more mature and more conventional ways to doing things. Young children need to be able to return to experiences to do again. From close observation of children’s repeated attempts, their repeated experiences are most unlikely to be exactly the same. Children are likely to repeat with a slightly different focus, to repeat with variations, to be focusing on some different aspect. Child initiated repetition is very different to adult directed repetition. The child has the locus of control and so the child is attending to different aspects etc. In doing things again, the experiences need to be able to offer different responses to the child’s attempts, rather than the same response as last time. For this reason, the digital resources need to be sufficiently open-ended and challenging to encourage children to return time and time again.

The nature of the open-endedness of experiences created by digital resources is complex. The experience needs to respond to the individual child or small group of children utilising the experience. In this situation, different children are likely to need different experiences, with different kinds and levels of response and further experiences, as well as being different on different occasions for repeated practice. This feature of appropriate experiences has been identified as sorting the chaff from the wheat in relation to particular digital resources (Dublin, Pressman, Barnett and Woldman, 1994).

The experiences need to be able to

- ?? encourage children to respond in “thoughtful ways”,
- ?? offer response to children’s answers,
- ?? offer variations that are child controlled,
- ?? cater for individual children’s ability, cognitive development and computer skills as well as the child’s culture/s and language/s.

In contrast, drill and practice experiences are well identified as offering limited opportunity for children to develop and extend their problem solving processes and attitudes. The US NAEYC (1991 in Chang, Rossini, and Pan 1997) criticised drill and practice experiences as limiting children’s thinking. Other researchers have elaborated on the inappropriateness of drill and practice type experiences. Haugland and Wright (in Chang *et al*, 1997) argue that when young children memorise the answers in drill and practice type experiences, they reduce their focus on interacting with others

and objects. This leads to a reduction in their focus on their own construction of ideas and processes, their joint participation in the social construction of these ideas and processes as well as their participation in creative problem solving processes. In addition, Clements and Nastasi (1993) found that drill and practice experiences did not improve children's conceptual development as much as discovery based computer based experiences.

The challenge of providing appropriate digital resources reflecting the complexity of learning was clearly defined by the participants in the current study – 'Kids work very well with the exploratory mode; 'Lots of interaction and lots of colour and feedback. Should also not be anything too complex (or) you lose the children'. Another educator reinforced the cyclic and dynamic nature of young children's learning which is necessary to account for in digital resources – "They are picking up different things all the time, things can be developed in that way, then there's this freshness but repetition and they're learning new things all the time and relating the elements."

Another important point arises from the research literature on the power of open-ended learning experiences. Well designed, open ended group projects result in better learning for children than when children explored in random ways (Lemersie, 1993). More recently, Clements (1999) argued that when designing learning experience using digital resources, educators must enable children to spend more time looking for ways to collaboratively solve problems while working on a specifically designed group project.

Once the environment is effectively set up, the educator is then free to observe and to interact with children in appropriate ways as explored in the following section.

2.2.2 Effective educator interactions

The informants in this study identified a number of key elements of effective interactions between educators and young children. Of primary importance was role of the educator in scaffolding children's use of digital media, thereby encouraging risk taking and persistence, and asking questions that challenge children's thinking.

The adult's role in scaffolding children's thinking and learning is complex and crucial. Since young children need different types of scaffolding at different times, the educator firstly needs to be a consistent and close observer of children's actions and interactions (Arthur *et al*, 1996). At times, observations may need to be prolonged in order to see the learnings with digital resources (Cochran-Smith, Kahn and Paris, 1988). In addition, the public nature of children's interactions with screens and keyboards, and their prolonged engagement with open-ended experiences enable educators to observe children's diverse learning and thinking styles (Emihovich and Miller, 1988) and interactions (Wright, 1994).

From close observations, educators are then able to scaffold and interact with children from an informed and appropriate stance. Appropriate interactions may range from acknowledgment to co-constructing to directive interactions with children as explored in the continuum of teaching strategies (Bredenkamp and Rosegrant, 1992). Put simply, different children need different interactions to promote their learnings at different times and this applies to learning with manipulatives, traditional and digital resources. The following are particular points that need to be considered when interacting with children using digital resources.

2.2.2.1 Warmly encourage both risk-taking and persistence

The emotional and social environment implemented by the educator will have a strong impact on the children's responses to using digital resources. Children need to feel comfortable and that their efforts with digital resources, as with all experiences are valued and accepted. They need to feel that it's acceptable to have a go, and to understand that to make mistakes is part of the learning process. One of the factors that promote these ideas is the role the educators play in demonstrating and modelling as well as co-constructing with children in relation to using digital resources and taking risks. When children see educators "have a go, get it wrong and the sky doesn't fall in", children believe it's safe for them to take risks as well. Indeed, the educators and parents who participated in the current study believed that "kids who have experiences on the Internet, they would be more confident and take a risk to get something out of it, they are pretty cluey at that age, its more than child development, the processes will be more aligned."

Persistence is an attitude as well as a behaviour. It's a part of positive approaches to problem solving, where attempts to achieve a goal are repeated. These may begin with random attempts at the goal, but soon, from evaluation of attempts, the attempts of trial and error begin to become more strategic in achieving the goal. Educators need to model this behaviour when solving problems using digital resources, as well as when using traditional resources. Representation and celebration of children's risk taking behaviours and persistence in problem solving through further discussions, questions, photos, drawings, dictated sentences, children's meetings (Watson, 1997) are important dimensions of the adult's role in promoting these attitudes and behaviours. It is important that these representations and celebrations are extended to problem solving environments using digital resources as well as traditional resources.

2.2.2.2 Ask questions that challenge children's thinking

Educators are able to ask a whole range of questions to promote children's learning whilst using digital resources. Young children's oral language development and associated cognitive development is usually reflected in the functions of language (Tough, 1981) that they utilise. Such functions for young children to age 8 include self-maintaining, directing, reporting, logical reasoning, predicting and anticipating, projecting, imagining. Higher order functions such as reasoning, predicting, projecting and imagining reflect higher order thinking. The educator's questions and planned experiences that stimulate children to utilise higher order language functions are likely to be those that promote complex thinking. Because of the public nature of the screen and the interactions between child and computer, the teacher is ideally placed to observe carefully and ask appropriate questions.

The educators and parents in the current study felt that using digital resources for challenging children's thinking was something achievable from as young as three years old—"Probably a lot of the older children 3-5 (years old) onwards are starting to question a lot more. So with the programs that are on there, they are starting to ask why, what is happening, there is a lot more language associated and they're interested in refining their research and gaining that extra knowledge."

Indeed, there was a general recognition amongst participants that, in the case of digital media, the children were the ones with the greater expertise, and their use of such media formed a challenge to adult's thinking. As one educator suggested, "Student Internet projects are good for getting educators involved, activity can take off with kids, but teacher initiated. If kids are at an age to process the project they can take the teacher along with them, instead of the other way round". Thus, in addition to the encouraging and support children's use of digital media, the need for educators to be confident

modellers of appropriate use of digital media was also identified as an important component of effective educator interactions.

2.2.2.3 Educator professional development

The educators and parents who participated in the study felt that it was extremely important that educators feel confident in the use of digital resources, and modelled and transmitted this confidence to the children. The attitudes of educators towards technology have been long identified as powerful influences on their teaching practices. Certainly, the debate about the appropriateness of technology in early childhood education is not resolved (see Appendix A), with some teachers being “seduced into thinking that if the... computer presents the information, their work as teachers is finished” (DeVoogd and Kritt, 1997). Some educators feel inspired by the potential of technology and others feel threatened by the rapidity of change (Hoot, 1994). Nevertheless, technology is gaining increasing prominence in the lives of young children, and thus the need for professional development to facilitate educators’ inclusion of technology in the classroom is paramount. The rapidity of technological change requires that, in order to effect positive ongoing interactions between young children and digital resources, educators must see themselves as co-learners.

The process of learning and using digital resources, for both children and adults, involves engaging with and becoming immersed in the technology, and taking risks. The lack of time to undertake such learning and risk taking was identified by the educators who participated in the study as a major inhibitor to the development of effective educator interactions with digital resources. “Time is an issue, if I have the energy, if I’m not too busy. Early childhood teachers are committed to what they do and they don’t have a lot of time to waste and the system has to get early childhood teachers to do this, give them proper training and access to good infrastructure.”

A further barrier was the application of gender stereotypes, which limited the level of support for the professional development of early childhood educators’ (who are primarily female) in the area of technology. “My boss suggested that women tend to try to get things right before attempting them, where men go ahead and do it and if it fails, then they get back up and try again. Most early childhood teachers are women and perhaps if the teacher is not comfortable, and if they’re not the risk-takers, as my boss suggested women in general are not with the technology, then children will not be introduced to it.”

Learning within an action research project was seen as one way to develop confidence and familiarity with the technology; however, not many early childhood educators involve themselves in such experiences. Educators who have had satisfying, supported experiences with the use of digital resources would be more likely develop confidence and get excited about the medium. From these personally significant experiences, educators believed staff would make use of digital resources in the classroom with a fresh approach.

Once educators have experienced satisfying experience with technology and have developed confidence and experience with digital resources, they would have much to share with others. Once sharing with others is established, educators would be responsive to and develop supportive networks with other educators and be able to pool resources and ideas for appropriate experiences for children.

2.2.3 Current practices

Clearly, good practice in the use of digital resources with young children is complex, involving both the environment and the educator. The newness of the technology, and the newness of the concept of

using digital resources with young children, means that the practicalities of best practice are still being worked out. Consequently, there are few examples of good practice at either the environment (including curriculum and policy) level, or at the educator or classroom level. Indeed, some educators expressed concern that at the governmental level, the introduction of technology into early childhood educational settings was viewed as “a waste of public money”. Nevertheless, there are a small number of early childhood educators, curriculum and policy makers who are enthusiastically striving, albeit in somewhat of a curriculum, policy and professional development vacuum, to realise the effective use of digital resources with young children.

2.2.3.1 Curriculum and policy

The use of digital media is increasingly permeating policy, curriculum and professional development in early childhood education. Currently, however, much emphasis still remains with the issues of the acquisition of suitable computer and communication hardware and the improvement of student to computer ratios. There also remains a high level of concern with children’s ability to master the technical and motor skill aspects of computer usage. Indeed, as recently as 1996, the NSW Department of School Education Annual Report noted that whilst providing assistance for teachers to integrate computer experiences into all key learning areas was an area of importance, “Keyboard familiarity and keyboarding skills have been specifically targeted”.

Nevertheless, there is recognition among school education authorities, and among curriculum and policy makers, of the need for a paradigm shift in education in order to meet future educational needs. The school of the future is described in various State Education Department documents as having flexible delivery patterns (including the use of the digital media to access global resources and expertise), educators as facilitators of learning (rather than dispensers of knowledge), outcome defined/based learning and a student centred approach. The reviewed Education Department curriculum and policy documents recognise, as did the participants in this study, that computer technologies are absolutely essential for future learning, and can only be beneficial when they are integrated into all key learning areas, contribute to achieving curriculum goals, and be used in meaningful ways.

There is less recognition, however, of the digital resources as a social activity, the need for resource use to be child directed, and used in ways that create open-ended learning experiences. The social aspect of computer use, in terms of social interactions with peers in the classroom was recognised by the participants in the study as an important by-product of digital resources. This benefit is not greatly acknowledged in curriculum and policy documents. The social aspect of computer use, in terms of participation in the global community, is recognised in curriculum and policy as one of the greatest changes possible through the use of digital technologies. The documents reviewed, however, provided little guidance as to how to realise this potential within the classroom (beyond the now well established learning circles).

A small number of documents reviewed cited the importance of adoption of a student centred approach when using digital resources. Only the Northern Territory Department of Education, however, provided explicit advice about how this is to be achieved—“It is extremely essential for the teaching methodology to include strategies that will throw the responsibility for decision making on the students. Use questions like ‘What does that mean?’, ‘What will we do next?’, ‘How do we do that?’ The student should be the driver, the teacher the navigator.” Such strategies would suggest that the digital resources should thus be used as part of an open-ended learning experience, however, the document also states that the purpose for such activity is by “Utilising computer technology, students

can make products good enough to be used by the wider community.” There is little evidence in any of the reviewed Departmental documents of digital resources being used in ways that create open-ended learning experiences.

Nevertheless, all state school education authorities agree with the view expressed in the Tasmanian documents, that “it is the way in which the technology is incorporated into teaching programs that appears to be the critical factor in its effectiveness”.

Few significant curriculum documents of guidelines regarding the use of technology in early childhood education exist for the 0-5 sector. The most significant document, which has been referred to on a number of occasions throughout this report is the US’s NAEYC guidelines. These provide a comprehensive guide to the use of computers and related digital resources, but say little about online resources. Within Australia there are no sector-wide general guidelines or agreed sets of practices. At various times, particular umbrella organisations such as the AECA (Elliot, 1996), KU children’s services (1989) and SDN (1998) have produced various statements, but these seem to have had little effect on policy, resource provision and practice in early childhood settings.

2.2.3.2 Using digital resources in the classroom

The early childhood educators who participated in this study primarily used the Internet as a source of information for access by their students and as a source of teaching resources for themselves. That is, they used the Internet to “look things up”, in much the same ways as they used CD-ROM encyclopaedias, but with the cited advantages of a greater breadth of information which was more up to date.

Arguably, however, the greatest strength of digital technologies, as identified by the South Australian Department of Education, Training and Employment, is that they “enable collaboration to extend beyond the boundaries of one classroom to other classrooms within the school, neighbouring schools and school across the world. Students and teachers have opportunities to participate in discussion groups and in individualised and group problem solving”. However, whilst a small number of educators in settings which had established web pages were using the Internet as a place for publishing children’s work, very few educators were currently using the Internet as a two-way communication tool for young children.

The reasons for the somewhat limited use of digital resources in the early childhood settings were complex. The ability of young children to manage the motor tasks was an issue much debated amongst educators who participated in this current study. Interestingly, the early childhood educators who were using the Internet with young children did not consider the motor tasks a barrier to computer usage by children, even as young as three years old.

Although the use of digital resources was not limited by the physical capabilities of the students, it was limited by the somewhat limited definitions of the learning goals to be achieved, as reflected in current curriculum and policy. The educators needed to ensure that the students’ activities were purposeful, with a demonstrable outcome, primarily expressed in terms of the information located, and less often in terms of the process of locating, evaluating and critiquing the information. Of prime importance to most of the educators who participated in the study was the need to not “waste time surfing the net.” Student exploration was limited, and risks eliminated.

Many educators expressed the desire to use digital technology in an increased range of activities and in more child-directed ways, including participation in open-ended online learning groups, and increased global communication, but felt limited in their ability to do so for two primary reasons.

Firstly, many of the early childhood educators who were using digital resources in the classroom felt that they were very isolated, were having to use a trial and error approach, and ‘reinvent the wheel’. They wanted to increase and improve their use of digital resources, but did not know how to go about it, due to the lack of documentation of examples of good practice. Secondly, many felt that appropriate resources required for effective use were not available. The hardware made available in early childhood settings was often “handed down” from educational settings for older children, a reflection, they felt, of the lack of importance placed upon the use of digital resources by young children. The cause of greater problems, however, was the lack of Internet sites suitable for use by young children, and a lack of suitable places and modes for communication by young children. This important concern will be dealt with in the next section.

2.3 Overview

Despite the somewhat limited current use of digital resource with young children by a small number of enthusiastic educators, it is increasingly acknowledged that the use of digital resources in education “no longer the province of the zealous enthusiasts but is firmly and inextricably tied to our core business – to the mainstream of day to day learning activities in all key learning areas and all year levels” (Rout, 1997, p.16). It is essential, then, that best practices in the use of digital resources with young children be recognised and adopted by all educators, and curriculum and policy makers.

Best practice in the use of the use of digital resources for young children include the well recognised and documented need for such resources to be embedded within learning environments and be shaped by learning goals and pedagogical approaches consistent with what we know about how children learn. Good practice is also utilising the full potential of digital resources to enable and increase child directed, open-ended learning experiences, which include communication, exploration and risk-taking. The latter, somewhat less tangible or measurable elements of good practice, are not yet well recognised in curriculum and policy, and are reflected in the lack of appropriate resources and technologies to realise best practice for young children.

3 Good Resources for Under Eights

The lack of appropriate digital resources for young children was an issue readily identified by all the participants in this study. However, there was strong recognition of the fact that this will not always be the case. The development of digital technology and communication infrastructure, particularly voice recognition and activated software and increased speed of modems, will provide increasing opportunities for the use of online digital media by young children. Participants felt that in the case of educational resources for young children, now is the time to “get in on the ground floor”. As one educator commented, “I think that what we are saying is that a lot of things that are not available on the web will be, therefore the rules that we apply to things is what we should be, what we are talking about”.

NAEYC includes the use of multimedia sources and the Internet in the list of key resources that need to be supplied for children (1998). Careful consideration needs to be given, however, to selecting appropriate resources for children’s use on the Internet. As the NAEYC Position Statement on Technology and Young Children (1998) states, teachers need to pay attention to carefully evaluating digital resources in the same way that they would any other learning resources.

As with evaluating any resource that an educator is selecting to use with young children, the first phase primarily relies on an adult perspective. At this stage educators need to take account of the content of the site and the design of the site. Through evaluating these elements, educators can make the initial selection decisions based on what they believe to be developmentally appropriate for a child, or group of children.

The second stage of evaluating a resource involves observing children interacting with the resource and listening to them reflect on their use of the resource. This is an essential stage of the evaluation process. For, as DeVoogd and Kritt (1997) argue, teachers need to observe and ask, “what does the student make of the material, how is it used and how is it interpreted, and conversely, how does the material constrain or enable particular thought and action?” By doing this, educators observe new possibilities and unintended outcomes that are created through the interaction of child and computer.

The following elements are those that need to guide educators in the selection stages of evaluation, the stage prior to using the resource with children.

3.1 Key elements of good resources

The following characteristics of good Internet resources for use with young children are based on what we know about how children learn, appropriate curriculum and the role of the adult, and upon the key elements of good practice. There are two distinct groups of criteria: those that relate to the appropriateness of the content of the site; and those that relate to the design of the site.

3.1.1 Appropriateness

The appropriateness of the site can be considered in terms of the nature of the activity and the potential interactions between child/children and computer, and the content of the site.

Children's sites on the Internet can be grouped into four types of sites based on the nature of the activity undertaken at the site. These four are:

- 1) **design and make sites**—where children can design, draw, paint, create, make, build or construct artefacts such as patterns, pictures, scenes, written texts, galleries, cards, slide shows, music;
- 2) **work and play sites**—where children can play, explore, investigate, look things up, solve problems, and do puzzles and other activities;
- 3) **communicate and share sites**—where children can talk, send messages, join in a group discussion, display products of their work and play;
- 4) **online project sites**—where children work collaboratively on agreed tasks on- and off-line with children in other locations.

While these groups are not mutually exclusive, they provide a useful way of thinking about the nature and quality of Internet sites for young children. When making judgements about the quality of sites it is important to do so in the context of the purpose of the site and how that relates to its content. No matter how well designed a site may be, if it only offers inappropriate or trivial experiences it should not be included in an educational collection for young children. Similarly, a site with that has the potential to offer children valuable learning experiences but has some poor design features, may be worth including in the collection, if teacher or peer mediation can help overcome potential problems created by poor design features.

The following represent the key criteria upon which to judge the quality of the content of an Internet site for young children.

3.1.1.1 Open-ended experiences

Educators have indicated that children find digital resources that enable them to explore and interact and that allow them to create a product to be the most appealing (Rodriguez, 1997). Not unexpectedly, these are the types of activities that young children can engage in within open-ended sites. The NAEYC (1998) identified open-ended experiences as being the most appropriate for young children as they allow children to interact in their own way, at their own pace, and to follow their own interests.

Open-endedness is about providing tools, artefacts and an environment that gives children the opportunity to children to make choices. In one sense open-endedness is a continuum. For example, colouring in sites can range from providing very limited choices to extensive choices. At the limited end of the spectrum children can choose from a variety of existing scenes/objects or characters and from a variety of colours. Further choice can be added as children can mix colours, choose from patterns and textures, tones and intensities of colours, and can modify existing pictures or create their own to colour. It is worth noting that this increasing power and choice takes the site from being a 'colouring in' site to a paint and draw site with powerful tools for designing and creating patterns and pictures. Similarly, puzzles, games, and problem solving activities can have varying degrees of open-endedness.

Open-ended resources encourage children to make choices and to follow their interest. Sites that are of most interest to children, based on observations undertaken for this project, enable children to follow a path where there are multiple layers. When this is the case "the children control the pacing and the action" (NAEYC, 1998, p.2). Children engage with the resource when they are able to ask their own questions, guide their own learning, repeat processes and revisit activities.

Key questions to ask when evaluating for open-endedness are:

- ?? What choices can a child make within this environment? Are they appropriate to the nature of the activity?
- ?? What is the nature of the choices, do they lead to reflection on the obvious or the trivial or on useful concepts and key ideas?
- ?? Does the collection of choices give appropriate control to the child in terms of pursuing their own interests and creating challenges?

3.1.1.2 Appropriate challenges

Resources need to be at an appropriate developmental level for the children's ages and stages and need to cater for what children can do independently as well as what they can do with assistance from more capable peers or adults. It is important to evaluate the age appropriateness, individual appropriateness and cultural appropriateness of resources (NAEYC, 1998) as well as links to children's interests. Mamamedia (1998) suggest that Internet resources need to provide a suitable level of challenge so that activities can be used and revisited again and again. An appropriate resource "grows in dimension with the child, enabling her to find new challenges as she becomes more proficient." (NAEYC, 1998). Resources that are not at an appropriately challenging level may be mere entertainment (DeVoogd and Kritt, 1997) even though the resource is marketed as educational and the child appears to be actively engaged.

3.1.1.3 Opportunities for collaboration

Appropriate resources encourage social skills of cooperation and collaboration and assist in language development. Internet resources provide two different types of opportunities for collaboration. Firstly, quality design and make, and play and work sites can provide opportunities for collaboration among children within the early childhood setting. Quality sites and activities within sites can encourage negotiation, discussion and even turn-taking. Secondly, communicate and share and online project sites provide opportunities for children to collaborate with adults and children outside of the setting. This collaboration is generally structured around shared or joint activities or through communicating ideas and the results of actions that children take within their own setting.

The following questions need to be asked about collaboration:

- ?? Does the site encourage collaborations with other children within the setting? Outside the setting?
- ?? What is the nature of the collaboration that is encouraged?

3.1.1.4 Quality information and experiences

Children need access to sites that provide a wide range of information and experiences relevant to their own lives and interests and to the curriculum frameworks of the early years of school. When information is provided it needs to be accurate and timely, and appropriately structured for the chosen age group. It should include written, visual and aural texts of an appropriate complexity (or simplicity) for the chosen age group. The information also needs to be informative rather than emotive, persuasive or contain over-generalisations or simplifications (Schrock, 1999).

Sites that provide opportunities for students to explore raw data or collections of artworks, artefacts, are valuable in that they encourage children to investigate, compare and evaluate. For school-aged children this can support problem-based learning and interest-based project approaches, resulting in depth and complexity of thinking and independent learning (Jones *et al*, 1995). The key evaluative

component for these types of sites is the relevance and complexity of the information and the way it is organised.

Micro-worlds, simulations and construction kits are particularly relevant to the curriculum areas of mathematics and the sciences. These environments allow children to create and investigate how aspects of their world exist by taking control of decisions and actions within a rule-based world. A simple example would be a simulation of growing seeds, where the child can alter the amount of water, light, warmth provided for the various seeds in a collection in order to help them grow. These types of sites create opportunities for children to explore and investigate in conceptually rich “worlds”. Key questions about this type of site relate to the accuracy of the model involved and whether the necessary simplification of a complex real-world phenomenon has distorted the potential understandings that a child might derive from playing within the environment.

3.1.1.5 Ability to cater for diversity and challenge stereotypes

Internet resources, like traditional resources, convey explicit and implicit messages to children. Quality resources should “affirm children’s diversity” (NAEYC, 1998). Resources should reflect the cultures, languages and family structures of the children in the setting, surrounding community and Australia, and should challenge prevailing stereotypes and biases. Resources should be available in languages other than English and incorporate diverse cultures. The needs of children with hearing, sight or muscular disabilities should also be addressed.

3.1.2 Design

Based on what we know about how children learn (Chapter 2) the following design features need to be considered for Internet sites for under-eights. Importantly, a site’s purpose should be clear to the child (and the adult).

3.1.2.1 3.1.2.1 Integration of sound, text, graphics and animation

Sites need to be appealing to young children. Young children are naturally curious, wanting to manipulate and experiment by clicking the mouse and responding to sound, graphics and animation. Mamamedia (1998) suggests that sites need to offer a rich combination of text, graphic, sound and animation and educators who participated in the consultations agreed that young children need clear graphic/sound/text links. Children, particularly under-fives, respond to sound, music, colour and movement, with DeVogd and Kritt (1997) suggesting that “noises, movement and mouse interaction” attract three-year-olds. There needs to be minimal written text for children under five, with increasing amounts of written text possible for use with children in the early years of school. However, text and lettering need to be large and clear. Research by El-Tigi (1996) with children aged seven, eight, and nine found that they responded positively to cold colours used in text and background.

3.1.2.2 Easy navigation

Internet sites for under eights need to be easy to access and easy to use. The interface needs to allow for easy navigation around the site and between and within activities/places within the site. Importantly the navigational system within the site needs to be clearly differentiated from any system to take children in and out of the site, or from the activity section of a site to a marketing or sales section. It has been found that uniform layout assists young children to navigate Internet sites (El-Tigi, 1996).

Educators who participated in the consultation stressed the need for pathways to be clear and to allow children to go to different layers of meaning. Instructions and activities need to be self-evident. The interface also needs to encourage children's participation and allow for repetition.

3.1.2.3 Efficient technology

Sites need to respond to children quickly, be interactive and offer feedback. The ALSC Children and Technology committee (www.ala.org) stresses the importance of sites being stable, consistently available and able to load without problems. Mamamedia (1998) suggest that there needs to be clear explanations of the technologies used. Any necessary plug-ins or other technical requirements should be clearly identified (Association for Library Service to Children).

The tension between the need for quality graphics, sound, and text, and the need for quick response time, is currently one of the greatest dilemmas for early childhood educators. Current technologies deny the existence of both. When making judgments about the relative importance of these features, early childhood educators need to consider the purpose of the site and frame questions around relative importance to purpose.

3.1.2.4 Safety

With the proliferation of commercial sites on the web and children's access to communication sites, safety is an essential consideration. Parents involved in consultations were particularly concerned about children being manipulated and exploited and want assurance that there are safeguards in place. These issues are currently attracting much attention in the research and public policy literature. The Centre for Media Education in the United Kingdom (<http://www.cme.org/>) suggests that there is a web of deception around online marketing, with advertising being designed to capture children's attention; with the seamless integration of advertising with content; and the use of "spokescharacters" to sell products. Alexander and Tate (cited in Schrock, 1999) argue that market-orientated web sites "blend entertainment, information and advertising". Sometimes this is done in subtle ways such that children are not always aware of that it is being done. When evaluating web sites for safety, Mamamedia (1998) suggest that it is important to check that:

- ?? there is a clear distinction between advertising and editorial content
- ?? parental permission is sought before collecting information from children
- ?? there is a privacy policy that states whether they sell collected information to third parties.

A further issue of serious consideration is the actual nature of the site in terms of being bounded or unbounded. A bounded site contains no links to other sites. Within these sites, children cannot accidentally or deliberately leave the site. Unbounded sites are the converse, they contain links that easily take children to other sites. Unbounded sites may themselves be 'safe' but provide links to sites that are not.

3.2 Usefulness and quality of current resources

As part of the research activity associated with preparing this paper a number of early-childhood teacher-education students and educators located and evaluated over sixty sites for young children using the above criteria (see Appendix D for list of sites reviewed). As well, parents, educators and children commented on the usefulness and quality of the sites that they used. The results of the evaluations are summarised below for each of the four types of sites identified in the previous section.

Overall the majority of sites were more suitable for 5-8 year olds than 0-5 yr olds. The main reason for this differentiation was the amount of text on the various pages within the sites. Young children, particularly under-fives, need the support of graphics, sound and animation to assist them to focus on the intended meaning of a site. While some sites provided an effective mix of text, graphics, sound and animation, over 50% included only text and graphics. When sound was included, it was often only a song as an introduction. When interacting with sites, children, particularly under-fives, responded positively to music and song when it was included and at other times some children asked why there was no sound.

Most sites were heavily reliant on text to make meaning and although 68% of sites were found to have clear interfaces that were easy for adults to navigate, this was dependent on a level of literacy that most children would not have. There are very few sites where children can navigate independently. When interacting with sites such as the ABC Playground four year olds needed adult assistance to move around the site. School age children were able to independently navigate sites such as this to a greater extent, although they still needed assistance to read and understand the procedures.

3.2.1 Design and Make sites

There are few quality Internet sites that provide opportunities for young children to create, make, design or build. Some sites offer opportunities for children to be involved in creative writing, for example designing a postcard, or writing a letter to the Easter Bilby, but these require children to have well developed literacy skills. There are very few sites where younger children are able to create, make or design, and most of these are limited to activities such as making patterns with shapes, or creating pictures with stickers and stamps.

By far the most open-ended and powerful creative site found was within the Disney site. Given the degree of sophistication of software needed for quality design and make environments, it was not surprising that the better environments existed with the commercially orientated sites. Importantly, even these more sophisticated sites were no more powerful than those currently available to young children through CD-ROM-based programs such as Kid Pix Studio. The only advantages of the online sites seemed to be access to “stamps” of familiar popular-culture characters and the potential to access ever-changing collections of stamps and upgrades of the software. The former advantage would be more relevant to the home than the educational setting.

3.2.2 Work and Play sites

Work and play sites provide children with the opportunities to play, explore, investigate, look things up, solve problems, and do puzzles and other activities. For the purposes of this section, these sites will be grouped into three categories: activity and game sites, explore and investigate sites, and information sites.

3.2.2.1 Activity and Game sites

There are many sites for young children that provided activities and games. The majority of these were found to contain closed and trivial activities, which had little potential for children to develop concepts, make meaning or solve problems. This was especially true of sites that purported to serve the under-fives.

The parents who participated in the consultation indicated that this was main type of site that their children used at home. At home, the children were particularly attracted to sites linked to popular

culture characters from television shows. They provided, as did the children, examples such as Batman, Barbie and Xena home pages. At these sites children played games, did the various activities (eg. puzzles, quizzes, colouring in) and looked up information and pictures about their characters. Parents expressed concern that the children were drawn by the graphics, sound and animation at these sites but that they were of little educational value. Furthermore, parents argued that the quality of sound and graphics and speed of interaction were not as good as the CD-ROM products in the home. As one parent noted “the pictures take so long to download anyway they get bored before it gets there”. For this reason, parents saw CD-ROMs as more appropriate for game playing and activities than the Internet. However they identified some limits with CD-ROM collections in terms of the cost of purchasing CD-ROMs and the size and currency of a family collection. They also identified two benefits of the Internet as the ability to “look up” sites of favourite characters and to find new games and activities. The children who were interviewed also mentioned looking up these characters as one of their favourite activities on the Internet.

When talking about game and activity sites, the parents also raised concerns about the commercialisation of such sites and issues related to safety and privacy in relation to sites where the children were required to give their name before they could fully access the site. Among the evaluated sites whose activities were appropriate for young children, there are sites where content, editorial and advertising were integrated. The Australian Broadcasting Corporation’s Playground site is an example of a “safe” site in that while it provides links to commercial products, it does not deliberately entice children to purchase products, nor does it integrate links to advertising within the playground site.

3.2.2.2 Explore and Investigate sites

These types of children’s sites are still relatively rare on the Internet. There were a number of scientific sites on topics such as weather, the natural environment, living things, the human body, machines and dinosaurs that provided limited versions of these types of environments. These were mainly focused on the nine to fourteen year olds. Similar sites, for the five to eight year olds, were fewer in number and more often than not provided more closed types of activities. No such sites were found for children under five. When scientific and cultural museums or major public institutions provided “educational” sites for very young children, the environment provided often reverted to relatively trivial activities such as colouring-in.

3.2.2.3 Information Sites

Parents and educators perceive that accessing information on the Internet is of the main reasons for its importance in education. The Internet is considered not only valuable in terms of the nature and size of the information collection but also because of ease of access and currency. Ease of access was important to the parents who participated in the consultations. They argued it was particularly important for busy families with two working parents where it may be difficult to get to the library before it closes or before someone else has borrowed all the relevant resources for the school project. Parents, educators and the children, themselves, reported that children liked to look things up on the Internet both for leisure and for school-related purposes.

It was found that information sites abound for school curriculum areas and topics. Often education systems, educational institutions and other organisations such as public libraries provide validated lists of such sites usually grouped by age or year level. Within these collections, there were many quality sites suitable for children in the early years of school. Rarely did these collections provide pointers to sites for under-fives. Similar validated collections of information sites did not exist for the under-fives. More often than not, generic lists for under-fives existed and within these lists there were

references to some information sites. When sites were found that purported to be suitable for under-fives closer examination revealed that was not the case. For example The Little Explorers Site, by Enchanted Software (<http://www.enchantedlearning.com/dictionary.html>) provided an appropriate alphabetical letter and pictorial interface to various animals, plants and objects. However, when children clicked on the various pictures, they were often taken to sites where the complexity and amount of text was inappropriate for them as independent users. Similarly the Mamamedia site provided a novel visual interface to collections of information about shells (sea shells, concert shells etc), however when selected the children were again taken to various sites that were inappropriate for independent use by children under five. In both cases, while the interface provided an appropriate pathway for the under fives, the actual information the children were taken to was more appropriate for children over five and often only for children over eight.

Generally, even the quality information sites that were directed at younger children had text levels that would make them inappropriate for independent use by many five-to-eight-year-olds. Evaluation of Internet sites by early childhood students and educators found that information sites did not have as good a mix of text and graphics as games and activity sites and were less likely to include sound and animation. The content of the information sites evaluated, however, would be valuable as resources for teacher-directed or scaffolded use. Many of these sites, however, rated poorly in terms of ease of navigation, with 85% of information sites evaluated as being difficult to navigate (even by the educators who were evaluating them).

3.2.3 Sites where children can communicate and share

The Internet was seen by parents who participated in the consultation, to be most useful as a tool for communicating with others—“as a communication tool it is fantastic”. Parents and children reported using the Internet to email relatives and friends, send birthday cards, and put children’s artwork and writing online for others to see. When making these comments, parents and children were talking about using email, and posting artwork and writing as attachments or publishing them on websites. Early childhood educators, who worked with children under five, rarely spoke of using the Internet for themselves or with their children in this way. The exceptions were the small number of early childhood educators who used email for personal communication and one director of a preschool who had just had an Internet connection installed. He was planning to create a web page for the preschool to communicate better with parents and to publish their children’s work for them. Early childhood educators working with children over five were more likely to use the Internet.

As well as these basic functions the Internet provides a range of sites where children can chat with each other in a “safe environment” and can publish their writings and artwork. These sites have primarily been provided by community organisations or by commercial organisations as an additional element within their larger sites. Generally, while declared safe sites, there were few real checks about the true identity of users of these sites. The safety checks came through the moderation of the discussions and the postings. Overall, for the service these sites provided, they were a relatively even safety standard and ease of use. As a category of sites, they seemed more appropriate for home than for educational settings, in the sense that email (to known recipients) and communication and sharing through online projects already provide these facilities for educational settings.

3.2.4 Online project sites

These sites, as a group, are relatively unfamiliar to early childhood educators. Only one educator in the entire consultation spoke of actually using these resources. This educator had engaged in the “Travel Buddies” project.

Generally online projects were provided by educational authorities or well established educational organisations. They provided a range of high quality projects in which early childhood educators and young children could participate. All we focused at the early years of school, although a few might be adaptable for use with four and five year olds as teacher-directed activities.

In general, the projects were structured by content, timing and a predetermined sequence of events, and encouraged high degrees of sharing. In one sense they were not open-ended learning environments, as the projects were largely predefined at the point of advertising. However, within many of the projects, there were activities that can be open-ended even if teacher-initiated.

3.3 Overview

Overall the range and quality of resources for independent use by children under five are poor. Currently, the higher quality digital resources that are appropriate for independent use by this age group already exist as CD-ROM based software. Most Internet experiences for this age group will continue in the short to medium term, to be mediated if only in part, by parents and educators. Communication and sharing, in particular will remain joint activities until voice recognition and transmission are better-developed technologies.

For the 5-8 year olds, the quality and range of resources are patchy, yet there were sufficient sites of quality to enable educators working in the early year of school to effectively integrate digital resources from the Internet into their curriculum. Of uniformly high quality were the online project sites, both in terms of the range of projects offered and the quality of the actual projects. Design and make sites could not compete with their CD-ROM based counterparts. Appropriate work and play sites, particularly information sites, were patchy in quality, but existed in sufficient numbers to make a validated collection of quality sites viable and extremely useful to educators. Communicate and share sites *per se* may continue to have little place in educational settings for their roles are already fulfilled by email and online project sites.

4 The Organisation of Internet Resources for Young Children

During the consultations with educators much discussion was held about the key requirements for the organisation of Internet resources for young children. Discussions included how the organisation of the collection needs to be shaped by its nature and purpose and the characteristics of its users. The collection should be organised in such a way that good practices are supported, that is, the organisation of the collection should reflect the pedagogical approaches of early childhood educators, be shaped by learning goals and learning environments, and encourage social, child directed and open-ended learning experiences. There was also recognition that the online collection would serve multiple purposes and users and therefore need multiple representations.

4.1 Multiple representations of the collection

Given an agreement that the collection would need multiple representations, discussion centred on whether the default representation of the collection should be based on the perspective of the child as user or the adult/educator as user. Most existing Internet collections that are organised from the perspective of the child as user, generally have a homepage of an alphabetical list of sites or links, or a virtual playground where children select by type of activities (games, puzzles, pages to colour in) or by known characters or topics. Alternatively, collections organised from the perspective of the adult/educator as user, generally use lists, arranged either alphabetically or grouped by content and/or age groups.

The educators at the national workshop saw merit in collections organised around the perspectives of both the child and the educator. They were of the view that these two perspectives were not necessarily mutually exclusive. However there was a strong view that the dominant or default representation should be one which children as well as educators can easily use. In this way the collection can serve the needs and interests of the child or a group of children, allowing them, when appropriate, to initiate activities on the Internet.

4.2 A key feature of the collection

The characteristics of early childhood educators as “users” of the collection creates a challenge for the nature and organisation of the collection. Currently, in Australian early childhood settings there is a very low level of use of computers and almost no Internet use. Furthermore, among early childhood educators in under-five settings, there is still a strong ambivalence towards computer-use with children (recent research by Dockett, Perry and Nanlohy, 1999). These findings have direct implications for the nature and organisation of an online resource collection. The resources in the collection need to be embedded within a carefully constructed curriculum and professional development framework. This framework needs to address the needs of two main groups of early childhood educators. The first group is the small number of early childhood educators who are already committed to using digital media, artefacts and tools with young children and who are seeking help with access to resources and “good practice”. The second group is the vast majority of early childhood educators who have yet to be convinced that computer-related activities are not only appropriate but also an essential component of the early childhood curriculum. For this latter group, an online collection will only be useful if it contains quality resources organised in such a way that these

educators are drawn to the possibility of using the collection. A number of educators who participated in the consultations thought that the most powerful motivator for this second group of early childhood educators to use the collection would be seeing sites that they think would be good to use with young children in their setting. Such a view re-affirms the notion that the dominant organisational feature of the collection be quality sites for children to use.

The educators who participated in the consultation also strongly believed that the professional development and curriculum framework, within which the children's resources were embedded, should itself exist within an online professional community. This community would provide communication channels for early childhood educators as well as "meta-resources" for early childhood educators who might use the sites with young children in their settings. The term meta-resource is used in the sense that the resources for use with children are embedded within resources for educators that facilitate effective pedagogical practice.

Two types of meta-resources were considered essential:

- 1) resources that informed educators of a variety of ways that the children's resource could be used within the framework of developmentally appropriate play and/or within the framework of curriculum outcomes; and
- 2) resources that provided educators with narratives or case studies of how other educators had used the resource with children.

The provision of meta-resources changes the nature of the collection. It moves beyond being a collection of validated quality children's sites, to being a community (collection) of early childhood educators who add value to the selected resources through the provision of curriculum- and pedagogy-related information and personal "stories".

4.3 Ways of categorising resources within an online collection

Traditionally, the key data that influences the organisation of resources is the content of the resource in terms of its discipline areas/KLAs/ themes/topics/characters/ and the targeted age groups or school year levels. Educators who took part in the consultations agreed that these are key characteristics of educational sites for young children. The following were also considered important when creating metadata or creating a database of the characteristics of reviewed sites. Access to this additional data, provides greater opportunity for educators to retrieve sets of sites from within the collection and to organise different browsable representations of the collection. This latter feature would allow early childhood educators working with young children to tailor a browsable list to meet the needs and interests of the children within the setting. These categories are:

Nature of site

What is the dominant activity children undertake at the site? Four main types of activity were identified:

- 3) design and make sites
- 4) work and play sites (activity sites, exploratory sites, and information sites)
- 5) communicate and share sites
- 6) online project sites

Mode of use of the site

Is the site suited for child initiated and independent use; peer-supported use; teacher-scaffolded use; and/or teacher directed or mediated use?

Safety of the site

Is it bounded or unbounded (can the children travel out of the site by clicking on various elements within the site)? Does the site separate content from advertising and marketing strategies?

Portability of the site

Can it be downloaded into the hard disk of the computer in the early childhood setting (would only be applicable to bounded work and play or design and make sites).

While the above characteristics are basically descriptive, the following characteristic adds an evaluative component.

Quality of the site given its purpose

For example if it is a colouring-in site, is it open-ended in the sense that it allows children to do such things as mix colours, repeatedly change colours or add their own elements to the drawing? Similarly if the site contains puzzles, games or activities—are they related to ideas and concepts that help children make sense of their world or are they only related to familiar popular-culture characters? The quality could be reported as a rating scale on ease-of-use and quality of interactions/learning that the site facilitates.

4.4 Design features of the representation of the collection

Among the educators who took part in the consultation, strong support existed for the idea of organising the dominant representation of the collection in a way consistent with a powerful metaphor that can be translated into a visual image of a virtual space. Examples from existing sites include classrooms, playgrounds, gardens, buildings, libraries and funfairs. Such a metaphor would need to be familiar to young children as well as to adults and educators, so that children can use the collection in self-initiated and -directed ways. Using this approach shifts the collection from being little more than a list of lists that can be retrieved through a search activity. It becomes a 'place' where both children and educators can visit and explore time and time again.

Other essential features of the dominant representation include:

- ?? a welcoming "feel"—the metaphor is intuitive in its representation of the collection and welcoming in its ambience, that is, it has elements that make it familiar to even the first time user.
- ?? easy navigation—the collection is easily navigable. First time and experienced users are able to browse without getting 'lost' but also able to find specific items in the collection with ease.

Quick access to alternative views for particular purposes and sophisticated searching functions for the regular and expert user.

By providing such an easy-to-use collection of quality resources and a comfortable place to be, the actual collection becomes part of the professional development and curriculum development strategy as well as a safe place for children to explore and play.

4.5 Current organisation of resources

The current ways of organising and classifying sites in early childhood education (including the EdNA collection) are not designed in a way which allows the collection to serve multiple purposes and users. Collections such as Sunshine Online (<http://www.sunshine.aust.com/aus/index.html>) and Oz Kidz Cubby House (<http://www.ozkidz.gil.com.au/cubbyhouse/>), which are directed to a child audience, are organised around themes or topics, pre-chosen, and limited to a small number of

particular themes. Other collections for children, such as Berits Best Sites for Children (http://db.cochran.com/li_toc:theoPage.db), offer a broader range of topic areas, but provide no indication of the nature or mode of use of the sites included.

Collections, such as EdNA Online, which present as directed to a more adult/professional audience, are dominated by professional material and sites and are notably lacking in sites for use by young children, although this is probably a reflection of the dearth of suitable educational sites for young children generally (see previous section), rather than lack of effort on the part of those maintaining these collections. Such collections are organised around key learning areas (KLAs), or use searching tools to locate sites that match particular terms or keywords. Neither classification allows the user to identify sites for young children by their mode of use or nature, that is, for designing and making, or work and play. Design and make, and work and play sites for young children thus appear to be rarely included, and are lost within the collection. Keyword searching can be used by educators to locate large amounts of teaching materials such as work sheets or project patterns for educators to use with young children offline, but there is a lack of online make and design, or work and play sites for young children identified within the collection. Communication and share, and online project sites are often listed separately, and are thus more identifiable, but their suitability for use with children under 8 years old is often not easily determined.

The current ways of organising collections, therefore, provides no quick way for early childhood educators to locate sites for use with young children. Educators wishing to locate suitable sites for young children would have to visit each individual site in order to determine the site's nature and mode of use. The time required to undertake such evaluations would necessarily result in educators limiting their use of the Internet to those sites to which they have previously been exposed, rather than using collections of sites such as EdNA Online as a meaningful and useful resource.

4.6 Overview

An online collection of resources for early childhood education would need to serve multiple purposes and users. The collection would serve young children by providing a safe and maintained environment for them to explore exploratory and information sites. It would also serve educators by providing not only quality digital resources to use with young children but also curriculum and professional development support. As such, this becomes a multi-layered collection with children's resources embedded in educators' resources framed within an online community of educators who are themselves using and producing the resources.

In order to be a welcoming place for children and for educators the collection needs to be represented as more than a list of lists. The dominant representation of the collection needs to be a virtual space for both young children and early childhood educators.

5 A National Online Collection of Digital Resources for Early Childhood Education

5.1 Pathways to the early childhood collection

There are a number of key issues and facts raised in the literature and consultations about the need for and purpose of an online collection of digital resources for early childhood education in Australia. Each of these will be discussed in turn below, followed by recommendations to EdNA.

A key issue drawn from the consultations related to the inability of current Internet service providers and telecommunication carriers to provide sufficient band width such that young children's sites can employ the same quality of graphics, sound and interactivity that is currently found on comparative CD-ROM based resources. This led to a serious discussion of the value of spending limited resources on creating and maintaining a validated collection of such digital resources. Overall, it was felt that the quality of the environments available on CD-ROMs far outstripped the quality of online environments and that where resources were available or affordable in CD-ROM media, early childhood educators should use these in preference to online resources.

When considering this advice and its implications for EdNA, there were differential outcomes for the various types of digital resources identified in the earlier sections of the report.

- ?? Digital resources for designing and making were considered a significant resource for early childhood education, and already exist in sufficient quantity and quality within CD-ROM media. Only high quality sites, or sites providing creative environments not currently available through CD-ROM media, should be considered for inclusion in a national collection.
- ?? Digital resources for working and playing were grouped into three main categories: activity, exploratory and information. The quality and content of activity resources made them relatively unimportant as educational resources in early childhood settings. They were considered more relevant to the home and leisure/entertainment related processes. Exploratory resources as well as information resources, though currently few in number and not well geared to younger children, were regarded as significant and valuable for an early childhood curriculum. As such they were considered the foundations of a quality collection of digital resources. The key reason for needing a comprehensive collection of such online resources was the potential size and scope of such a collection. Given the limited budgets within early childhood settings, it is not feasible to expect these settings to provide a collection capable of meeting the various needs and interests of young children.
- ?? Online resources that provided channels for communication were easily identified by educators as making a unique and valuable contribution to the early childhood curriculum, even though they were the most rarely used form of online resources in early childhood settings. The key issue with these types of resources is that currently they are heavily based on written texts and the processes of reading and writing. Online voice and video communication, which are more suitable for younger children particularly the children from birth to five, is still not readily available. Notwithstanding this educators believed that communication through email is a valuable resource and that the current high quality online projects provides opportunities for children to communicate, collaborate and share digital artefacts.

Even with these qualifications about the nature of the available online resources, the over whelming majority of educators who were consulted either assumed that such collections existed or argued that

they should exist. This reaffirmed the importance of EdNA's on-going commitment to providing online resources for early childhood education in Australia.

The following set of findings from the various searches of the Internet also support the importance of EdNA playing a key role in the provision of online resources for young children:

- 1) The current proliferation of commercially orientated sites for young children dramatically outstrips the number of public sites where children can play, explore and look up information free from advertising, manipulation or exploitation. Suitable public sites are hard to find, and Australian public sites even harder.
- 2) At the present time there are no Australian public institutions, apart from EdNA that provides a comprehensive service for children, families or educators which evaluates and lists quality, safe sites for young children.
- 3) At the present time there is no public policy framework or community initiatives in the area of advocating the development of quality, safe Australian sites for young children. While overall, the number of public safe sites for children is growing; more often than not these sites are most suitable for middle childhood (9-14 year olds).
- 4) At the present time none of the key public cultural and scientific institutions in Australia, such as botanical gardens, museums, zoological gardens and art galleries, broadcasting organisations have created quality educational sites where young children can work and play or design and make within conceptually rich "worlds".

Recommendations:

EdNA needs to:

- ?? continue to provide a collection of quality safe educational sites for young children. The collection should:
 - o concentrate on exploratory sites, information sites and online project sites
 - o focus on sites for young children under five as well as children between the ages of five and eight
 - o provide additional information about the sites, beyond content and age group, that will facilitate more effective selection by early childhood educators. Such information might include, nature of site, mode of uses, safety, and overall quality
- ?? act as an advocate and broker for the development of quality educational exploratory and information sites for young children by key national cultural institutions

Similar to the above findings, the Internet searches and discussions with educators revealed significant gaps in the online services available to early childhood educators. The main findings were that:

- 1) While all public school systems and a number of other educational sites provide resources for educators, primarily they are focused on middle childhood and older children. Within these sites, resources that focus on early childhood education provide few if any resources in the area of using digital resources in early childhood education and almost no resources in the area of using online resources.
- 2) Australian and international resource collections for early childhood educators mainly focus on resources and activities with traditional resources (manipulatives and print resources). No site was found that provided a comprehensive collection of resources related to activities with digital resources, yet alone, on online resources.

- 3) There are no existing national/state-based virtual communities for early childhood educators that focuses on (or has an identifiable section with special interest in) computer use in early childhood settings.

These findings are significant in the light of the need identified in earlier sections of this report to embed the resources for children within pedagogical resources and a community of educators who use and contribute to these resources.

Recommendations:

That EdNA:

- ?? add value to its collection of validated young children's sites by embedding it within an online professional community. This would involve two overlapping services: the development of "meta-resources" for each of the resources it provides for young children and the development and maintenance of an online community of early childhood educators.
- ?? invite pre-service early childhood teacher education faculties explore ways that pre-service students can become early members of the community and as part of their coursework and practicum requirements contribute to the development of the meta-resources.
- ?? explore ways and means of publicising its services to early childhood educators.

5.2 Pathways to the early childhood collection

The key recommendations for the design of the site are based on the notion that what is needed is more than lists of resources. Given the professional and curriculum development roles for the site, the creation of a "virtual place" where early childhood educators can visit and explore time and time again is important. Equally important is the need for the site to be welcoming and useable by young children. Essential features of this place are its "feel", the ease of navigation, and quick access to alternative views for particular purposes and sophisticated searching functions for the regular and expert users.

Recommendation:

That EdNA create a virtual space which:

- ?? attracts early childhood educators to the site and encourages them to remain and "visit" the various collections and participate in the community of educators.
- ?? welcomes young children to a place where they can explore and take risks within a safe and managed environment. This environment needs to be modifiable by educators to meet the needs and interests of the children with whom they are working.
- ?? uses a metaphor to create a visual image of the virtual space which intuitively signals to children and educators where they can go to visit and use the provided resources.
- ?? provides, within the children's part of the site, visual cues that lead to various representations of collection.

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Appendix A: Is the Use of Computers and Related Technologies with Young Children Appropriate?

Digital resources are appropriate for learning and have a place in early childhood settings alongside traditional resources such as blocks, paints and books. Open-ended digital resources enable children to create, problem-solve, play and discover in ways similar and different from other more traditional resources. When used with peers in an interactive way digital resources can encourage children to collaborate and cooperate and enhance language and social development.

Through observations of adults and siblings using digital resources, young children come to value digital literacies in the same way that they value print-based literacies, as useful and highly desirable tools and processes that enable them to participate in their community.

There have been a number of concerns raised regarding the appropriateness of digital resources for children under eight. It has been suggested that children do not have the fine motor, cognitive or language and literacy skills to successfully engage in computer experiences. However, children are often much more competent than developmental literature suggests. Clements (1999) in a recent review of research concerning young children and digital technologies found that very young children can comfort and confidence in using software; they have the little problem using keyboards and other devices and they can follow pictorial directions and use situational and visual cues to understand and think about their activity.

Even faced with this type of evidence many early childhood educators remain reluctant to integrate computers into early childhood curriculums because they believe that computers, as a symbolic media, are not developmentally appropriate for young children (Dockett, Perry and Nanlohy, 1999). Their view is based on the reasoning that as computers do not enable children to manipulate concrete objects they are not developmentally inappropriate. Such reasoning is challenged by the more recent interpretations of developmentally appropriate practice which incorporate a Vygotskian perspective and by alternative ways of thinking about these resources which allow comparisons with traditional print-based resources.

The Vygotskian perspective of developmentally appropriate practice leads educators to plan experiences that challenge children within what Vygotsky refers to as “their zone of proximal development”. Vygotsky viewed learning as socially constructed, where children learn what is necessary to participate within their society and culture through interactions with cultural tools that are mediated by peers and adults. In western cultures, communication and information are increasingly embedded within digital media as well as in the traditional print-based technologies. Digital artefact and tools abound within these cultures. In their home and community lives young children are learning through manipulating digital tools as well as print-based tools (Makin *et al*, 1999). From a very early age they make sense of images and symbols in digital media as well as print media, as well as manipulate language and mathematical symbols in both media. Experiences that challenge children to develop new concepts and processes, especially when scaffolded by an adult or peers, are highly appropriate for young children’s development of concepts and processes whether it be with the traditional print technologies or the newer digital technologies.

The question today remains not one of are these newer technologies developmentally appropriate, but rather how do we use these new technologies in appropriate ways to enhancing children’s learning and development? When the dominant computer software environment was drill and practice, as it

often was in the 1980s, it was appropriate for early childhood educators to reject this environment as an appropriate resource in the early childhood curriculum. Today, open-ended digital resources that promote communication, interaction, discovery and problem-solving abound. As these processes are viewed as essential for young children's learning and development, so must the technologies in which they are embedded, be viewed as essential, alongside the traditional resources found in early childhood settings.

Appendix B: Study participants

One-day workshop

The one day workshop in Sydney was attended by 19 persons:

- ?? the research team (4),
- ?? education.au representatives (2),
- ?? early childhood educators from three States (3 from NSW, 3 from SA and 1 from WA),
- ?? an Information Technology specialist
- ?? five researchers from the University of Western Sydney, Macarthur, with an interest in early childhood education and/or Information Technology.

The workshop commenced with a large group discussion, followed by small focus groups (two groups) and concluding with another large group discussion and a writing exercise.

Individual phone calls to early childhood educators

Telephone interviews were conducted with 15 early childhood educators working in schools or preschools in SA (2), Victoria (5), NSW (3), Tasmania (2), and WA (3). The size of the sample was limited by the tight time-line for the project and the considerable difficulties encountered when trying to contact classroom teachers. Nevertheless, there was considerable saturation in the data collected.

The participants were drawn evenly from both the public and private education sectors and most were involved in the education of children aged 5-8 (11 participants). The other four participants were involved with children aged 3-5. Most (13) were female.

Parent focus group

The focus group for parents of children aged 0-8 was conducted at a government primary school in Sydney. Four parents were able to attend the focus group (3 fathers and 1 mother). Another three parents (2 mothers and one father) who were unable to attend the focus group were interviewed individually via telephone.

Children focus groups

The focus group for children aged 5-8 years was held at a government primary school in northern Sydney. Ten children participated—five girls and five boys. All participants had had previous exposure to the Internet at home. The children participated in a group discussion about the use of computers and the Internet, and then, in groups of two or three, were observed whilst using the Internet.

The focus group for children aged 3-5 years was held at a preschool in inner Sydney. Eight children participated—six girls and two boys. All were four years old and had previously used a computer, but not the Internet. The children were interviewed in pairs whilst playing on Internet sites with the assistance of the interviewer.

Appendix C: Education department documents reviewed

Tasmania

Does Information Technology Improve Student Learning Outcomes?

<http://www.tased.edu.au/directions/discuss/infotech> (Link no longer active)

Queensland

The Next Decade: A discussion about the future of Queensland State schools (Discussion paper 1997)

Our Vision for Technology in Schooling in Queensland (Brian Rout, Telesystems Seminar, 17th September 1997)

Learning Technology Plan Template (Metropolitan East Region, Regional Learning Technology Reference Group, 1996)

Northern Territory

Computer Technology and Learning

<http://www.ntde.nt.gov.au/692565c500206a82/3fcdbee172eeae2a692565c5001fe539/a441abc66142524c692566130003030e?OpenDocument>

South Australia

Learning Futures (Curriculum Resources Unit, Department of Education Training and Employment, 1999)

New South Wales

Technology in Learning and Teaching

<http://www.dse.nsw.edu.au/staff/F2.0/tilt/index.htm> (Link no longer active)

In High-tech Classrooms (DSE Annual Report 1996)

Agenda98

<http://www.dse.nsw.edu.au/dse/D5.0/agenda98/index.htm> (Link no longer active)

Agenda99

<http://www.dse.nsw.edu.au/dse/D5.0/agenda99/index.htm> (Link no longer active)

Excellence in Teaching and Learning (DSE Annual Report 1997)

Western Australia

Internet in the Curriculum

<http://www.eddept.wa.edu.au/centoff/tisp/internet.htm>

Victoria

An Evaluation of Computer Assisted Learning in Victorian Schools (Don Fitzgerald, Phil Hughes and Robert N Fitzgerald, 1996)

Learning Technology: Issues in Implementing Learning Technology

<http://www.sofweb.vic.edu.au/lt/issues.htm>

Appendix D: Internet Sites Reviewed

<http://animabets.com/index.html> (Link no longer active)

<http://artsafari.moma.org/>

<http://bangemann.gil.com.au/ozkids.fromeset.html> (Link no longer active)

<http://db.cochran.com/li-toc:theopage.db/> (Link no longer active)

http://disney.go.com/home/homepage/today/flash/homepage_main.html

<http://edweb.gsn.org/> (Link no longer active)

<http://interact.uoregon.edu/MediaLit/FA/MLChildren.html> (Link no longer active)

<http://persona.www.media.mit.edu/postcards/>

<http://starchild.gsfc.nasa.gov/>

<http://tap.epn.org/cme/>

<http://www.5tigers.org/ta4lex/a2.html> (Link no longer active)

<http://www.abc.net.au/children/>

<http://www.acs.ucalgary.ca/~dkbrown/index.html>

<http://www.aeca.org.au/morean.html> (Link no longer active)

<http://www.afroam.org/children/index.html> (Link no longer active)

<http://www.ala.org/parentspage/greatsites/amazing.html> (Link no longer active)

<http://www.america-tomorrow.com/menu/update/update.htm> (Link no longer active)

<http://www.bgu.edu/users/mimacp/> (Link no longer active)

<http://www.candlelightstories.com/>

<http://www.classroom.net/>

<http://www.coe.uh.edu/~chhuang/support/internet/> (Link no longer active)

<http://www.cs.umd.edu/hcil/pad++/papers/chi-97-kidpad/>

<http://www.ctw.org/home/>

<http://www.edbydesign.com/>

<http://www.edu4kids.com/math/>

<http://www.enchantedlearning.com/dictionary.html>

<http://www.fed.qut.edu.au/staff/mstelmasters/ece.htm> (secured)

<http://www.funbrain.com/>

<http://www.humongous.com/>

<http://www.insectworld.com/>

<http://www.ipl.org/youth/storyhour/?476.27/> (Link no longer active)
<http://www.kidscarnival.com/>
<http://www.kidsonline.org/>
<http://www.learningplanet.com/>
<http://www.lifelong.com/>
<http://www.magickeys.com/books/>
<http://www.mamamedia.com/>
<http://www.naeyc.org/>
<http://www.nauticom.net/www/cokids/> (Link no longer active)
<http://www.nchafc.org.uk/internet/index.html>
<http://www.netparents.org/>
<http://www.ozkidz.gil.com.au/cubbyhouse/> (Link no longer active)
<http://www.ozprojects.net.au/bilby/index.htm> (Link no longer active)
<http://www.puzzlemaker.com/>
<http://www.safesurf.com/kidsware/htm> (Link no longer active)
<http://www.scribbles.com.au/max/koala2.html>
<http://www.squiglyplayhouse.com/>
<http://www.surfnetkids.com/>
<http://www.techplaces.wiu.edu/> (Link timed out)
<http://www.thewiggles.com.au/>
<http://www.ume.maine.edu/~cofed/eceol/welcome.shtm> (Link no longer active)
<http://www.youngmedia.org.au/>