Children as e-designers:
How do they understand learning?

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Certificate of authorship/originality

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

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Acknowledgements

The recent learning journeys of the university researchers, school partners and children who formed Team GENESIS are woven together throughout this thesis.

Now that I have seen and tasted learning as children know it, I recognise more clearly and appreciate more deeply the value of my recent travels. The children's view of learning made known to me the significance and worth of seeking understanding as a part of a learning community. I wish to make known my appreciation and regard for the communities that I was fortunate enough to be a member of during the past four years.

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Nerida McCredie, Sydney, 2007

Preface

The following publications and conference papers are related to this thesis:

Alexander, S. (2004). Learners creating the learning environment. In M. Selinger (ed.) *Connected Schools - Thought Leaders: Essays from innovators* (pp. 26-33). London: Premium Publishing.

Schaverien, L., Hall, R., and Genesis Team. (2006). A Case Study - GENerating Learning Systems in Schools (The GENESIS Project). An Australian Research Council Linkage collaboration between the University of Technology, Sydney (UTS) and three partner schools in Sydney, NSW, In Chapter Six Assessment and Reporting with ICT: How do teachers know what students have learned? (pp. 209-212) In G. Finger, G. Russell, R. Jamieson-Proctor, and N. Russell, (2006). *Transforming Learning ICT: Making It Happen.* Frenchs Forest NSW: Pearson Education Australia.

McCredie, N. (2004). e-Design for a learning journey: A contemporary encounter with students' ideas about how and why we think. Paper presented at the pre-conference doctoral consortium of the International Conference of the Learning Sciences, Santa Monica, Ca, June.

Schaverien, L., Hall, R., McCredie, N., Alexander, S., Hill, C., Tomkins, J., Nicholson, N., Cuthbert, K. and Vecchiet, S. (2005). Can we help e-Iearning to scale up in schools by casting students as e-designers? The GENESIS Project. Paper presented to the Australian Association for Research in Education annual meeting, University of Western Sydney, Parramatta Campus, 27 November - 1 December. [accessed on 3 March 2006 at http://www.aare.edu.au/05pap/alpha.htmJ.

Hill, C., Alexander, S., Cuthbert, K., McCredie, N., Nicholson, N., Schaverien, L., Tomkins, J. and Vecchiet, S. (2005). GENerating E-Iearning Systems in Schools: School-university e-Iearning research partnerships for scaling up innovation. In S. Lee, P. Warning, D. Singh, E. Howe, L. Farmer, & S. Hughes. IASL Reports, 2005: *Information Leadership in a Culture of Change.* Selected papers from the 34th annual conference of the International Association of School Librarianship and ninth International Forum on Research in School Librarianship, Hong King, China, 8-12 July 2005 [CD-ROM], (Section 19: pp. 1-7). Erie, PA, USA: International Association of School Librarianship.

Note

In this thesis, reference is made to several sources which were written before authors were conscious of the need for inclusive language. I acknowledge this collectively in advance.

Many of the contributions that children posted online were written in shortened text format. While spelling mistakes have been corrected, words and phrases written in their abbreviated form have been left intact.

Since there is a wealth of short quotations from a large range of sources, including discussion boards, brainstorms, videos, reports, interviews, posters and other work samples, precise details of time and date have not been included for every instance. Instead, children's names are given, acknowledging their contributions, and in most cases, the source of the quotation is identified.

Table of Contents

Chapter Seven

Chapter Eight

Chapter Nine

List of Tables

List of Figures

Abstract

This thesis reports an investigation into children's understanding of learning, as they engage with an e-Iearning design challenge.

It begins by making a case that children's views of learning are of crucial significance, not only because of their position as pre-eminent learners in families and societies, but also because their learning is at the heart of our culture's aspirations for education. Then, it examines a selection of prior studies of learning in e-design contexts in order to gauge the advantages of seeking the views of children about learning in an e-design context. This consideration revealed the technological and educational potential of e-design, suggesting that such a context would be opportune here.

Fortuitously, a large, ARC-funded Linkage Project (GENESIS - Generating e-Iearning Systems in Schools) provided just such an e-design context. In this project, researchers were keen to investigate whether the slowness of schools in appropriating e-Iearning might be offset when students have a sustained opportunity to conceive, design and, as far as possible, build an e-Iearning environment in which they and other students could explore questions they were passionately curious about. As a case study within the GENESIS Project, this study followed Papert's (1973) five-step process of educational research. First, a theory of education (a biologically based generative theory) was selected. Next, the ensuing set of conditions for the intellectual growth of children (the e-Iearning design challenge itself) was laid out. These conditions were then implemented within the context of The GENESIS Project: the children were equipped with the opportunity and resources to design an e-Iearning environment to explore a science-and-technology topic of their choice *(How and why do* we *think? How come we're not born with the knowledge we know now?).*

Of the large set of project data, six accounts were selected as representative of the diversity and commonality of children's learning and their understanding of learning in this study. Findings revealed that these children understand learning as generating, testing and thereby modifying ideas, they appreciate that these events are influenced by each leamer's values and they recognise value in undertaking this knowledge gaining activity as part of a learning community. Furthermore, these children explicitly enact opportune learning experiences, particularly technologically, demonstrating their fluency as technological thinkers, capable of having technological ideas about learning.

The findings of this study reveal that these children are able to make their views of learning known, both in conversation and by way of sophisticated characteristics of their e-designs. They highlight the need to canvas and hear children's views about the nature of an education that is in their best interests, and to support their demonstrated capacity to shape such an education technologically for their era.

Chapter One

Justifying and preparing for this study: Why should we be interested in children's understandings of learning?

This thesis asks and answers the following question:

Can I find out how children understand learning by engaging them with an e-Iearning design challenge?1

To justify considering such a question I must address two prior ones:

1. Why should we be interested in children's understandings oflearning?
2. Why would we choose to study such understandings by engaging children with e-learning design?

The latter half of twentieth century child development/psychology can be characterised by its exponentially increasing understandings of previously unrealized capabilities of young children. It was Piaget who delivered the groundbreaking insight, by means of a broad and deep life's work of empirical studies: that understanding children's developing minds was a serious and worthy field of study. Now, at the beginning of the twenty-first century, a clever and subtle lineage of investigations has exposed children's capabilities at younger and younger ages.[2] It is in this tradition, of respect for what we might learn from the youngest members of our society, that I ask this research question.

However, it is not simply a frivolous or voyeuristic anticipation that young children will have something of interest to say about learning that prompts this investigation.

In 1998, 10 my undergraduate Honours study (McCredie, 1998), I asked a similar question: *What insights do children have into learning and how might I find them out* through a sustained study of two Year Six students, observing and analysing their

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1 While e-Learning may commonly refer to online teaching that is contingent on the use of the Internet, this study conceives of e-Leaming *as the use of digital technologies and media to deliver, support and enhance teaching, learning, assessment and evaluation* (Armitage and O'Leary, 2003, pA).

2 For example, Gopnik, Meltzoff and Kuhl (1999) and more recently, Blakemore and Frith (2005) refer to a burgeoning literature of ingenious ways of finding out what babies know, including approaches such as those documented in Baillargeon and Brueckner's (2005) work on young infants' reasoning about hidden objects and Feigenson, Carey and Spelke's (2002) research into infants' discrimination of number vs. continuous extent.

learning within a computer mediated environment, SimCity. The findings of that investigation demonstrated that these young children appeared to have insights into learning as a process of generating and testing the value of ideas. The success, enthusiasm and determination of the participants showed them to be equal to the task of selecting, attempting and assessing their own path of investigation. It also demonstrated, in this context, that they were capable of learning over an extended period of time, that they could show great concentration for sustained periods and work to their own agenda in their own time frame. These findings of this small study sat comfortably with those of other studies of young children in technology-rich contexts both within our own research group (for example; Hall and Schaverien, 2001; Cosgrove and Schaverien, 1996, 1994) and beyond it (for example, Resnick, 2006, 2002; Cassell, 2004; Thibault, 2001).

The limited scope of my Honours study, however, called into question the extent to which the children's views of learning had been coloured by the particular e-Iearning environment (SimCity) these children had explored. While eliciting these children's views of learning had proved to be a worthwhile endeavour, how much more so if children were not interacting, responding and demonstrating learning within the confines of an existing environment, but in an environment they themselves had designed? Such a study would be positioned to make an original contribution to the research community, with the possibility that our appreciation and comprehension of children's understanding of learning could be challenged or refined through investigating their engagement in e-design. Such an investigation may have the potential to uncover what children desire to learn, the ways in which they anticipate technology may mediate or possibly enhance such learning, and how they might recognise and make use of new knowledge and understanding.

The findings of such a study could offer curriculum developers, teachers, designers of e-learning environments and educational researchers, opportunities to examine how their comprehension of the nature of learning aligns with children's understanding. Those who currently determine what is to be learnt at school, the manner in which it is taught and assessed, the ways new technologies are integrated into schools and how the success of such programs is investigated, might find their work is in tune with how children discern such activity. Such an examination, however, might bring to light decisions, assumptions and ways of investigating that conflict with how children understand, approach and value learning.

An opportunity to investigate children's views of learning by casting them as e-designers arose within the context of an Australian Research Council Linkage Project: GENESIS (Generating E-learning Systems in Schools). The project itself investigated the worth of casting children as e-designers as a means to scale up e-Iearning in school systems.[3] My particular interest in inquiring into students' views of learning was compatible within such a project.

My first two chapters justify my principal research question and prepare conceptually for it.

1.1 Overview of Chapters One and Two

As I have already noted, to justify this investigation into children's views of learning by engaging them with an e-design challenge, I need to attend to two prior questions. In Chapter One I will address the first question, (Why should educators be interested in children's understanding of learning?) while Chapter Two will examine the second (Why would educators choose to study such understandings by engaging children with e-learning design.)

With respect to the first question, I present a brief overview indicating growing research interest in the views of young people. While this is occurring in a broad sweep of disciplines and fields of practice, and children's views are being acknowledged as sophisticated and insightful, I argue that most critically this research needs to take place in education. I raise the paradoxical general neglect of children's views in Education and establish the need for strong and particular research interest in the views of learning of our young studenrs. I argue, based on the privileged sociological position of a child and on recent insights from neuroscience, that it is likely children have distinct and insightful views of learning. Having made this case with respect to the substance of this study, I then set out this study's needs, as a research investigation of learning in its own right, for a strong, clear view of learning:

- As a frame of reference alongside which to understand these children's views and
- To hedge the likelihood that learning will occur in this study.

) This project held that the scale-up of e-learning innovations, in Coburn's (2003) terms (measuring not only spread, but sustainability and depth of reform and a shift in its ownership from reformer to schools) has so far not occurred in schools and school systems, either for student or for teacher learning. The project tested the innovative strategy of casting learners as e-designers for its effectiveness as a means of scaling up e-learning in schools on these dimensions.

Of course, it is possible to argue that children might still be able to make their understandings of learning clear in a context in which only weak learning outcomes occur. However, researchers have an ethical responsibility to provide the richest possible set of learning opportunities, through well-theorised educational provision; and once learning occurs, there is the potential for penetrating insights, as children have an "object-to-think-with" (Papert, 1980, p.11) about learning. Hence the importance of ensuring, as best one can, that learning does occur. Once the needs for a strong theory of learning have been made clear here, I can layout the particular generative theory of learning that underpins this study.

With respect to the second question (Why would we choose to study such understandings by engaging children with e-leaming design?), once this theory of learning is in place, I can, in Chapter Two, work towards justifying those characteristics of an e-designing context that might make it potent for studying children's views of learning. To do so, I review, by means of examples, a set of studies in which researchers suggest significant learning has occurred in e-leaming contexts. I then tum to consider specifically first the technological legitimacy of these studies, in terms of Ihde's (1990) and Bronowski's (1974) insights into technologies, and next their educational power in terms of Papert's (1991) three layers of technological fluency and Schaverien and Cosgrove's (2000) generatively principled model of technology-and-science education. I can then describe the particular e-design task of the present study and interrogate it, speculatively and in anticipation, for its technological legitimacy and its educational potential. The work of these first two chapters will then have been completed: the worth of investigating children's views of learning will have been established and the choice of a particular e-design challenge as a worthwhile context for studying those views will have been justified. All that remains, in Chapter Two, will be to give a brief overview of the GENESIS Project, so as to locate the description that follows, in Chapter Three, of the research design and methodology that underpinned this study.

1.2 Why should we be interested in children's views of learning?

Researchers in such fields as education, health, psychology and sociology are recognising that children's views and opinions are under researched and under theorised. (Wall and Higgins, 2006; Danby and Farrell, 2004; Franklin, 2002; Roose and John, 2003; Green and Hart, 1998; Mason and Steadman, 1996) This study now considers why this might be

so, arguing that the views of children are distinct and of worth, and, more particularly, that uncovering and privileging children's views and opinions of learning in educational contexts has high importance.

1.2.1 Reasons for the neglect of children's views

Until recently, research into childhood and children's lives has been conducted through the *views and understandings of their adult caretakers.* (Christensen and James, 2000, p.2) Rather than asking children themselves, researchers have preferred to question adult respondents on their behalf, such as parents or teachers. (Scott, 2000) This traditional view of researching young children has been *strongly influenced by the developmental approach, which still dominates today.* (Danby and Farrell, 2004, p.35)

Researchers have identified several reasons why this view has been upheld.

1. Children are seen as incompetent, or as incomplete. *Childhood is studied as a state of immaturity, and the immaturity is synonymous with passivity and dependency.* (Mason and Steadman, 1996, pA) Their views are not taken seriously (Rayner, 1991, p.37) as it is believed that they are *so incompetent that they do not know what they really want or need.* (Melton, 1987, cited in Mason and Steadman, 1996, p.3)
2. It is alleged that children are *not rational and seem incapable of making reasoned and informed decisions ... [that] children lack any wisdom based on experience and consequently they are prone to making mistakes.* (Franklin, 2002, p.22)
3. Children may be too young to be *able to competently communicate their view, or be unduly open to adult pressure.* (Danby and Farrell, 2004, *pA2)*

This perspective of childhood and children has been central in disciplines such as psychology, sociology, anthropology and education. (Mason and Steadman, 1996; Mackay, 1974) Children have been described as *society's future, as learners - recipients of adult input, and objects of adult actions and adult research.* (Mason and Steadman, 1996, pA)

This view has begun to be challenged as *new approaches to researching young children are seeing children as competent informants of their own evelyday experiences* (Danby and Farrell, 2004, p.3). Researchers are working to legitimate a child's right to *engage in research as competent participants.* (Danby and Farrell, 2004, *pA2)*

The assumption that children are unable to fonn substantiated opinions, or that parents and professionals can accurately presuppose their state of mind, is being challenged in a diverse range of disciplines and fields of practice. Of the relatively few such studies accessible at the time of writing, the following set, selected predominantly from health and anthropology, suggests that children do not only have sophisticated insights and knowledge that are *amenable to research* (Green and Hart, 1998, p.14), but that there are often discrepancies between their understanding and experiences, and those that parents and professionals report on their behalf (Carney et ai, 2003).

Roose and John (2003) worked to gain insight into young children's understanding of mental health, and to identify their views on appropriate services for children in their age group. Their investigation contended this was an area of research previously discounted. Undertaking research to address this neglect, they determined *the participants showed a sophisticated understanding of mental health.* (Roose and John, 2003, p 545)

Girling, Sparks and Smith (1999) were interested in how children understood and discussed issues of justice, punishment and reward. They too saw children's views as *a subject about which little* is *known in detail.* Seeing this subject matter as an *important aspect of the social world of childhood* they believe *that knowing how children think about justice and punishment is central to understanding how they respond to and interpret parents' and schools' attempts to exercise authority over them.*

In seeking to ascertain children's views of accident risks and prevention, Green and Hart (1998 pp. 14 - 21), identified that while parents' views of risks to children had been addressed, *children's own views of risks and the possibilities for risk reduction have been relatively under-researched.* They identified that this irregularity was present in health matters generally, and was attributed to researchers who *often see them (children) as incompetent or irrational reporters.* (Mayall, 1996; James 1993)

To strengthen their case for seeking the views of children, Green and Hart (1998) referred to the findings of research into children's views in other fields; and these broader collections of data (Anderson, 1993, Haudrup Christensen 1993) *suggested that children's knowledge and abilities to account for their knowledge are not only sophisticated but also amenable to research.* From their own investigation, they too concluded that *children were knowledgeable about injury risks and how to reduce them.* (Green and Hart, 1998 pp 14-21)

A study by Chandler (1997) reviewing literature on children's understanding of what is 'real' on television, similarly found that children were able to *make increasingly sophisticated judgments about what is 'real' on television using multiple criteria* (Chandler, 1997 p 67). Of particular significance is this researcher's insight that children were able to make these assessments *without being taught to do so... based upon their growing knowledge of both the medium and the everyday world.* (Chandler, 1997, p. 67)

Carney et al (2003) saw the identification of children's views of their hospitalisation experiences as *essential to the development of appropriate services.* (Carney et aI, 2003, p.27) Once again, these researchers found the views of children traditionally overlooked for those of their parents or professionals, who *described what they perceive children to believe and understand about their hospital experience.* (Carney et aI, 2003, p.2S) In proposing the development of services that were to be appropriate for children, ascertaining children's views was essential, as the researchers demonstrated *discrepancies between children's experiences and those parents and professionals assume that they are having.* (Carney et aI, 2003, p.28)

From these and other studies, we can conclude that:

- In a wide group of research fields, the views of children have been under researched,
- Children often have views, and that they are sophisticated and based on multiple criteria.

Such findings challenge assumptions that children are irrational, immature or incompetent reporters. Furthennore, children's views are not necessarily what parents or professionals assume them to be, and these views can be influential in developing services for children. So, within a variety of domains, children appear able to contribute sophisticated and unexpected insights to the research community. Such findings raise the possibility that children might also be able to do so with respect to learning.

Until recently, (1991, according to Wall and Higgins, 2006) children's views of learning have not actively been sought in education. However, a recent review of educational research literature concerned with gathering pupils' views of teaching and learning (Wall and Higgins, 2006) noted that there has been an increase of investigations that consult pupils, particularly primary aged children, about different aspects in school. This review identified that children have been asked about:

- Their experiences of curriculum, pedagogy and assessment (Pollard, 1996; Tunstall and Gipps, 1996),
- Their attitude to school and school work (Blatchford, 1996), and
- Their perceptions of their primary teacher (Wragg and Woo, 1984), oflearning with lCT (Goodison, 2002) and of how pupils as researchers can be used in school improvement (Flutter and Ruddock, 2004).

It was recognized however, that while these investigations were concerned with eliciting children's experiences, attitudes and perceptions of school relationships and activities, few looked in detail at the children's thoughts concerning specific learning tasks or specific contexts (Wall and Higgins, 2006).

An example of such a study began by examining the issues surrounding pupils' perceptions of the learning process by conducting interviews with young children. These interviews made use of physical stimuli as a scaffold for the conversation. (McCallum et al. 2000) However, while the children were asked to describe *'learner conditions and classroom conditions that they [pupils} believed were conducive to learning'* (McCallum et al. 2000, p. 279 cited in Wall and Higgins, 2006, *pAI)* their thoughts about their own learning were not considered.

Attempting to address this concern, a carefully designed paper template was developed to mediate interviews with children about teaching and learning situations, to *stimulate reflection on the processes of thinking in different learning contexts* (Wall and Higgins, 2006, pA2). The interview process involved three-way interaction between the researcher, the child and the template. However, these discussions centred around learning contexts chosen by the researcher and encouraged the children to reflect on their thinking and experiences of tasks that were *broadly familiar to them in terms of what they usually do in school* (Wall and Higgins, 2006, pA2).

By contrast, the present study seeks to uncover children's most fundamental understanding of the nature of learning: a view of learning that is more extensive than simply school activity, curriculum or pedagogy. I tum to consider some evidence for supposing that children might be distinctively - perhaps even uniquely - well equipped to contribute such insights into learning.

1.2.2 On what grounds, if any, might there be a compelling argument for researching children's views of learning?

The late twentieth century and early twenty-first century have delivered powerful research insights into the status of young children as humanity's pre-eminent learners, as a result of their privileged position in their communities and the phenomenal early growth of their brains. I summarise these insights briefly now.

A distinctive community: The privileged position of a child

Children are born into a family, a community and a society. *From the moment of birth, learning and developing are social. Family and peers are as intimately a part of the world of infants and young children as are the objects and surfaces with which they live.* (Thelen and Smith, 1994, p.327, 328) It is a fertile world they live in, with *a rich social structure* and *opportunity for contradiction, instruction, and the linguistic transmission of information.* (Gopnik and Meltzoff, 1997, p. 24) Children are able to develop their understanding *in the context of a society that already has much knowledge of the world.* (Gopnik and MeItzoff, 1997, p. 25)

Infants and children benefit from *privileged sociological conditions.* (Gopnik and MeItzoff 1997 p.25) For while it is that *infancy and childhood are times of great vulnerability for the young,* (Elman, 1993 p.71) all of their *survival requirements are suspended,* (Bruner, 1974 in Gopnik and Meltzoff, 1997, p.19) enabling their minds to prosper at a period of time when *they have more multipurpose and flexible learning capacities* to employ. (Gopnik and Meltzoff 1997 p.19)

It is a time of life when children can *concentrate on acquiring a veridical picture of the particular physical and social world in which they find themselves.* (Bruner, 1974, in Gopnik and Meltzoff, 1997, p. 19) As children discover where they are, they make decisions about what to try and do. Their pursuit and their strategies operate in, *and indeed, may often assume, a social context.* (Gopnik and Meltzoff, 1997, p.19) This is the task required and undertaken during childhood - to engage with the physical and social world.

Children engage with their surroundings to *build systems of knowledge that capture the significant regularities in their environment, such as knowledge of the motions of objects, the actions of people and animals, and the structure of social events.* (Spe1ke and Henner, 1996 p.71) Not possessing adult concepts, they employ *discovery procedures* that rely on

a variety of sources, *including the laws of physics, the actions of others, and experience of the self as an intentional agent.* (Meltzoff, 2004, p. 166) This process of organization, by way of interaction between *the organism and its environment* is a *fundamental characteristic of the brain.* (Blakemore and Frith, 2000, p.14)

It is during childhood when *the greatest learning occurs,* a period of time in human life when we are undergoing the *most dramatic maturational changes.* (Elman, 1993, p.7l) Indeed, it may be these maturational changes that *provide the enabling conditions which allow learning to be most effective.* (Elman, 1993, p.7l) Human babies are special not because they are born intelligent, but because they are *designed to change their minds when faced with the data.* (Meltzoff, 2004, p.166) The abstract representations of the world that they are born with *enable predictions and interpretations* (Gopnik, 2000, p.lO), and equip infants to *change, revise, and alter* [their understanding] *in the light of new information that they get.* (Gopnik, 2000, p.lO)

So, according to these researchers, childhood is a time when ideas and understandings are most rapidly responding and modifying as children engage with their social and physical world, strongly suggesting that it is a most advantageous age for studying learning. It is now also clear that this time of distinctive social interaction coincides with distinctive brain function (Hung, 2003; Blakemore and Frith, 2000; Talay-Ongan, 2000; Bruer, 1999, 1997; Carter, 1998; Thelen and Smith, 1994), as I will now describe.

A distinctive brain: Phenomenal early growth

The human brain is a *dynamic and responsive structure,* [an organ that is] *deeply affected by experience, and shaped by stimulation.* (Talay-Ongan, 2000, p.28) The brain works in a *holistic, plastic, self organising fashion,* (Thelen and Smith, 1994, p.13l) its structural boundaries being less fixed than previously thought, *where collectives of neurons exhibit many dynamic properties, including phase entrainment and chaos.* (Thelen and Smith, 1994, p.13l)

It is during infancy that humans' brains are at their most plastic. (Carter, 1998) This plasticity refers to the *fluid and changeable* organization of the brain. (Talay-Ongan, 2000 p.29) Young brains in particular are very flexible and sensitive. (Blakemore and Frith, 2000) Neural plasticity can be thought of as *the subtle but orchestrated dance that Occurs between the brain and the environment, specifically, it is the of the brain to be shaped by experience and, in turn, for this newly remoulded brain to the*

embrace of new experiences, which leads to further neural changes, ad infinitum. (Nelson, 2000 pA2) It is this plasticity that is *at work behind everything we learn, all of our memories, declarative and otherwise.* (McEwen, 2002, p.120)

Neuroscientists can now demonstrate the early development of the brain's "wiring diagram" during gestation (Bruer, 1997, 1999). Indeed, they consider that *all parts of the brain develop in an integrated fashion over time and an infant comes into the world with a nearly adult-sized brain that has most of its mental circuitry already in place. The task remaining is to "solder" the neural connections linking the cerebral structures.* (Hung, 2003 p. 132)

This task is commenced soon after birth as *different areas of the brain establish connections with each other as the child engages in discovery and exploration, thus making sense of the world.* (Talay-Ongan, 2000, p.28) During postnatal development *the brain begins to form new synapses, so that the synaptic density, (the number of synapses per unit volume of brain tissue) greatly exceeds adult levels.* (Blakemore and Frith, 2000, p. 8-9) The growth of neurons accounts for some of the change, but it is the *wiring, the intricate network of connections between cells and synapses, [that] sees the most significant change.* (Blakemore and Frith, 2000, p.8) The process of synaptic proliferation, synaptogenesis, lasts up to several months. Following this is a period of synaptic elimination, or pruning, *in which frequently used connections are strengthened and infrequently used connections are eliminated.* (Blakemore and Frith, 2000, p.9)

Gopnik believes that compared with adults, children are much better at learning new things and also have greater flexibility in changing what they think about the world. She challenges the assumption that adults are better capable of paying attention than children, citing brain activity as evidence. *Some brain areas, like the dorsolateral prefrontal cortex, consistently light up in adults when they are deeply engaged in learning something new. For more everyday tasks, these areas light up much less extensively. In children, the pattern is different - these areas light up even for mundane tasks.* (Gopnik, 2005, p.139-14l)

So, not only are children pre-eminent learners, with a privileged position within a rich social structure, (Gopnik and Meltzoff 1997), they are also equipped with an already highly complex brain experiencing phenomenal growth. (Talay-Ongan, 2000)

Also, by virtue of their pre-eminent position as learners in the lifespan, children might be uniquely well equipped to deliver powerful insights for Education, as they are doing in other disciplines. Such a conclusion justifies the present study (and studies like it) for their potential to lead to enhanced educational provision as children's views of learning are enacted. However, the task of eliciting children's deepest insights into learning is far from simple, as I will now propose. Having established that it is appropriate to expect children to have distinct and fruitful views and understandings of learning, are children themselves able to disclose them in such a way that we as educational researchers may comprehend them?

1.3 The challenge of eliciting children's views of learning

I acknowledged a particular challenge of eliciting children's views of learning in my Honours study: that though English is well-supplied with words to describe teaching (pedagogy, for example) it has few to describe learning. This critical problem was identified by Papert (1980) who, by way of a solution, suggested appropriating the word "mathetics" for *having to do with learning* (p.39). However, by 1992, he himself acknowledged that the word had not been embraced by the educational establishment at large. In attempting to understand why that might be, he asserted that the problem is not only to do with vocabulary: it is a grammatical problem as well.

> *Think, for example, of parsing the sentence, The teacher teaches the child. Teacher is the active subject of the sentence; child* is *the passive object. The teacher does something to the learner. This grammatical form bears the stamp of School's hierarchical ideology in representing teaching as the active process.* (Papert, 1992 p.83)

Papert has identified that our language implies passivity on the part of the child and activity on that of the teacher. There are as well other ways that our language constrains our ability to discuss learning. On one hand, it predisposes learners to say only things that are possible to say in response to a query about learning, things that may not embody how they actually think about learning. Our culture's, and perhaps many if not all human cultures' question-answer patterns, might not allow too much liberty to depart from giving well-worn and superficial responses, prefigured by the nature of the questions themselves. On the other hand, language leaves gaps, so that there are some things learners might not be able to put into words at all. This is an example of the Whorfian hypothesis,

> *We dissect nature along the lines laid down by our native languages. The categories and types that we isolate from the world of phenomena we do not find there because they stare every observer in the face; on the contrary, the world is presented in a kaleidoscope flux of impressions which has to be organised by our minds - and this means largely by the linguistic systems of our minds. We cut nature up, organise it into concepts, and ascribe as we do largely because we are parties to an agreement to organise it in this way - an agreement that holds throughout our speech community and is codified in the patterns of our language.* (Whorf, 1956, p. 213)

Given the linguistic systems of our minds, our vocabulary, grammar and our syntax, we may well be hampered in our ability to move our ideas about learning around. As Minsky (1994) noted when considering the impoverished language of mathematics, *There is no way children can think about mathematics when they go home, no way that they can talk about what they are doing to their friends.* (Minsky, 1994, CD-ROM, transcript of speech).

This language barrier argues for choosing a context for studying children's views of learning in which there are opportunities that both provide and provoke situations where they can demonstrate their understanding, even if they can't always articulate their reasoning. As well, at the very least, as a key part of this study's conceptual armour, it is necessary to have a clear, strong theory of learning for the two reasons already proposed in my overview of this chapter, that is:

- As a frame of reference alongside which to understand these children's views as and when they make them clear, and
- To hedge the likelihood that learning will occur, so that children will have an object-to-think-with (after Papert, 1980, p. 11) about it.

1.4 A biologically based generative theory of learning

Several key factors influenced the selection of a learning theory to underpin this study. To act as a frame of reference alongside which to understand the children's views, and to hedge the likelihood that learning would occur, it was necessary that the study:

- Be framed to focus primarily upon learning activity;
- Be open to recognising, describing and discussing such activity with children, and
- Take place within a context that was anticipated to be educationally fruitful.

Schaverien and Cosgrove (1999) present a biologically based generative theory of learning, drawing strongly on insights from neuroscience and evolutionary epistemology. In essence, this theory considers learning (or knowledge gaining) biologically, as evolved adaptations (after Edelman, 1992, 1993 and Plotkin, 1994, 1997, 2002, 2004). It conceives of learning as the generating of ideas and the testing of these ideas on their value. Those ideas that survive these tests are kept. Ideas that do not are discarded. Such a view of learning has three central characteristics:

1. It is driven by values,
2. It is a process of generating and testing on these values, and
3. It is developmental.

This biologically based theory recognizes learning, knowledge gaining, as an adaptive behaviour. Such a view clearly directs the focus of researchers towards those who are adapting, the learners. As a selectionist theory, it provides researchers with a model of ideas and language for describing learning (generating, testing, valuing, modifying). So, to a certain extent, this model redresses our language's sparseness - and hence children's possible linguistic paucity - in describing learning. Such a view also guides the design of educational contexts: if learning is the act of generating and testing of ideas on their value to learners, such a view of learning suggests the necessity, if learning is to occur at all, of directly engaging learners' values and purposes, of enabling learners themselves to take a central part in the choice and design of contexts of very high interest to them. In all these ways, a biologically based generative view of learning provides a frame of reference against which children's views of learning might be compared and contrasted within this study, and also guides the design of potentially significant educational provision at the core of the research-strategy, hedging the likelihood that learning will occur.

1.5 Summary of Chapter One

This chapter has argued the worth of investigating children's insights into learning by:

- Challenging assumptions that children are irrational, immature or incompetent reporters,
- Highlighting findings that children's views are not necessarily what parents or professionals assume them to be, and
- Recognising that children's views can be influential in developing services for children.

Furthermore, powerful research insights from the late twentieth and early twenty-first century have highlighted young children's status as humanity's pre-eminent learners as a result of their privileged position in their communities and the phenomenal early growth of their brains.

I have acknowledged and addressed the challenge of eliciting children's views oflearning by selecting a biologically based generative theory of learning to act as a frame of reference for gauging children's views and to hedge the likelihood of high quality educational provision within the study.

Chapter Two will complete the remaining task for the justification and preparation of this study: the justification of the choice of an e-learning design challenge as an appropriate and fruitful context in which to conduct this study.

Chapter Two

Justifying and preparing for this study: Why should we choose to study such understandings by engaging children in an e-Iearning design challenge?

Chapter One argued the worth of investigating children's insights into learning. There, the challenge of eliciting children's views of leaming was acknowledged and addressed in part by selecting a biologically based generative theory of learning to act as a frame of reference for gauging children's views and to try to encourage high quality educational provision within the study. This chapter also addresses the challenge of eliciting children's views of learning. It sets out to justify the selection of an e-Ieaming design challenge as a framework in which to carry out this study.

2.1 The worth of e-Iearning design contexts for investigating children's views of learning

There is an accumulating body of research that demonstrates the potency for leaming of e-Ieaming contexts in which children can begin to be designers, albeit in adult-conceived projects. Demonstrations that learning occurs in such contexts is a strong starting point for justifying the choice of an e-Ieaming design context for investigating children's views ofleaming in this study.

In this section I present a cluster of ten accounts of e-Ieaming design contexts. Then I consider these accounts for their technological and educational legitimacy and power. To do so, I have chosen two key philosophers of technology (Ihde (1990) and Bronowski (1974)) and two sets of models of how technological contexts might reveal that educational power: Papert's (1991) layers of technological fluency and Schaverien and Cosgrove's (2000) generatively principled model oftechnology-and-science education.

2.1.1 Computer Clubhouse

In 1993 a Computer Clubhouse was opened in Boston for youth aged ten to eighteen in recognition that *today's youth are ready and eager to do more with computers.* (Resnick, 2002, p.35) On one hand, computers can be used to *transmit, access, represent, and manipulate information in many new ways,* (Resnick, 2002, p.32) and on the other, they

can be used by children to *explore the workings of systems in the world (everything from ecosystems to economic systems to immune systems) in ways that were previously not possible.* (Resnick, 2002, p.36) The Clubhouse sought opportunities to nourish and develop creativity. In a place where computers were seen as *a universal construction material, greatly expanding what people can create,* (Resnick, 2002, 33) it was hoped that an individual's creative ability would be extended and refined, creating *individuals who are constantly inventing new possibilities for themselves and their communities.* (Resnick, 2002, p. 37)

One instance of such creativity involved an eleven-year-old girl, Jenny, pursuing her interest in birds. Using a programmable brick, she was able to design and build a new type of bird feeder. It involved *making a wooden lever that served as a perch for the birds. When a bird landed, it would trigger a touch sensor, sending a signal to a programmable brick, which turned on a LEGO mechanism, which pushed down the shutter of a camera, taking a picture of the bird.* (Resnick, 2002, p.35) This new technology *provided Jenny with "design leverage,"* that enabled her to act on her curiosity and create for herself a tool to meet her ends *that would have been difficult for her to create in the past.* (Resnick, 2002, p.35)

2.1.2 Kaleidostories

The Kaleidostories project sought to explore *how new technologies can assist young people to discover their own selves as well as the underlying patterns of thought and behavior that connect the worldviews proposed by different cultures.* (Bers, 2003, p. 1) Young people used the web-based tool to form a virtual community *to exchange stories about shared values and role models.* (Bers, 2003, p. 3)

One child, Melanie from Buenos Aires, participated in the project through the Sunday School she attends in her synagogue. Melanie nominated Moses and Einstein as two of her role models. In this environment focused on values and role models, she also wanted to share her thoughts and beliefs about the Nazis. It was important to her that others read her story and *learn what she thinks about them.* (Bers, 2003, p.21) The environment did not provide a place for 'anti-role models' and so Melanie resourcefully published her views in the role models section, sparking a significant response. Not only did others in the community question her and provide her with an opportunity to share her reasoning,

the designer of the environment altered it to include the features Melanie was looking for in the next version.

2.1.3 Radio Gune Yi

Radio Gune Yi is managed and conducted by children and for children. In Dakar, Senegal, new information technologies are handed across to young public in order for them to create a space to exchange their thoughts and speak about their concerns. It equips young people to initiate debates, have discussions and *to look for solutions without intermediaries.* (Mbodj, 1995, para. 1)

Children are involved in all phases of the project, and participate in every program. They identify places of interest and determine programming content. They show great interest in *the promotion of children's rights, the access to the value of the social-cultural heritage through tales and legends and the freedom of speech.* (Mbodj, 1995, para.2) A responsive audience has seen Radio Gune Yi's activity extend beyond the capital city to include villages and far-away places of the country.

2.1.4 The International Children's Digital Library

In 2001, a team of researchers, including educational researchers, computer and library scientists, visual artists, classroom teachers and children came together to develop *inteiface technologies that support children in using large amounts of digital information.* (Hourcade et aI, in press, p.5) The team worked together to modify an existing interface,_ the digital library interface SearchKids, to support books.

As the team became familiar with SearchKids, they identified three features to address in their project's modification: how to adapt the existing tools to engage with children's books, how to create a community of online readers and how to support these readers in their reading of books online. Separate groups, all containing children and adults, broke away to address each of these features, reporting back to the whole team so an appropriate prototype could be developed.

The children involved in the design returned with their parents, siblings and friends to trial the environment, reading stories online in a standard reader (page by page), a comic strip reader (several pages spread across the screen to zoom in and out on), and the spiral

reader (showing the page in focus with the rest of the story twirled around the screen in smaller frames.) Interestingly, while this last-described reader had been the most novel of the children's design ideas, it proved the least helpful in their opinion as they engaged in evaluating their design.

2.1.5 Rediscovering Culture

The non-profit organization Arab Resources Centre for Popular Arts (APCRA) was created in 1990 and aims to *fight poverty and the lack of identity references* (Ajana, 1998, Para. 1) in the Palestinian Camps in Lebanon. APCRA designed the "Images and Testimonies from the Camps of Lebanon" project for the children of these camps *to express their emotions and hopes of becoming "journalists" or "directors".* (Dajani, 1998, para. 1) The project aimed to renew links with the past, *offering their children the possibility of rediscovering their parents' culture and preserving it for future generations.* (Dajani, 1998, para. 3) Thirty children, aged between nine and fourteen, most of whom were no longer attending school, participated in the project. This younger generation faced the prospect of the *progressive degradation of the links with the Palestinian past, folklore and culture, particularly due to the disappearance of elderly people, who are agents of the collective memory of their people.* (Dajani, 1998, para. 3) Using new technologies to film interviews and take pictures, the children were equipped with accounts they could preserve and use to *rebuild their past and culture, in order to better understand their refugee situation and reconcile their identity with their self-esteem.* (Dajani, 1998, para. 1)

2.1.6 CSILE Knowledge Forum: Multiple Perspectives

The CSILE (Computer Supported International Learning Environments) Knowledge Forum is an electronic group workspace. People can come to the Knowledge Forum and participate in *a multimedia community knowledge space.* [Participants] *contribute theories, working models, plans, evidence, reference material* in the form of notes to a shared space. (Scardamalia, 2004, p. 183) This information, and the understanding of the information by the participants, is continually reworked and adapted in this e-leaming environment.

In one of many reports of the use of the Knowledge Forum, children in Grades 1-3 contributed information to the forum about their favourite dinosaur. As the amount of

information grew, children could identify classmates who shared their favourite dinosaur, and appreciate the graphical entries some children made. The information in the forum was clustered according to "dino types" and presented in a new view for participants to encounter, one where graphics and text were linked. University students coming to the forum accessed this information, appreciating the references many notes made to the geological time when particular dinosaurs lived. They developed a view of the notes based on this classification, inspiring students who had not included such detail on their notes to discover and add it to enable their work to be situated in this view. Once again, another member of the community, a biologist, adapted the multimedia information about dinosaurs to be presented in a view that catalogued the dinosaurs as being either plant or animal eaters.

2.1.7 Thailand: Project Lighthouse

Cavallo (2000) reports Project Lighthouse. A village leader from Nong Baot in the northeast of Thailand *expressed the need of the people to gain more control over their lives and the belief that certain uses of (the) technology could help them.* (Cavallo, 2000, p. 774) The villages wanted *access to expert knowledge* and, more importantly, an opportunity to *be in control of gaining the access to and making the decisions about what to do with the knowledge.* (Cavallo, 2000, p. 775)

The villagers wanted to build a dam that *would retain water at the end of the rainy season that could be used for agriculture in the dry season.* Two previous attempts had failed; *the reservoir did not contain the water.* (Cavallo, 2000, p.776) Cavallo became a project mentor as the villagers and rural teachers worked to investigate and develop a solution making use of previously unavailable technology.

The team *walked through the flood plain and took some digital photographs* and *measured the distances between relevant objects in the terrain using the odometer on a motorcycle.* (Cavallo, 2000, p.776) Photos were uploaded into Microworlds LOGO, and work began 011 making *visual representations of the area.* Upon constructing *their own map of the area,* a mistake was identified: *the villagers had been building the dam in the wrong place!* (Cavallo, 2000, p.776) To correct the mistake and create a viable solution, the villagers undertook many tasks that included making maps *to measure distances and perform calculations over these distances,* determining *water usage for various crops over time while accounting for evaporation and drainage* and creating *LEGO robotic-*

controlled apparatuses to assist in farming and environmental sensing. (Cavallo, 2000, p.779)

2.1.8 Exploring Octagon Deluxe

For eight weeks, six eight-year-old children met with a researcher for an hour and a half a week to work with LOGO. Within LOGO users can program a turtle to move across the computer screen and can develop and program this turtle to follow procedures they have designed. The children were *encouraged to pursue individual interests, ... ideas that interested them most with any member of the small community they chose.* (Care, 1997, p.22)

The work of one child, James, made his developing mathematical thinking evident. Initially, he used the turtle as a shape drawing tool, *conceiving of more and more complex designs and setting about expressing them algorithmically.* (Care, 1997, p.55) These examples (Figures 2.1 – 2.4) show his procedures and his tendency to nest one procedure inside another, *a hallmark of James' programming style.* (Care, 1997, p.52)

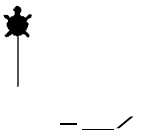

Figure 2.1 Octagon

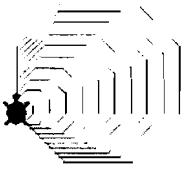

Figure 2.2 Nested octagons

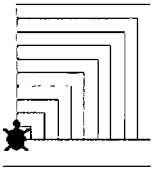

Figure 2.3 Nested squares

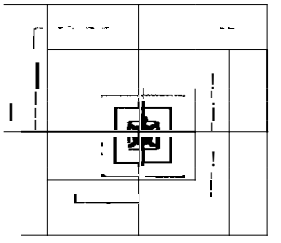

Figure 2.4 Rotated nested squares

However, as James set out on a quest to design and comprehend a shape he labelled an Octagon Deluxe, *a significant conceptual and strategic shift occurred in his mathematical thinking.* (Care, 1997, p.55)

The initial procedure James programmed did not result in forming an Octagon Deluxe as he had imagined. The unexpected shape it did form he named Starman (Figure 2.5). James debugged his procedure and successfully programmed an Octagon Deluxe (Figure 2.6), but the experience greatly influenced the way he used his turtle. He no longer decided what particular shape he wanted to design and then worked to figure out a procedure to draw it. *He began to use the turtle as an agent for exploring what might occur rather than as an agent for carrying out preconceived ideas.* (See Figure 2.7 and 2.8 as examples of turtle explorations) (Care, 1997, p.55)

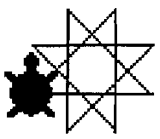

Figure 2.5 Starman

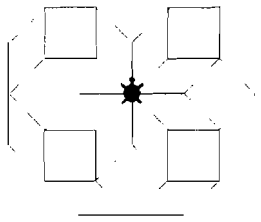

Figure 2.6 Octagon Deluxe

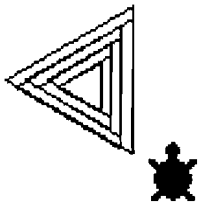

Figure 2.7 Active Triangle

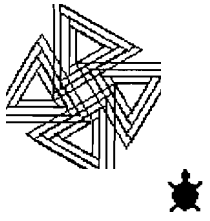

Figure 2.8 Wow Triangle

James' new way of using the turtle, as a tool for exploring mathematical ideas, was a shift in his approach that he was well aware of. His new mathematical behaviour involved *experimentation with the mathematical language.* (Care, 1997, p.55) James himself explained *I've got all these ideas in here but I haven't caught them yet. They're running around (in my head)... I mean, I don't know what they are. I know they're in there but I don't know what they are.* (Care, 1997, p.55) LOGO provided him with an environment where he could capture, examine and make sense of these ideas.

2.1.9 Speed Zero

Papert (2000) records an account of a child's delight and satisfaction attained while engaging mathematically with LOGO. A kindergarten girl had been ascertaining how she could control the speed with which objects on her screen moved. She explored using *commands like SETSPEED 100. which would make them* go *very fast, or SETSPEED 10, which would make them* go *much slower. She had investigated some speeds that seemed significant, like* 55, *and then turned to very slow speeds, like* 5 *and* 1 (Papert, 2000, p.724).

While undertaking her investigation, she made a discovery so significant and exciting she summoned a friend and her teacher to enter into and appreciate her breakthrough. Papert shared the initial puzzlement of the teacher of what this discovery might be when there was no movement or activity occurring on her computer screen. That nothing was happening was in fact the whole point of Dawn's excitement. What had occurred, and her understanding of the consequences became clear to Papert: *She had typed SETSPEED 0 and the moving object stopped. She was trying to tell us, but did not have the language to do so easily, that those objects that were "standing still" were nevertheless "moving"-they were moving with speed zero.* (Papert, 2000, p.724)

LOGO had made visible for Dawn a new realization, *that zero is also a number, speed zero is also a speed, distance zero is also a distance and so on. Up to that point zero for her was not a number. All of a sudden, it had become one.* (Papert, 2000, p.724)

2.1.10 Mayors of the City

This account, drawn from my Honours study (McCredie, 1998) records the thinking of two eleven-year-old boys that was made visible as they went about using a computer simulation program, SimCity, as an object with which they could think about managing a town's budget.

The boys needed $3000 to build a power plant to save their city and so Adam decided to open their budget to see what he might do. The boys studied the contents of their budget. Looking at the lack of law enforcement funding, Adam decided, 'We need to give the police guys money 'cause they've got nothing.' Robert, remembering their purpose behind this financial exploration reminded his friend, 'We don't have any money!' In

response to this, Adam went to the tax rate, and lowered it, but not before he had set the budget so the police would receive the $300 they required:

Robert: (with a questioning tone)
Adam?
Adam: (lowering the tax rate to 2%)
We need some money.
Robert: (coming on board with the plan)
Now let's see if we gain money or lose money.
Adam: *We should gain money.*
Robert: *Yes, I think the lower the better.*

Both the boys agreed that by putting the tax rate very low, they would 'gain' money. When the yearly budget flashed onto the screen, the boys received $200. As Adam had raised the police funding to $300, all the money that they had was given to the police. Puzzled, Adam commented, *we had $200 and it goes straight to zero.*

Adam and Robert returned to their budget to try another strategy. Realising that their $200 had been distributed to the police, Adam suggested, 'Let's put it (funding to the police, fire and transport) down to zero and then when we get some money or build a power plant, then we'll give them money.' As well as following through with this idea, the boys also lowered the tax rate to 0%, obviously still considering 'the lower the better.'

Another budget came: the boys saw that their second attempt had failed. Without distress, they leant closer to the computer to consider their situation further:

Robert: *Now we've got to rethink.*
Adam: *Better not* go *to zero.*

Prompted by Adam's remark, Robert raised the tax rate to 5%. When the next budget came, because the boys had dispensed of their funding responsibilities, they received and retained several hundred dollars. Having found a way to keep their tax money, Adam acknowledged that, 'We have to wait until it goes to $3000.' Turning to the speed settings, the boys selected the fastest possible to increase the rate of their accumulation, and, leaving the budget be, sat and discussed where they might start to build next.

Several minutes passed before Adam noticed:

Adam: *Oh! Hey, we've got enough. There* we *go.*

Robert: *That's right*

Adam: (Very satisfied with their achievement)
Okay!

Robert: *Ta da!*

There was a pause of several seconds, before Robert turned away from the screen to Adam and said, 'Okay, more industrial zones needed.' Having successfully manipulated the budget to achieve their goal, the boys fittingly, and characteristically, applauded themselves before moving on to their next decision. (McCredie, 1998, p.39, **41)**

Having presented this cluster of research vignettes **in** which children appropriated a range of e-Ieaming media for designing, I now tum to review these accounts for their technological legitimacy and educational power. First, I demonstrate how these contexts might be interrogated **in** terms of the ideas of two key philosophers of technology (Ihde, 1990 and Bronowski, 1974). Then I reveal the educational power of these contexts in terms of two pertinent learning models: Papert's (1991) layers of technological fluency and Schaverien and Cosgrove's (2000) generatively principled model of technology-and-science education.

2.2 Examining the technological legitimacy of these e-Iearning design contexts

Technological development enables us to interpret and adapt (or adapt to) our world. Bronowski (1974) the *distinction between the moulding action of the hand, and the splitting or analytic action of the hand* as one of the most *important steps that man (sic) has taken.* It is the action by which the human hand *becomes an instrument of discovery.* Humanity's impulse for discovering an *underlying order in matter is its basic conceptfor exploring nature.* From early times when we made tools from stone, to modem day computerized axial tomography (CAT) scans or through images taken by the Hubble Space Telescope,

> *a* [human] *prises open the nature of things and uncovers the laws that the structure dictates and reveals. Now the hand no longer imposes itself on the shape of things. Instead, it becomes an instrument of discovely and pleasure together, in which the tool transcends its immediate use and enters into and*

> *reveals the qualities and the forms that lie hidden in the material. Like a man cutting a crystal, we find in the form within the secret laws of nature.* (Bronowski, 1974, p.58 - 59)

After young James (Section 2.1.8) had successfully programmed an Octagon Deluxe, the LOGO Turtle became for him such an instrument of discovery, an agent for exploring new mathematical ideas. Indeed, Jenny (Section 2.1.9) also found LOGO to be a tool of discovery and pleasure, summoning others to come and see the 'secret law' of SETSPEED 0, and to share her breakthrough understanding that zero was a number.

While Bronowski's appreciation of humanity's impulse for and delight in exploring nature through instruments of discovery provides this study with an overarching philosophical context, Ihde's (1990) insights lay open a way of recognizing and appreciating how it is we interact technologically with our environment.

Ihde acknowledges three ways in which *I-as-body interacts with my environment by means oftechnologies.* (Ihde, 1990, p.72)

The first of these is embodiment relations. The context for this interaction between humanity and the world, involves technology entering into a person's experience of perceiving the world in a particular way. Putting on a pair of eyeglasses to correct vision, or a hearing aid to enhance hearing are ways we embody technology to *transform* our *perceptual and body senses.* (Ihde, 1990, p.72)

While a person is driving a car, they experience the *road and surroundings <u>through</u> driving the car.* (Ihde, 1990, p.74) The technology is in a position of mediation. Through this, a driver's *bodily is 'extended' to the parameters of the driver-car body,* an embodiment demonstrated in such experiences as parallel parking: *when well embodied, one feels rather than sees the distance between the car and curb.* (Ihde, 1990, p.74) A computer running Microworlds LOGO was able to act as a mediating technology for the villagers in Thailand that Cavallo (2000) worked with, and their world. Working with Microworlds, visually representing the area where they were hoping to build a dam with photos they had taken, they came to realise why previously that had failed to build a successful reservoir. Moreover, these technologies enabled them to perceive the world in such a way as to be able to determine how to accomplish this task.

Ihde's second way in which I-as-body interacts with the world by means of technology is hermeneutic relations. The context for this interaction between humanity and the world involves technology not extending or mimicking the body's sensory capacities, but rather providing an *interpretive* capacity. (Ihde, 1990, p.85) Care's (1997) work with James presents genuine examples of this interaction. The ideas that James had running around in his head that he could not catch could be made available to him when he explored them using LOGO.

We can, *as it were,* through hermeneutic relations, *read ourselves into any possible situation without being there.* (Ihde, 1990, p.92) Through technology, the world is *transformed into a text,* such as a temperature indicated on a thermometer or dials indicating revolutions per minute in an aircraft, *which in turn is read.* (Ihde, 1990, p.92) Clearly, one needs to know *how to read the instrumentation and from this reading knowledge, get a hold of the 'world' being referred to.* (Ihde, 1990, p.85)

The third way I-as-body relates with the world by means of technology, according to Ihde, is alterity relations. Ihde considers in what sense *humans relate to technologies as relations to or with technologies, to technologies-as-other.* (Ihde, 1990, p.107) In this context, technologies *are not seen as embodied but as other or quasi-other to which I as human being relate.* (Jorgenssen, 2003, p.215) Ihde suggests the computer *is one of the strongest examples of a technology which may be positioned within alterity relations.* (Ihde 1990, p.106) One such case of alterity relations would be Virtual Reality, *where human beings relate to a simulated world.* (Jorgenssen, 2003, p.215) This was the nature of the children's relationship with technology in my 1998 Honours research. While playing SimCity, Robert and Adam discussed ideas between themselves, but their learning relationship also included relating to the simulated world. They presented ideas to the computer program, to the simulated police officers and towns people in the form of budgets. Together the boys could agree upon a solution to try, but they required a response from the simulated world to determine the success of their venture.

So, from these examples, we can conclude that these e-learning design vignettes are technologically legitimate on the strength of their inherent Bronowskian and Ihdean technological meanings. Similarly, their educational power can also be examined.

2.3 Examining the educational power of these e-learning design contexts

Papert's (1991) classification of e-leaming opportunities into three layers, each illuminating a kind of technological fluency, helps to make their knowledge-gaining potential apparent. For Papert, the first layer of technological fluency is the *use* of technology to enhance doing other things (Papert, 1991, p.3) The thirty children who participated in "Images and Testimonies from the Camps of Lebanon" project (see Section 2.1.5) were offered the opportunity to rediscover the culture of their parents and preserve it for future generations. In this project, the use of technology could not only make the gathering of accounts undemanding, but the technology provided them with film interviews and photos to archive, enhancing their ability to preserve their past culture.

So, e-Leaming environments can help in accessing, organizing and making sense of ideas and information, as computers provide *an incubator for thinking which deepens understanding of the underlying processes* (Hannafin and Land, 1997 p. 188). The computer can enhance knowledge gaining as it *provides surrogate intelligence* [that can be used to] *monitor responses, provide individualized feedback about choices, and maintain records of performance* (Hannafin and Land, 1997 p. 176). e-Leamers and e-designers can *derive problems, vary solutions, and expand the boundaries of their understanding.* (Hannafin and Land, 1997 p. 187)

These kinds of e-leaming opportunities afford *contexts that are rich in experience, knowledge, and opportunity potential.* (Hannafin and Land, 1997 p.195)

Papert called his second layer of technological fluency the *practice* of technology. The practice of technology provides a broader experience of and deeper access to knowledge.

This layer of fluency deepens and builds upon individuals' knowledge of and familiarity with technology. It is through experience that *learners become increasingly facile with available tools and resources, and skilled in assessing how and when to employ them.* (Hannafin and Land, 1997, p.190) As a designer uses technological tools with increasing ease, discovering *what is available and what the various tools do,* the tools become a part of their thought process (Drexler, 1990, p.33). Indeed, their toolbox becomes more *highly evolved,* with the tools becoming an *automatic part of the design process* (Baldwin **in** Drexler, 1990, p.33).

As designers become more eloquent in their technological practice, they may recognize not only the value of technological tools to enhance what they are currently doing, but picture how these tools can be used in other, innovative ways. Those fluent with the practice of technology can use tools to build devices for themselves - *learning-through-making.* (Papert, 1991 p.3)

e-Learning technologies can enable learners to *design experiments, predict results, test and revise predictions, and revise both beliefs and strategies based upon their evolving understanding,* according to Hannafin and Land (1997, p.190), who identified several *technology-based science simulations as well as mathematics environments* [that] *nurture the learner's intentional model building and reconstruction.* (Hannafin and Land, 1997, p.190)

Jenny, at the Computer Clubhouse (Resnick, 2002) exhibits this layer of technological fluency in her project. Her innovative use of a programmable brick as a bird feeder led her to learn about touch sensors, cameras and birds to be able to complete for herself a technological device.

Many studies have shown how learners can become fluent in the practice of technology. Students can design pieces of instructional software to teach others about fractions (Harel and Papert, 1991).

- Teachers can build and program a LEGO robot that plays the xylophone, or a zoo to monitor the activity of hamsters (Resnick, 1991).
- Designers can build a simulation of a city to learn about electricity supply and demand (McCredie, 1998).
- Researchers can build a virtual classroom to eqUIp and investigate teacher education (Schaverien, 2003).
- In a hypertext environment, students can pursue *their own objectives* and *create texts dependent on their needs, interests, and purposes by choosing their own individual paths within networks* (Dwight and Garrison, 2003, p.717, 721).

Further to recognizing new opportunities available to them with the tools they have, fluent e-designers can also be capable of developing a more significant awareness of those mechanisms being used. As tool-using hands gain experiences, rousing an attentive mind, the tools can be remodelled or remade, shaped by the practice and intuition of the

user. This occurrence between tool and operator has been recognized as an *uncertainty, drift, invention, mediation, the creation of a link that did not exist before and that to some degree modifies the original two.* (Latour, 1999, p.178)

An admirable quality of hypertexts as tools is that they can easily be retooled *to fit the individual inquirer's purposes.* (Dwight and Garrison, 2003, p.716) As more technological tools are developed, as they are widely and creatively used, it is to be expected that in the same way as blacksmiths *who heeded the suggestions and criticisms of experienced axemen* modified axes (Ferguson, 1993, pA), so developers might respond and rework tools alongside e-learners and e-designers.

Those fluent in the practice of technology, those *with knowledge of current practice and products...* with *firsthand knowledge and insights,* have experience and discernment that is of greater worth than a *set of techniques* alone. (Ferguson, 1993, p.57) They are provoked to create.

Papert's third layer is fluency in technological thinking: the having of technological ideas. (Papert, 1991 pA) Papert records the view held by some that the *advent of written language changed the nature of knowledge,* to the extent that it not only increased *access to knowledge* but brought about *a different way of knowing - or ways of knowing.* While not fully agreeing with the claim that written language changed the nature of knowledge, Papert maintains *that this direction of analysis is clearly true – and educationally important – in the case of technology.* (Papert, 1991, pA) As she worked alongside Papert, the little Kindergarten girl exploring speed with LOGO had technological ideas. Programming her turtle to not move changed her nature of understanding about speed zero; it was indeed a speed. Engaging with this technological turtle tool had provided her with a different way of knowing about speed and consequently enabled her to delight in the discovery of her ideas about nothing happening (the turtle not moving) being something very important happening.

Schaverien and Cosgrove (2000) have developed a generatively principled model of technology-and-science education that provides a framework for identifying evidence of technology-and-science learning in e-leaming projects. This framework, as shown in Figure 2.9, consists of six acts of learning: exploring, designing, making, operating, explaining and understanding. Learners enter and pursue their learning venture from and

through any of the six connected acts freely, following and possibly retracing any of the connections indicated in Figure 2.9.

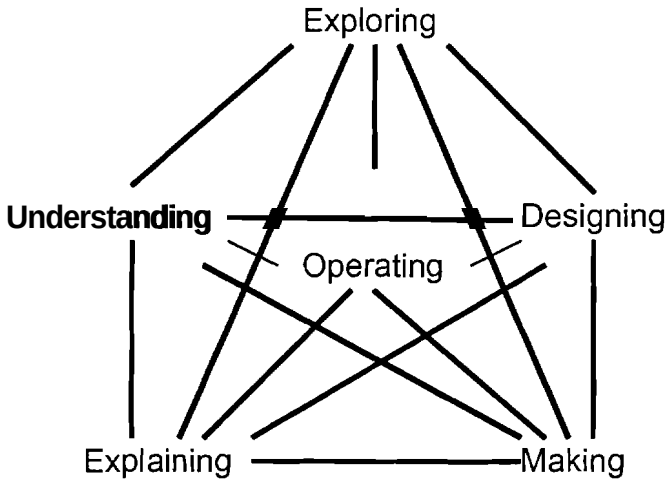

Figure 2.9 Schaverien and Cosgrove's (2000) model oftechnology-and-science learning, with the addition of a sixth act of learning.

This model, derived from the generative learning theory, is an elaboration of the generate-test-regenerate cycle. It was originally proposed with only five acts of learning (Schaverien and Cosgrove, 2000). A sixth act, operating, was added after publication of that manuscript.

Examining two e-learning designing contexts, Bers' (2003) Kaleidostories and Cavallo's (2000) project in Thailand, in terms of Schaverien and Cosgrove's (2000) model makes clear their educational significance.

Melanie, the little girl from Buenos Aires who became involved with Kaleidostories (see Section 2.1.2), started by **exploring** the environment and making sense of its features and function. She wanted to use it to **explain** to others her understanding and beliefs about the Nazis and discovered that there was no existing anti-role-model feature to do this. Melanie published her ideas in the role-model category, redesigning the purpose of this feature. This led to the designer of the environment redesigning its features and **making** it a part of the new version.

The villagers in Thailand (see Section 2.1.7) **understood** that they needed to learn about ways of using technology to help them design a dam that would retain water. Using

digital cameras and the odometer on a motorcycle, they explored the environment in a new way. With the information they gathered they made visual representation of the situation leading them to understand the problem with their previous attempts. Now knowing that they needed to relocate the site for the dam, they made maps and designed LEGO robotic-controlled devices to assist them.

I can now justify the choice of an e-designing context for this investigation of children's views of learning on the grounds that, if it bears some familial likeness to those contexts I have described in this chapter, it is likely that learning will occur there. The eclectic group of e-Iearning ventures detailed in this chapter illustrate the diversity of ways this medium can equip learning experiences. It can be a medium for expression, as it is for the children who run and listen to Radio Gune Yi. It can preserve and protect authentic voices, as it equips children to research and record their cultural heritage within the Palestinian Camps in Lebanon. It can make collaboration with like-minded others possible, as was the case for students participating in Kaleidostories. e-Learning can equip us to make meaning, by providing a language in which to think and an environment in which to explore ideas, as was the case for Project Lighthouse; and, as in the Computer Clubhouse, it can place the user in control of the message and the medium.

2.4 The context of this study

It now remains for me to describe the particular e-designing context of this study and to speculate as to its technological legitimacy and its educational potential. That done, the work of these first chapters will have been completed: I will have justified the worth of studying children's views of learning and substantiated my choice of this particular e-designing context in which to undertake such an investigation. I can then proceed, in Chapter Three, to layout the research design and methodology by which I conducted it.

The opportunity to conduct my study of children's views of learning in an e-designing context arose within the context of a three-year, industry-linked project: the GENESIS Project (Generating e-Learning Systems in Schools). This project engaged three partner schools in an e-Iearning research and development collaboration with the University of Technology, Sydney. The research was supported by the Australian Research Council Linkage Scheme and two schools contributed cash funds. All three schools supported the collaboration with generous in-kind contributions. There were two Chief Investigators: one in the Faculty of Education, the other the Director of the Institute for Interactive

Media and Learning (IML) at the university. Within the University project team, I took a leading role, as did a project manager/research assistant. Staff at IML and at an independent software company wrote the code for the e-leaming environment. Schools' contributions to the project were led by a named partner from each school and supported in two of the schools by a leading teacher. Other teachers participated in various phases of the project. (Interestingly, two of the key teacher participants were teacher librarians.) Initially, approximately 300 students participated across 12 classes. Students were aged between seven and fifteen years. As the project progressed, there were shifting numbers of students and classes involved and parents and other community members also engaged with the project. Each school was different. School 1 (hereafter referred to as Girls' College) is an independent K-12 girls' school located in inner western Sydney. School 2 (hereafter West Grammar School) is an independent co-educational K-12 school located in outer western Sydney. School 3 (hereafter North Primary School) is a government K-6 co-educational school in Sydney's north.

2.4.1 The GENESIS Project

The GENESIS Project was developed to research a central question: Will casting students as e-designers help to scale up e-Iearning in schools? GENESIS researchers were keen to investigate what happens when students have a sustained opportunity to conceive, design and, as far as possible, build an e-learning environment in which they and other students could explore questions they were passionately curious about.

Five phases of The GENESIS Project emerged as follows:

1. **Selecting a topic:** Hundreds of students engaged in activities to elicit scientific and technological questions they were deeply interested in answering. The question cluster selected by the students from a short list of three was: *How and why do* we *think? How come we're not born with the knowledge* we *know now?* Small groups of students in every class examined aspects of this question and explored ways of investigating and understanding it.
2. **Designing their environment:** Representatives from each class attended two Design Days at the university. They familiarised themselves with the work of other classes and schools, evaluated existing e-learning environments and fonnulated a draft design for the GENESIS environment (The GENESIS Journey). Returning to school, they gauged the reactions of their peers, identified

priority features to include in their e-Iearning environment and negotiated a final proposal with the multimedia developers.

3. Developing content for their environment: Students undertook experiments and investigations. Questions explored specific aspects of the overarching question identified as being of interest by the students themselves. Results were analysed, findings reported and materials developed and submitted to the software developers for inclusion in the students' environment.
4. Preparing to implement: Student representatives examined a prototype of their environment and provided feedback to the developers. A team of students at each school (The i-Team) worked with their teachers and university researchers to develop a plan for their environment's launch, management and evaluation.
5. Initiating The GENESIS Journey: Logins were provided to hundreds of students across all three participant schools. Students then entered and undertook The GENESIS Journey. The i-Team conducted surveys, initiated class discussions, observed interactions between peers and monitored online discussions to evaluate the worth of their environment for learning. Ways of scaling up The GENESIS Journey were discussed and implemented. In one school a new initiative, The Odyssey Project, pursued questions about Space using the GENESIS process.

In 1998, in my honours research, the two children I studied were able to articulate their views of learning within the technologically and educationally powerful context of their engagement with SimCity. The other nine e-learning designing environments I have described in Section 2.3 appear to offer similarly legitimate technological experiences and worthwhile opportunities for learning. Now, in the GENESIS Project, I saw a familiar but less constrained opportunity to explore children's views of learning - in a context in which students would not be limited by those parameters of the e-Iearning environments that adults had already designed in. The GENESIS Project presented an opportunity to investigate children's views of learning as they themselves designed an e-learning environment.

2.5 Summary of Chapter One and Chapter Two

These chapters have justified the study and prepared its conceptual ground in two ways. First, Chapter One established why we should be interested in children's understandings of learning, noting the growing research interest in views of young people in a range of

disciplines and fields of practice (See section 1.2.2). Neuroscience and developmental psychology supplied possible insights into why this might be so. A biologically based generative learning theory provided a frame of reference to understand the views of children and to guide the research design and methodology (See section 1.4).

Chapter Two has clarified why we would choose to study such understandings by engaging children with e-learning design. Characteristics that make e-design contexts potent for studying children's views of learning were distilled by exploring the nature of technology (with reference to the ideas of Ihde (1990) and Bronowski (1974)) and the educational significance of e-learning in terms of Papert's (1991) three layers of technological fluency and Schaverien and Cosgrove's (2000) generatively principled model of technology-and-science education. The particular e-design task of this study was then detailed and its potential to be a worthwhile context for studying children's views of learning briefly anticipated.

Chapter Three will now develop a methodology in keeping with this study's appreciation of learning and respect for childhood.

Chapter Three
Developing a Research Design and Methodology for investigating children's views of learning in an e-Iearning design context

3.0 The story so far

Chapters One and Two have justified this study's research question: *Can I find out how children understand learning by engaging them with an e-Iearning design challenge?* I postulated that children's understanding of learning is of significance, and demonstrated, from previous research findings, that many e-Iearning design contexts have rich technological and educational power, suggesting their potential, to be tested in this study, for discerning children's understanding of learning. This potential will be examined in this study.

In Chapter One I also presented a biologically based generative theory of learning (See section 1.4) (Schaverien and Cosgrove, 1999) as a worthy frame of reference alongside which to understand children's views of learning and to provide guidance for the design of a potentially significant educational context in which to study them.

In Chapter Two likewise I contextualized the e-Iearning basis of this study.

3.1 Overview of Chapter Three

Now that I have justified asking my research question, *Can I find out how students understand learning by engaging them with an e-Iearning design challenge?* and prepared conceptually for the study, I now layout the research design and methodology by which I will answer it. In this Chapter, I select a particular approach to educational research and develop the broad consequences of this approach for my study's design and methodology and more specifically for its research plan.

3.2 The methodological foundation of this study

While examining the worth of uncovering children's views in Chapter One, I made reference to the number of research projects that are investigating children's views in educational contexts. Reviewers of these projects acknowledged that while this work was concerned with eliciting children's experiences, attitudes and perceptions of school relationships and activities, few investigations looked specifically at children's thoughts regarding particular learning tasks or specific contexts (Wall and Higgins, 2006).

To address these concerns McCallem et al. (2000) designed a tool for discussing the process of thinking in different learning contexts. This approach, as described in Section 1.2, centred around contexts chosen by researchers, whose role was also, *to a certain extent, [to] steer the dialogue* (Wall and Higgins, 2006, pA2). It was reported that this tool successfully helped to inform *researchers, teachers and pupils about* [pupils] *thinking about their learning in different learning contexts.* (Wall and Higgins, 2006, p.52)

3.2.1 *Papert's research design*

My study, however, considers another way of thinking about what children know. It seeks to determine if children's understanding oflearning in itself, as a behaviour and not only as a school room activity, can be brought to light, and if this can be done, as far as possible, in a context of their choice and steered by their dialogue. I have chosen Papert's (1973) five-step approach to educational research as the methodological foundation of this investigation. As the following description shows, this approach enables me to generate the specific set of conditions required, on a clear, theoretical foundation. It is an approach that given a synergistic theoretical foundation, fundamentally privileges the role of children in educational research.

3.3 Steps in Papert's design

The first of Papert's steps is to select a theory of education. The second is to *develop the consequences of this theory enough to design what it projects as a really good set of for the intellectual growth of children.* (Papert, 1973, p.33) As his third and fourth steps, Papert recommends implementing these conditions on a minimal stage, and equipping the research with all the resources required by the design. In Papert's fifth step,

the experiment is run for the time required by the theory and either succeeds or fails. If it succeeds, then the task is to understand why: whether it can be generalised and what can be learned from it. If it fails, then the task is to declare it a failure and to unravel why it failed, perhaps retrying (Papert, 1973).

Having outlined these five steps, I will now treat each step in more detail, allowing this study's research design and methodology to be understood more clearly.

3.3.1 Step One: Select a theory of education

In Chapter One, this study adopted a biologically based generative theory of learning[4], a theory that considers learning (or knowledge gaining) as an adaptation. This view of learning recognises three characteristics as central to learning. These are:

1. That learners' values drive their learning
2. That learners' generating and testing of ideas is the essence of their learning
3. That learning proceeds developmentally if idiosyncratically, as learners capitalise on opportunities (Schaverien and Cosgrove, 1999, p.16)

A study seeking to understand students' views of learning required such a theory as this, one that appreciates that if learning is to occur at all, then learners must be in control of their learning, assigning teachers a derivative, supporting role. So, such a learning-focused or, in Papert's (1980) terms, mathetic theory as this was needed as the first step of this methodology, for this study required a context in which learning was likely to occur - a context which was likely to furnish students with "objects-to-think-with" (Papert, 1980) about learning. I was not requiring the implementation of particular prescribed teaching or models, but rather, teachers' considered application of teaching stances likely to enable learning to occur and to support it when it did, so that students might be in a stronger position to be able to demonstrate (and even articulate) their ideas about learning.

3.3.2 Step Two: Developing this theory's consequences for the intellectual growth of children

Three specific and significant consequences follow for the intellectual growth of children, and thence, for this study's research design and methodology, from this biologically based generative theory of learning:

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4 Such theories can be traced back to Chomsky's defeat of Skinner's behaviouralist view of education.

1. Learners should control decision-making and be free to make choices according to their values.
2. The study should provide an intellectually meaningful context in which children are both willing and able to refine their ideas, through selection, over time.
3. There should be enough flexibility to allow children to participate in their own ways, taking unanticipated pathways and making use of resources and opportunities that arise or that they orchestrate.

Children's design of an e-Iearning environment in The GENESIS Project, as outlined in Chapter One, in which their own scientific questions might be pursued in ways they considered enlightening, appeared a suitable challenge, within which the above conditions could be met. Further, it enabled me to pursue my line of investigation into children's views of learning. The implementation of these conditions is the work of Papert's third step.

3.3.3 Step Three: Implementing these

With a context in place that in theory designed to fulfil Papert's (1973) requirement regarding the intellectual growth of children, I now describe the process by which this study's conditions were implemented.

The GENESIS Project took place in three schools, as described in Section 1.4, between January 2002 and November 2005. The most intensive period of project work in schools occurred between May 2003 to July 2004. My study was located within this project. Throughout The GENESIS Project four different teams were formed or evolved to take up particular responsibilities and roles. The work of the project moved between these teams[5]:

1) **Team GENESIS** - this team consisted of all students, teaching staff, project partners and university staff involved throughout the project.
2) **The Implementation Team** - responsible for developing a plan to initiate investigation for The GENESIS Question in each school, consisting of representative students, (two or three from each class), class teachers, project partners and university staff.
3) **The Design Team** - responsible for designing an initial concept for The GENESIS Environment, consisting of nominated or elected student representatives, project

5 Chapters 4 to 9 will describe more fully the members and the activities of each of these Teams.

partners, one or two parent representatives from each school, university staff, multimedia developers.

4) **The i-Team** - responsible for investigating the community's response to the completed environment, consisting of nominated or elected student representatives, project partners, university staff.

Table 3.1 presents a chronological overview of the project, describing the events that took place and the people involved in each step.

Table 3.1

Calendar view of The GENESIS Project

Date	Event	Teams
Phase One: Selecting a topic		
May 2003	The project is launched in schools. Students submit and explore many possible questions and topics. Students vote to investigate 'How and why do we think? How come we're not born with the knowledge we know now?'	Team GENESIS
May-June 2003	Students explore many aspects of this question in a wide variety of ways, working to refine their understanding of the topic and identify clever ways of finding things out.	Team GENESIS Implementation Team
Phase Two: Designing an environment		
June - July 2003	The students develop a design for their e-learning environment. They submit a brief to multimedia developers, review their proposal and sign off for The GENESIS Journey to be built.	Team GENESIS Design Team
Phase Three: Developing material to contribute to the e-learning environment		
Aug-Dec 2003	Students conduct investigations, analyse their findings and decide how best to share their work - reports, graphs, videos, websites or discussion questions. These materials are uploaded into The GENESIS Journey wire frame.	Team GENESIS
Phase Four: Preparing to implement		
Feb - April 2004	Selected students trial the prototype, providing final feedback to the multimedia developers. Students prepare a plan for implementing The GENESIS Journey at their schools and design ways of assessing its impact and value.	i-Team
Phase Five: Implementing The GENESIS Journey		
May- July 2004	The GENESIS Journey goes live in each school. Over 300 students log in and participate. Former participants return for a Review and Reunion event. Students research the corrununity's response to The GENESIS Journey and submit their findings to the University researchers and their school.	Team GENESIS i-Team

As will become clear in the chapters that follow, the project evolved under the children's jurisdiction, meeting the consequences laid down in Step Two, in the following ways:

I. Decisions concerning the topic, nature, content and distribution of the e-learning environment belonged to the learners and choices were made by them on the basis of their values.
2. The project recognised and valued the ideas and work of the learners throughout all phases of the project, allowing the project's form, content and presentation to be adapted as ideas and understanding refined, within the broad constraints of the project's preconceived purposes.
3. An emergent design enabled students to participate and contribute m a wide variety of ways, orchestrating research opportunities or making use of resources and opportunities that arose.

Unmistakably, both the consequences for the intellectual growth of children, arising from a biologically based generative theory of learning, and the manner in which ensuing conditions were implemented, reveal an alliance between the methodological approach of this study and the ethical principles of a number of significant educational theorists and philosophers. At the core of these principles are matters of ownership, of adaptability and diversity. I tum now to address these ethical considerations of my study and my resulting approach to data collection.

3.4 Ownership, adaptability and diversity: Ethical considerations of this study

[n Chapter One, this study established the possible value of bringing to light children's views of learning for educational research purposes. There is also a clear case for privileging children's views of learning on moral grounds. Extracts from The Declaration of the Rights of the Child and compelling claims by educational theorists build this case.

Ethical principles of fundamental importance to this study are enshrined in internationally accepted statements as well as in the writings of respected educational thinkers. The Declaration of the Rights of the Child as decreed by the United Nations in 1956 states that each child *shall be given opportunities and facilities, by law and by other means, to enable him to develop physically, mentally, morally, spiritually and socially in a healthy and normal manner and in conditions of freedom and dignity. In the enactment of laws for this purpose, the best interests of the child shall be the paramount consideration.* (Deciaration on the Rights of the Child, Article 28, Principle 2, 1956)

Towards this end, each child is entitled to receive an education, which, at least in the elementary stages *shall be free and compulsory.* (Declaration of the Rights of the Child, Principle 7, 1956) To enable each child to become a *useful member of society* his education will *promote his general culture and enable him, on a basis of equal opportunity, to develop his abilities. his individual judgement, and his sense of moral and social responsibility.* (Declaration of the Rights of the Child, Principle 7, 1956)

The best interests of the child shall be the guiding principle (Declaration of the Rights of the Child, Principle 7, 1956) for those who are responsible for the education and guidance of children.

However, these statements begged the question of who is to decide on children's best interests. Is there a place for a child to voice their understanding of what is in their best interest? Some significant educational theorists believe so, on the grounds that:

Children are recognised as capable, instinctive learners:
A child has, without exception, *an innate and unquenchable drive to understand the world in which he lives and to gain freedom and competence in it.* (Holt, 1970, p.3) From a very young age, children *have learned how to use their bodies, how to use language and how to control emotions. They have learned to depend on themselves and have been rewarded for initiative in learning.* (Reimer, 1971, p.30)

Children's learning instincts should determine their learning experience:
A child's own instincts and powers should give the *starting point for all education* (Dewey, 1897, 428). *Whatever truly adds to his understanding, his capacity for growth and pleasure, his powers, his sense of his own freedom, dignity, and worth may be said to be true education* (Holt, 1970, p.3) Schools should be places that *will always allow for individual variations and for considerable student participation in and suggesting worthwhile activities* [and should not require] *all students to engage in the same activities,* (Postman and Weingartner, 1973, p.31) rather letting them choose from many options.

Neglecting such capabilities leads to conflict and wasted opportunities:
Not allowing children's instincts to guide their learning is *the cause of a large part of the waste of time and strength in school work. The child is thrown into a passive, receptive, or absorbing attitude. The conditions are such that he is not permitted to follow the law*

of his nature; the result is friction and waste. (Dewey, 1897, p.435) The situation where *the what, when, where and how of learning are decided by others* lead children to *learn that it is good to depend upon others for their learning.* (Reimer, 1971, P .30)

The result of this is that children become seen as *objects to which things happen,* rather than being given opportunity to become *active shapers of their own school experience.* (Postman and Weingartner, 1973, p. 39)

It is these ideals that underpin this study's search for an education that is in children's best interests, on the hypothesis that children may well be strongly equipped to shape such an education. These principles underpin both the project's core generative teaching approach and also my generative research approach, in that a generative theory privileges:

- Ideas generated by children,
- That are then tested by children, and
- Adopted or adapted on the basis of their value as determined by children.

Of course, as well as respecting these ethical principles of children's ownership, adaptability and diversity, The GENESIS Project sought and gained the university's Human Research Ethics Committee formal approval, together with formal ethics committee approval from each independent school and from the NSW Department of Education and Training. Together, these formal ethics approvals permitted me to conduct my doctoral study.

3.4.1 Data collection

A research design is *the logic that links the data to be collected (and the conclusions to be drawn) to the initial questions of a study.* (Yin, 1989, p.27) For the data from this study to link logically to the research question, the same ethical ideals that guided the justification and design of the study must steer my approach to data collection and analysis. The following insights and guidelines secured that consistency.

When approaching data collection and analysis in a democratic manner, it is appropriate that, as a researcher, I sought contributions from all possible relevant sources, and treated the experiences, views and insights of participants with the same dignity as I did my own. Therefore, it was necessary that I:

- Accumulate a variety of evidence, making use of *extensive data,* both probing and analysing it intensively to *produce understanding of the entity being studied.* (Bums, 1994, p.313)
- Seek to understand the event in its own right, valuing and working towards an understanding of *its object more than [understanding] how it differs from others.* (Stake, 1995, pA7)
- Let the data speak for itself, avoiding as much as possible *the use of assumptions about the phenomenon,* and instead with an open mind, observing, recording, classifying and seeking, *wherever possible, to capture the reality of the subject and not only [my] own reality.* (Laney, 1993, p.9)
- Seek the meaning of the data to the participants; acknowledging that the key question is not only *What is happening here, specifically?* but also *What do these happenings mean to the people engaged in them?* (Erickson, 1996, p.124)

3.5 Step Four: Equipping the research

The fourth of Papert's five steps requires the research design be equipped with all the resources it requires. To implement my research design I needed to provide or organise access to the following resources for my study.

3.5.1 People

Over 350 people were required to resource this study. Children were provided with access to the people they needed to undertake their work. Peers, teachers, infants, community members, university staff and experts who could assist them were identified, either by the students themselves or university researchers on their behalf. These people were consulted, invited for interview, or observed, with their consent, while interacting together or with children. On several occasions such people came and visited the children at school. On other occasions students corresponded with them through emails and telephone conversations. Students also had access to the multimedia developers, both through discussions with the university staff and also at times face to face.

Notably, the students undertook this study with the support of their schools' principal, with whom they had opportunity to discuss and negotiate the progression of their investigation.

3.5.2 Time

To be able to achieve the expectations of their role in the project, students were provided with time. Significant amounts of time during school terms were set aside from normal timetable lessons and released for generating, testing, designing, evaluating and redesigning, implementing and assessing their environment, The GENESIS Journey. Some schools cleared several days at a time. Others reassigned existing science units or homework expectations to GENESIS work. Projects and examinations that traditionally formed a part of particular schools' curriculum were put aside or altered to allow the students to focus on their GENESIS investigations.

3.5.3 Equipment

Throughout the entire project, students were provided with access to the equipment they required for their role in The GENESIS Project. In the initial phases they energetically scoured the World Wide Web as they investigated the overarching scientific question and the resulting subquestions of particular interest they had chosen. They identified research, information and people to assist them with their exploration, conducting phone conferences and email conversations. During their design and development phases the student investigators also had access to the technical equipment they required, including audio recorders, video cameras, data projectors, laptops and editing software. As soon as it had been built to their specifications, students were given the environment's wire frame and were able to access their prototype, voicing their concerns or approval. Thus, as far as was possible, Papert's fourth step was met.

3.6 Step Five: Running the experiment and determining success or failure

In Papert's fifth step, the experiment is run for the time required by the theory of learning, and it succeeds or fails. If it is a failure it is to be declared so, and the researcher's task becomes the unraveling of why it failed and possibly working towards a retrial. If it is determined that the experiment has succeeded, the task is to understand why - whether it can be generalized and what can be learned from it.

For *my* experiment to prove successful, it needs to disclose children's views oflearning. I will look at the data from the experiment in three ways to gauge success. I now consider

these differing bases on which to judge success, selecting those of importance to my study.

3.6.1 Determining success or failure: examining my data

In this study, there are three distinct ways of examining success and failure, necessitating viewing the data;

1. Did the children succeed? (That is, were they able to design and implement an e-learning environment to explore a science-and-technology topic of their choice?)
2. Did the children learn?
3. And am I able to see their views of learning?

Logically, these successes are independent of each other, but given the topic the children selected, *'How and why do* we *think, and how come we're not born with the knowledge we know now?'* there is very significant overlap between the children's investigations and mme.

It is not crucial for the children to have completely resolved their problem (of designing an e-Iearning environment) to be able to declare my educational research experiment a success, for even if they did not succeed, it may still have been possible for me to elicit their views of learning. However, since their topic was exploring the nature of thinking and knowing, a solution to their e-design problem (one that proves worthwhile for learning) is helpful to me in answering my research question. Such a solution both demonstrates (in the form of the e-Iearning environment itself) and makes explicit (in children's initial investigations themselves and in their evaluation of their prototype in operation) these children's views of learning. Moreover, even though it might be logically possible for me not to examine the success or failure of the students' e-design, given that this is the essence of their engagement in my study, it would severely undermine the democratic principles of my study if! did not consider their success or failure.

A second basis on which to consider success is whether, during their investigations, their development, design and evaluation the children learned. Was activity guided by their values and choices? Were ideas generated, tested and adopted or adapted as a result? Did children pursue individual pathways of exploration and evaluation? Even if learning did not in fact occur, I might still be able to acquire some understanding of children's views of learning. However, if little or no learning were deemed to have occurred, a critic might

conclude it strange for a researcher to be trying to examine children's views of learning in a context in which there were few significant objects-to-think-with (after Papert, 1980, p. 11) about learning. In contrast, if significant learning were deemed to have occurred, then arguably children would at least have been provided with a richer context within which to begin to articulate their views of learning. It therefore stands to reason that it is worth my examining success on the basis of whether children learned.

However, if I am to answer my research question, *Can I find out how students understand leanzing by engaging them with an e-learning design challenge,* I must examine not only what children say about learning, but also try to detect more subtle dimensions of their views of learning, wherever possible, in what they do. Only then will I be able to assess the success or failure of my experiment as Papert's (1973) fifth step recommends.

The following set of questions allows me to gather data on which to judge success or failure:

- What questions do students generate and select for investigation?
- What approaches do they choose for such investigation?
- What methods do they employ to make sense of information and findings?
- What decisions do they make concerning how to represent their ideas and inform others?
- How do they anticipate the response and reaction of the wider community?
- How do they recognise if they have learned?

This set of questions will frame my reponing of my findings.

3.7 Characterising my research approach: A design-based case study

In essence, by following Papert's five-step approach, I was adopting a case study research approach. Case study *offers a means of investigating complex social units consisting of multiple variables of potential importance in understanding a phenomenon. Anchored in real-life situations, the case study results in a rich and holistic account of a phenomenon. It offers insights and illuminates meanings that expand its readers' experience. These insights can be constructed as tentative hypotheses that help structure future research; hence, case study plays an important role in advancing the field's knowledge base.* (Merriam, 1988 p. 32)

Case studies are able to respond to the evolving nature of research plans, to incorporate a wide variety of evidence and to inform and advance a field of understanding. (Yin, 1989, Patton, 1990, Bums, 1990) The very complexity of my project strongly suggests the worth of a case study approach. The *qualitative paradigm is ideal for phenomena that are patently complex and about which little is known with certainty.* (Lancy, 1993, p.9) Indeed, *the distinctive need for case study arises out of the desire to understand complex, social phenomena.* (Yin, 1989, p.14) Moreover, a case study proved an appropriate approach considering my very active role as doctoral student within The Genesis Project. When conducting a case study a researcher *has direct contact with and gets close to the people, situation and the phenomenon under study.* (Patton, 1990 in Fraenkel & Wallen, 2000, p.54) Whilst many methodological texts describe such intimacy instrumentally as a deliberate research decision, my own immersion in The Genesis Project was integral to both research and development. As such, I can argue that it afforded me a uniquely privileged view of what the children did.

A priori, the intent of my study, uncovering children's understanding of learning by way of e-design, and my adopted methodological technique, Papert's five step approach, appear to be in close keeping with a particular form of case study: design-based research. Design-based research is *not so much an approach as it is a series of approaches, with the intent of producing new theories, artifacts, and practices that account for and potentially impact learning and teaching in naturalistic settings.* (Barab and Squire, 2004, p. 2) Examining the correlation between Papert's approach (adopted within an e-design study) and the key features of design-based research (as outlined by The Design-Based Research Collective, 2003) highlights their similarity:

- Design-based case studies have transfonnative agendas. (Barab and Squire, 2004) Papert's approach seeks to provide educational researchers with a methodology that enables them to do more than *make small changes to a large and complex on-going system.* (Papert, 1973, p.32) In design-based research contexts, researchers seek to move beyond simple observation, to produce specific results and to systematically engineer contexts that *allow us to improve and generate evidence-based claims about learning.* (Barab and Squire, 2004, p.2)

- Both approaches irrevocably intertwine the exploration and development of theories of education with the design and implementation of meaningful learning contexts for children. Indeed, developing theories of learning and designing learning environments are the key goals of design-based research, (The Design-Based Research Collective, 2003, p.5) while Papert's approach requires theoretically derived conditions to be developed for children's intellectual growth. Indubitably, the core correlation of these approaches is this recognition of the need to design theoretically sound learning environments to be able to substantially investigate and develop theories of learning. This may involve the development of *technological tools, curriculum. and especially theories that help [researchers] systematically understand and predict how learning occurs.* (Barab and Squire, 2004, p.2)

- Just as design-based research takes place through *cycles of design, enactment, analysis. and redesign* (The Design-Based Research Collective, 2003, p.5), so too does Papert's approach. Papert's fifth step requires the researcher to analyse, enact and, in the case of failure, redesign the investigation in an attempt to understand why it did not succeed. Both approaches seek to describe success and failure in an attempt to enhance understanding of the nature of learning and equip authentic learning settings – such as schools - appropriately. (Papert, 1973, The Design-Based Research Collective, 2003)

- Both approaches recognise that detennining the success of such inventive research cannot simply be addressed by asking, *How do you measure that?* (Papert, 1973, p.34) Such research requires the development of methods that *document and connect implementations to outcomes.* (The Design-Based Research Collective, 2003, p.5) Having intertwined the investigation of learning with the designed learning environment, these approaches acknowledge that both features must be incorporated within any evaluation.

The similarities of these methodologies indicate that by following Papert's five step approach to educational research, I am adopting a particular qualitative, design-based, case study research approach. I now detail its data collection, analysis and reporting.

3.8 Data collection, analysis and reporting

Both the recommendations and guidelines of Stake (1995) and Yin (1989) and the need to gather insights into the children's understanding oflearning as they learnt meant collecting the following diverse kinds of data:

Documentation

- Response sheets completed by the children regarding topics of interest;
- Brainstorms and mind maps drawn by the children exploring aspects of the selected topic;
- Audio tapes and transcripts of discussions and conversations between students, and between students and other research participants (for example, school and university personnel and members of the community);
- Surveys conducted by the children for their experiments and for the review and evaluation of their environment;
- Video footage of key events, including the Implementation Meetings, Design Days, iTeam planning sessions, Reunion and Review event;
- Reports written by the children regarding their experiments and final reports evaluating the success of their environment; and
- Posts made by the children on the discussion boards within the environment.

Interviews

- Informal interviews with students, staff and parents;
- Formal interviews with students and staff; and
- Access to interviews conducted by students with their peers, staff, professionals and members of the community, for their experiments and reports.

Direct observation

- Of children's discussions and decision making;
- Of children carrying out their experiments, discussing their findings and observing the reactions and responses of peers to their final product; and
- Of children's interaction with their e-Iearning environment and with each other within the environment.

Participant

- Assisting to facilitate key events throughout the project, including the Implementation Meetings, Design Days, iTeam planning meetings, Reunion and Review event and iTeam final review discussions; and
- Collaborating with the children in their inquiries.

Physical artefacts

- The e-learning environment - The GENESIS Journey

I classified my raw data, reviewing video and audiotapes, transcripts of interviews, online discussions, the children's reports, surveys, graphs, videos, experiment outlines and their suggestions for further investigations, to identify four quintessential examples of events from each school that represented the children's activity and showed its diversity. In this way I acted to preserve the integrity of the events that took place in my study while seeking to produce an economical and accessible record.

From these four selected vignettes, I sought patterns of inquiry, decision-making, discussion and elucidation to intimate the children's views oflearning, and drew tentative conclusions. I returned from these four particular vignettes to the comprehensive data set to check that my tentative conclusions were supported there. At all times I tried to ensure that multiple primary perspectives, such as children's conversations, their devised investigations and design decisions, were used together to try to establish an accurate picture of these children's understandings of learning.

3.9 Summary of Chapter Three

Chapter Three has laid out the research design and methodology of this study. Papert's (1973) five-step approach to educational research was adopted and the consequences of this approach have been developed. This chapter has also addressed the ethical considerations of this study, my approach to data collection and analysis and has situated my research as a particular (qualitative) case study approach. My task now is to report my findings, and then describe and analyse what occurred during the design of The GENESIS Journey.

Chapter Four
Students set out on The GENESIS Journey

4.0 The story so far

Chapter One and Two established that there is cause for educational researchers to be interested in children's understanding of learning, laying out the benefit of studying such understanding within an e-Ieaming design context. Consequently, I have now argued the worth of this thesis' question: *Can* 1 *find out how children understand learning by engaging them with an e-learning design challenge?* Chapter Three laid out Papert's five-step approach to educational research, providing a methodological framework by which to design and undertake my study and analyse my its findings. The first of its two steps, selecting a theory of education (a biologically-based generative theory of learning) and then developing the consequences of this theory so as to design advantageous conditions for the intellectual growth of children (The GENESIS Project), were completed in Chapter Three; and the methodological processes of Steps 3 to 5 were laid out in skeleton there.

My task now is to report, as findings, the implementation of these conditions (Step 3) and how they were equipped (Step 4), **in** order to prepare the ground for gauging the success of my investigation into children's views oflearning (Step 5).

To this end, this chapter is the first of six accounts that describe and begin to analyse what occurred, as The GENESIS Project engaged participating children with the task of creating an e-Iearning environment of their own devising, to explore their own particular scientific question and to provoke others to do so.

This account begins with what these children wanted to know, and progresses to how The GENESIS Project supported their development and implementation of a plan for exploring, designing, developing, refining, implementing and evaluating their own e-learning environment in which they and others could seek answers. Within this and the subsequent four accounts (in Chapters Five to Eight) events, choices, reactions and responses begin to reveal the ways these students understand learning. Then, in Chapter Nine, I consider whether the children successfully met their challenge, as detennined by their own expectations and assessment. However, the nature of the children's own research question *(How and why do we think? How come we're not born with the*

knowledge we have now?), and the principles underpinning my study (as presented in 3.3.4) make such a consideration a prudent and principled step. Beginning in Chapter Nine (as the account of the children's own evaluation of their attempt is presented) and throughout Chapter Ten I assess whether the children learned and, most crucially, whether I am able to uncover and account for their views of learning, in this way determining the success of my investigation (Step 5).

This chapter's story is distinct from those following in Chapters Five to Eight. It gives an overview of the first four phases of the GENESIS process: selecting a topic, designing an environment, developing content for the environment and preparing to trial the environment. As such, this chapter situates the specific accounts that follow by laying out the conditions of The GENESIS Project for the intellectual growth of these children, helping to contextualise both the diversity and the representative nature of the examples chosen in Chapters Five to Eight. Chapter Nine then returns from the examination of specific accounts to present an overview of the evaluation phase of the GENESIS process.

4.1 What scientific and technological question did students want to address?

Where does the vacuum in space come from? Is forgetting a survival mechanism or a mistake? Why is DNA shaped in a spiral shape? What's the meaning of life? What will happen if there is no gravity? How did the Earth evolve? What's inside a wormhole? What does $E = mc^2$ *mean? Is stress useful? When is the world going to end? Can we mix DNA from different creatures?*

In the beginning, The GENESIS Project existed as questions. When given an opportunity to nominate what they would like to learn about in science and technology, the three hundred students aged between eight and sixteen years responded with remarkable enthusiasm.[6] Their own words portray their eagerness and readiness for an opportunity to learn about what interested them. Nidhiraj had *always wondered about* the shape of DNA. He could not recall a time he hadn't pondered why it was shaped like a double helix. Jade's question about the meaning of life had *been stuck in [her] mind for a long*

6 While the students were at ease stepping into this new role of selecting their learning pathways, many teachers involved with the project were unsure of how to initiate a forum for evoking children's deep questions. These teachers were invited to workshops modelling such situations and provided with activities with which to engage their students with. These activities had previously proved to provide a rich context for identifying and discussing questions about science and technology during my time as a classroom teacher.

time. She hadn't been able to resolve it. If we could answer what's inside a wonnhole, Ritam believed it *could be an event in history.* He recognized the lasting impact of new discoveries and revelations. Gabi promoted her questions about the end of the world by claiming *a lot ofpeople think about this.* She had observed how a community wonders about things unknown, a shared interest in a disturbing, challenging question. With hundreds of such questions generated by the students, it was difficult to narrow the field to a manageable short list. Table 4.1 contains a selection from the 292 questions from one of the participating schools. It demonstrates the breadth and depth of the questions elicited by the project from the children.

Table 4.1

Questions from Year Four Students at North Primary School

Why does the world spin around?
Why is there gravity?
Why does DNA curve like a screw?
How come there are so many parts to the brain?
How come we are not born with the knowledge we know now?
Can you make oxygen in a controlled area?
If there was a hole through your head and you could see inside what would you see?
What happens when you die?
If you are taken apart in pieces what is the most vital part you need to survive for just a few seconds?
How much weight can a see-saw lift?
Can we mix DNA from different creatures?
What is DNA?
In the future will there be a time machine?
Which parts of the brain actually think about different things?
Does the world have a meaning?
Why does the world exist?
Why is DNA shaped in a spiral shape?
Can you cross breed things totally different together?
Can an air bag break your ribs?
How come space never ends?
Does it keep on going?
Is it possible to make a paper aeroplane so strong that it can take a human passenger?
Is there a limit to what our brain holds?
Why do we think? And how?
Are airbags strong enough to kill you?
Is water 2D or 3D?
What is the meaning of life?
Why is there gravity?
What would happen if there was no sun?
Why can't I write when my brain works so well?
What would happen if a car would travel through a light beam - would it reflect at the spaces around it or so on?
Is paper 2D or 3D?
Is hair a solid figure?
What would happen if nobody could talk, move, make noise or feel anything?

What does it feel like if you are an ant?
If we can build planes, how come we can't build flying cars? Will they ever be invented?
Why does everyone think there'll be UFOs and robots in the future?
Will the world blow up?
Why do scientists want to re-create dinosaurs if it could very easily go haywire and many people could get hurt?
Why do people want the world to be perfect?
Why do we like certain foods?
Why do we idolise popstars?
Why do we look the way we do?
Why do we exclude things we don't understand?
What is the meaning of life?
Did cavemen think like us?
If it wasn't for gravity, how would we live?
How does a black hole disappear and reappear?
Why can't dogs speak like humans can?
What makes life?
What would the future be like?
When is the world going to end?
What would happen if you changed bodies with an animal?
What would happen if there was no gravity?
What is life?
Can a brain work by itself or does it need the body and heart to work?
What would happen if the Earth went out of the Solar System?
Can two genes combine to make one gene?

At a meeting in April 2003, all the questions that students had asked were brought together and sorted by the project partners for common themes or topics. Three questions that reflected the greatest student interest were taken back to each school. They concerned the human body, the universe and the human brain:

1. How do different medicines work?
2. What is gravity and how is it involved with the pattern and movement of stars and planets in our universe? What happened at the Big Bang and is space really empty?
3. Why do we think and how do we think? How come we're not born with the knowledge we know now?

I built a community website, Team GENESIS, to encourage and support students' thinking about these questions. All of the students had time to explore and consider each of the three topics before they were asked to vote to select their question of choice. (See Figure 4.1) When the vote took place, the third question won with a clear majority: Why and how do we think? How come we're not born with the knowledge we know now? This was what the children wished to uncover. This became the GENESIS Question.

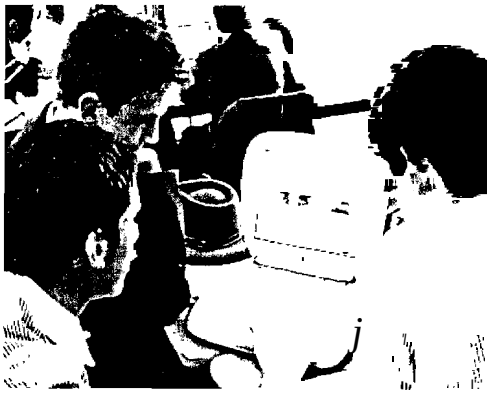

Figure 4.1 Boys from West Grammar School explore The GENESIS Webpage

4.2 How did students approach the task of investigation?

Over three hundred children spread across three schools were members of Team GENESIS. They needed to find a way to work together to design an e-Ieaming environment that explored The GENESIS Question. Student representatives from each class met with their teachers and university researchers on the GENESIS team to develop and agree upon a plan for carrying out this task. This group of people became known as the Implementation Team.

To tackle the scope of The GENESIS Question, The Implementation Team suggested that each class select an idea connected to the question to explore. During a lesson or class meeting children identified a particular contributing concept or question that they would like to address together. Three (of the twelve) questions indicate their depth: *Why isn't knowledge passed down when intelligence is? How and why do we forget? How do our senses affect our thinking?-The* children recognized the significant challenge of exploring such a complex overarching question, but they did not shirk the task they had set themselves. Rather, a manageable way to approach it was found. In each class the children generated many questions connected to their contributing class question. These questions were thoughtfully examined and discussed. I suggested some become light bulb questions, (key questions to pursue immediately), others arrow questions, (questions that point to light bulb questions, extending and clarifying their nature) while other questions be put on hold, becoming pause questions while the children waited to see if they had a place in their investigations.

While investigating their selected question or topic, the children were aware that they were juggling several tasks. As they sought and gathered knowledge and understanding

of their particular content area, they were conscious that they also needed to identify which strategies they were finding to be the most profitable for their investigations. These findings would influence which strategies would become priorities in the design of the GENESIS environment. These insights, along with further questions that had evolved during this time, were reported back from groups to each class. Each class organised their findings and shared their work with the other GENESIS classes at their school. The GENESIS children wanted to hear each other's stories.

During these weeks of investigation, one school held a symposium, inviting community members involved in fields of study that interested the children to attend. Presentations and workshops were held where students could 'ask-the-expert' their questions and discuss their ideas. For example, Samuel reported that he was *very happy with the amount of answers that J had within the three hours.* Ritam had many of his questions answered, *even if we received different points of view.* Ajeet acknowledged that *these people helped us to increase our knowledge on our area of interest.*

The children in the project had tested the waters of e-design. They had identified knowledge, strategies and further questions they saw as valuable. Within each school, students were familiar with their peers' investigations and thoughts, but now, all schools needed to work together to develop a design for an e-Iearning environment that would provoke others' active interest in how and why we think and how come we are not born with the knowledge we know now.

4.3 Which design features did children value in e-learning environments?

Managing the suggestions opinions of several hundred children was a challenge. For this reason, two students from each class participated in the initial planning of the e-learning design bringing with them the ideas of their class. Along with a teacher and parent from each school, they attended two Design Days at the university on 19th and 20th June 2003, during which time an intensive series of activities had been planned to support their conception of their own e-leaming environment: an environment that would engage them and others in exploring the questions they had investigated thus far.

These 24 students had a sizable task. They were required during these two days to develop a draft plan of an e-learning environment and present it to a team of multimedia developers. This plan needed to be in tune with the interests and wishes of the three

hundred students they represented. Each pair of representatives was asked to report on their class' investigation of the GENESIS question and on their related design ideas, sharing their most valuable thoughts and most useful strategies. (See Figure 4.2) In return, they needed to become familiar with the work of other classes and schools. Cameron and Samantha's class had investigated *what controls the brain.* Cameron had particularly enjoyed having visitors come to his class, one being his baby brother, Ryan. *He came in and we got to see how babies' brains work.* He had determined the value of real life observation for learning. Ajeet reported the experiences of his classmates, Ritam, Alex, Nicholas and Tom, who were investigating the evolution of language. They had benefited from being able to talk with experts, but had also discovered that *some other great resources were books about neurology, and anthropology - these helped us investigate different languages of different countries.* Max and Cassandra commented that at the end of their investigations, their class discovered *all the things that we still wanted to find out – there's really no end to the things we want to know.* Their investigations and findings had sparked many new ideas and questions and they were seeing the likelihood that this pattern would continue throughout The GENESIS Project.

Figure 4.2 Two Children from North Primary School present their classes' investigations.

Having heard reports from each class, the students had a greater awareness of the interests and experiences of the other members of Team GENESIS. To support their continuing identification and refinement of criteria for their design, a set of existing e-learning environments was provided for their exploration and critique. Working with a partner from another school they spent time exploring several environments, discussing their content, method of navigation, the clarity of ideas and information included and their interest in the topic. The 24 representatives then came back together to report share with each other ideas about what makes a software program successful for learning,

commenting on the environments they had just encountered and ones they were familiar with from school. (See Figures 4.3)

One group, Georgia, Belinda, Trisha and Michelle, were impressed by an e-Iearning environment that presented them with multiple choices. They liked being provided with *different paths so you can come back* and this way *you can use it more than once.* They also appreciated having *up to date information.* These girls recognised and appreciated the importance of choice, revisiting ideas and the need to have access to correct, current information. Kirsten, Natalie Y, Hannah, and Natalie Z did not like finding themselves in a position where *you have to agree with the computer - you can't choose something else.* They preferred a situation where the environment said, *'You're here. Do you want to do this or that?'* They identified a preference for having the learner take responsibility for navigation. For them, successful e-Iearning environments did not close in or limit the choices of participants. Max, Ajeet, Kirsten, Trisha and Matt enjoyed a simulation game but were frustrated that *at the end there's only one right answer!* Not only did a set destination cramp their style, but they were also annoyed that there was only one correct path to take to it, *you can't choose [another way).* These children demonstrated an understanding that some questions can have more than one answer, and that there can be a variety of ways that learners can approach coming to understanding. For them, a successful e-Iearning environment would allow for this to occur.

Figure 4.3 Design Team Children explore and evaluate existing e-Learning environments

With these impressions fresh in their minds, clusters of students then joined with a teacher and a parent to begin discussion on the style and content of the GENESIS e-learning environment. They worked to develop concepts and prepare ways of presenting their thoughts to the rest of the design team as well as the multimedia developers.

Students identified features they thought worthwhile. Some North Primary School students were very keen for *chat rooms, so you can talk to other people -- with real people - not a computer.* A group of West Grammar School students believed children *need to be able to do something to learn it.* They also wanted their design to let students navigate their own way through the content and activities, to be asked, *'What do you want to do now?'* and select from *a list of actions.* Communication between users was also important to Danica, Shelli, Cassandra, Cameron, Alice and Felicity. Their thought was that the environment *could have a noticeboard - and if you've got any questions you write [them] on [it.]*

On the second Design Day, clusters of students from the Design Team negotiated with each other and with the developers to prepare a draft proposal to present to their classes and schools. (See Figure 4.4) One particular idea began to emerge - could this environment be a learning journey?

Figure 4.4 Children from all three schools discuss the design of the GENESIS Environment

Hannah and Natalie Y had started to work on this idea the previous day. They described for the Design Team a journey where *you learn through everything, so you don't have to find the answer straight out, you learn along the way. And you have your opinion on everything.* The environment wouldn't *just [give] you the answers it would be you [the user] thinking about the answers.* The girls recognised that for *most of the questions [we're asking] there is no answer. You can't know the answer - you can only be given information on the answer.* Venturing out through this journey would be *not really like a debate, but [there would be] lots of different ideas* and the user could see which ones they are *persuaded* to believe. The girls wanted to *learn about other possible answers,* and have a chance to decide what you think and be able to *have your say.* These design features clearly corresponded with the thoughts and wishes of the Design Team as their insights arose from their evaluation of existing e-Iearning environments the day before.

Then, they had expressed frustration with simulations that have only one correct answer, a desire for up-to-date, correct information and an interest in interacting with real people. Moreover, they wished for navigational control of the environment, the ability to be able to revisit ideas and a desire to actually do something to learn about it. The students were beginning to make clear the stark contrasts between the environments they had evaluated and what they wanted for their own environment. It would have many paths. Travellers would be free to choose where to go. Correct answers wouldn't be pre-determined or set as the end point of constructed pathways. Diverse understandings and ways of coming to understanding would be acknowledged and supported.

After further negotiation with the multimedia designers about cost and navigation, students agreed upon the following blueprint for their environment: The students decided to design it as a place where users are travellers on a journey of exploration. Here, these travellers' challenge is to investigate *how and why we think, and how come we're not born with the knowledge we know now.* Travellers land in a Town Square, surrounded by buildings to enter or paths to follow out into the bushland. As travellers walk along a path, they come across the ideas and questions of other travellers as Footprints along the way. They can enter houses filled with videos to watch, experiments to try, ideas to discuss and questions to wonder about. Using their notebook, they can collect ideas and information and make their own notes. Many discussion boards enable people to post comments, questions and challenges for other travellers to read and think about. In the Town Square, travellers may choose to drop in at the Internet to explore websites, watch interesting videos at the Movie Theatre or pick up a File' at GENESIS Headquarters that they may consider investigating.

The children now had a central idea for a design, constituted from the features they reported as being of particular value in e-Iearning environments.? Now the students needed to address what is conventionally described as content to place within their design shell: ideas, information and opinions for travellers to think about and, perhaps even to be persuaded by.

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7 It is highly likely that these students were anticipating the salience of these features for learning, though Whether they were was unknown at this point. This issue will be taken up again in Chapters Nine, Ten and Eleven, as it is gennane to this inquiry into students' ideas about learning as well as to the potency of e-learning design contexts within which to investigate these ideas.

4.4 What content would the students develop for their e-Iearning environment?

Having previously identified, through question framing, what it was that they wished to uncover, the children now designed investigations they believed would most likely provide them with the insights into their questions. At this time, I designed an Investigation Booklet (Appendix One) for students to use or adapt to support their inquiries. This booklet did not hinder students who were confidently negotiating an investigation on their own initiative. If they were not in need or not interested, they left it alone. In some classes however, it was able to broaden uniform approaches expected by some teachers of their students, by demonstrating how different students' inquiries could be undertaken in a variety of justifiable ways.

Indeed, the students went about their investigations using an array of different approaches. Children carried out experiments and surveys. They researched and compared existing theories. They observed situations. They collected data that included video footage, survey results, statistics and field notes (Figure 4.5). In making these methodological choices, they demonstrated their insight that different questions need to be explored in different ways, and that they yield different types of data that mayor may not be of use. For example,a survey might support researchers trying to make sense of how people understand dreams, while observing people's reactions might better suit researchers trying to understand decision making.

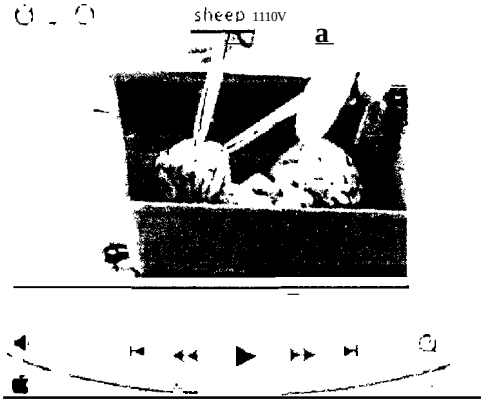


Figure 4.5 A video children made of an experiment on a brain

Jade and Elizabeth asked, *Does your gender influence your thinking? Does what we believe in affect us and how we think? How do our genes influence our thinking? How does our thinking influence us?* Gabi, Maike, Emma, Lee and Alice wondered whether working in different surroundings, and in different temperatures and atmospheres, affects how we think and do certain tasks. Brett, Philip, Zac, Reece and lain were curious about

our everyday experiences and thought they might affect our thinking. They wondered, *Why don't we think straight when we're under pressure? When we are concentrating strongly, do we block out other messages?* Rosie, Danica and Gabi made a movie comparing the interests of boys and girls to work towards answering their questions: *When you get older, why don't you like the things you liked when you were young?* Elizabeth and Natalie Z were interested in fraternal twins. They wanted to find out whether these children thought alike more often than identical twins. To find out, they tested seven pairs of twins and one pair of triplets using a ten-question quiz they had designed. Alex, Tom and Nick were interested in whether our Senses are activated when we are asleep. They talked with an anaesthetist, and found information from a diagnostic sleep centre and a sleep website.

Such a variety of questions and approaches to investigation provided a rich set of data for students to interpret. They graphed and tallied, viewed and reviewed their video footage, challenged the validity of their results and used field notes to clarify uncertainties. The students then needed to decide how best to engage the community with their experiences and findings within the e-Iearning design framework of The GENESIS Journey. Some chose to write detailed accounts of their investigation and findings. Some posted instructions for repeating an experiment they had undertaken, showing their appreciation that some children might opt to carry out these activities for themselves so as to be able to compare results and enter into debate. Some prepared videos that showed travellers what they had done and the sense they had made of it. These students put their credibility on the line by allowing travellers 'behind the scenes' acceSS to their work and thinking. Other students theorized their findings, placing their thoughts alongside other theories that were in contrast to their view. These choices most clearly demonstrate the rudimentary desire of these children to enable others to encounter and weigh the value of many ideas before coming to a conclusion, or before coming to realise that even with this wealth of knowledge they still did not have the knowledge they needed to be certain. All this investigatory work was collected and given to the multimedia developers to place into The GENESIS Journey. Some became the footprint comments scattered throughout the pathways. Other media were placed inside the Movie Theatre or Library for travellers to watch and read. Some clusters of material had been particularly designed to be placed inside a house, providing video footage, written reports, graphs, links and discussion board starters for a specific topic.

The multimedia developers placed the children's content into a prototype environment

that they constructed based upon the children's specifications. The Design Team examined this prototype (see Figure 4.6). They were pleased with it and gave approval for the developers to move ahead and complete The GENESIS Journey. This work took five months. In May 2004, The GENESIS Journey went live in the three participating schools. (See Figure 4.7)

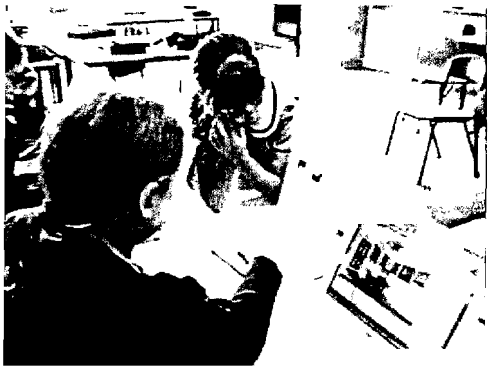


Figure 4.6 Design Team Children explore and approve the prototype

Figure 4.7 The GENESIS Journey is launched at North Primary School

4.5 Selected parts of The GENESIS Journey in detail: Four learning journeys

Against this brief, general background, I now tum to present four particular accounts of children's own learning journeys within the project.[8] These accounts are presented in detail in Chapters Five to Eight. I acknowledge that I could have chosen others, for each was unique. However, some learning journeys could not be told in adequate detail, whereas these could. Indeed, as J argued in Chapter Three, these both represent and show the diversity of the children's activity. These qualities will become clear as I introduce

8 A short video of the GENESIS Journey has been included as Appendix Two to assist the reader in appreciating the children's design.

and describe them, situating them now against this chapter's general description of the broad sweep of diverse investigations that constituted The GENESIS Journey.

These four accounts were chosen because they reveal dimensions of the children's activity during The GENESIS Project, including:

- The evolution of the children's diverse working relationships;
- The depth and variety of questions they asked;
- The range of investigative strategies they undertook;
- The detailed analysis and varying degrees of students' satisfaction with their data;
- The scope of content they submitted for inclusion in their e-learning environment; and
- The reactions and responses of the GENESIS community, seeking and appreciating the ideas of others.

Moreover, the themes of the investigations I have selected to report (dreams, individuality, choice, gender differences, learning and remembering, how the brain actually works and what influences it) were very prominent throughout The GENESIS Project. It is not surprising therefore, that the online interactions that took place in response to these investigations became hotspots of discussion, allowing me in my reporting to include the voices of many of the participating children. These four accounts embody the diversity of the children's questions, investigative styles and ponderings.

1) Gender Differences: The story of The Obstacle Course House and The Toy Choice House

Cameron, Hamish and Shaun, from a Year 3/4 class at West Grammar School, teamed up with schoolmates Max and Josh, boys from Year 9. While they did not have a ready question to investigate, they were all most eager to be involved in The GENESIS Project. While their ages would normally have prevented such a group interacting with each other, this common goal drew them together. Following discussion they decided to investigate gender differences, particularly comparing how boys and girls make choices. They designed, implemented and filmed two experiments. They graphed, analysed and reported their findings, submitting their video footage, their final report and their instructions for repeating their experiments for inclusion in The GENESIS Journey.

2) How People Learn: The 0/ The Chatterbox House and The Factors Affecting Learning House

Natalie Y, Hannah, Alysha, Melody and Marie Claire were members of a Year 5 class at Girls' College. They wanted to discover if people remember more accurately by recalling information or recognising correct details amongst many. They designed and implemented two experiments. While analysing their findings they identified flaws in their approach and worked to determine which if any findings were secure. The online discussions that resulted not only explored and reviewed these girls' findings, but directly discussed The GENESIS Journey environment and considered its value.

3) What actually is a Dream: The story a/The Dream House

Participating in The GENESIS Journey provided Matt with an opportunity to explore dreaming, a topic he was most interested in. Matt researched a range of theories of dreaming and then conducted a survey of children and teachers at his school, using his findings to develop his own theory of dreaming. While not able to participate in online discussions with visitors to his house due largely to organisational difficulties at his school, Matt carefully reviewed and evaluated their comments, valuing them as highly as the opinions of scientists he had researched during his initial investigation.

4) The Nature a/Uniqueness: The story a/The Drawing Test House

Kirsten and Ashleigh were two Year 6 friends at North Primary School. Already deeply interested in the uniqueness of every person, these girls designed an experiment to investigate and elucidate how people respond uniquely. The evidence they collected strengthened their appreciation of individuality. They submitted their report and video footage for inclusion in The GENESIS Journey and Kirsten participated in online discussions with fellow travellers once the environment went live.

4.6 Summary of Chapter Four

The GENESIS Project engaged children with the task of creating an e-learning environment of their own devising. The following chapters will explicitly consider the investigations of particular students to determine:

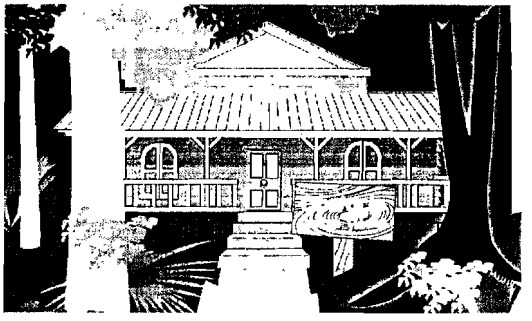
1. How they generated and selected their questions for investigation;
2. The approaches they took to carry out their investigation;
3. The methods they employed to make sense of their findings;

4. The decisions they made concerning how to represent their ideas and inform others of their findings; and
5. The responses and reactions of the wider community to their work.

In doing so, these chapters contribute the evidence required to address my research question, *"Can I find out how children understand learning by engaging them with an e-learning design challenge?*

Chapter Five

Gender Differences: The story of The Obstacle Course House and The Toy Choice House



This chapter is the first of four specifically selected accounts of investigations carried out by children to design and develop material to be placed within The GENESIS Journey environment. This account is of particular interest as it involves an unusual working relationship between the children, it contains particularly detailed analysis by the children of their findings and it provoked a remarkably strong response from the GENESIS community.

Cameron, Hamish and Shaun were in a 3/4 composite class in the Junior School at West Grammar School. Max and Josh were involved in the project through their Year 9 science class. They found themselves remaining around a table in their school library as other children formed investigation groups with peers their own age. While conventionally the ages of these five boys would keep them separated at school both socially and academically, this eclectic group gathered together because, in the evolving language of The GENESIS Project, they *wanted to do an event.*

What questions did the boys generate and select for investigation?

The group's discussions began from a common interest in *investigating the differences between* males and females. Together, they developed two experiments, The Obstacle Course and The Toy Choice Survey, to explore how boys and girls make decisions and to compare their likes and dislikes.

5.2 What approaches did the boys choose and develop for their investigation?

For their first experiment, the boys decided to build an obstacle course and monitor the ways young boys and girls navigated through it (See Figure 5.1). By recording and analysing the choices that the boys and girls made in regard to their path through the obstacle course, the boys believed they would be equipped with data to help them see if and how boys made different choices to girls. They conducted the experiment with two separate classes: nine students from Kindergarten and 13 students from Year 2. Cameron reported that:

> *Yesterday we made an obstacle course out of blocks from the library, chairs and tables. And we had lollies at the end. And we used it on Kindergarten and Year 2. And so they did that. We had four different ways. And we did a tally of which way the most boys went through and which way the most girls went through, sort of thing...*

Together, the experimenters had worked out what they needed to do and had assigned each team member a task. Cameron and Shaun brought the children from their classroom, Hamish was at the door, letting one child in at a time, Max videotaped the experiment, while Josh explained to the children what they needed to do. Josh commented,

> *I just said, "There's an obstacle course here and it's getting in the way of you getting to the lollies, the lollies on the table. And you can only go around it, over it or under it. And you've got to choose which way to go, to try and do that." And then they went for it.*

Each participant was filmed and a tally kept, recording the movements of the children.

Figure 5.1 A section of the obstacle course

For their second experiment, the boys developed a toy survey. By asking children to select toys they liked and didn't like, they hoped to discover any differences in male and female choices and likes and dislikes. The four toys the boys selected to use were a teddy bear, an Action Man doll, a plastic dinosaur and a Barbie Doll. This time, Shaun and Hamish looked after the children, Cameron conducted the interviews, Josh kept a tally of each child's selection and Max again worked behind the camera filming the events. Again, Cameron explained,

> *We had an interview. We had four toys. We had a teddy bear, a Barbie doll, an Action Man and a dinosaur. And* we *put them all down and I asked them which was their favourite and they picked it. And then we'd say, "What is your least favourite?" and then they'd pick that and then* we *said, you play with this toy you like the best?" sort of thing.*

The same 22 students who had navigated the obstacle course completed the survey.

5.3 What methods did the boys employ to make sense of information and findings?

5.3.1 Obstacle Course Findings

The experimenters had kept a tally of the choices the girls and boys made for each experiment. Max and Josh constructed these graphs from the obstacle course data. They each took a copy home and considered it overnight. The following day they spoke with the university researchers in the GENESIS team about their findings.

Max: *Josh and I, he had a copy and I had a copy and last night* we *both had a look at them. There were obvious similarities between what boys did and... differences, sorry, between what boys did and what girls did.*

Robin (University researcher): *In what way?*

Josh: *For example, not many... one girl went under whereas four boys went under and things like that.*

Max: *Yeah, the girls were, spent heaps more time as well thinking about what to do. They even asked, "Which way do you want me to do [it]?" whereas the boys just went straight into it.*

Cameron: *We saw one boy in Kindy that just ran straight ahead. He didn't care where he was going and crashed into a table and just walked around again.*

Using the graphs they had made (See Figure 5.2) and their observations, the experimenters drew conclusions which Max expressed in these words:

> *From the results found, it is fair to conclude that boys are much quicker and more confident in the decisions they make to get to the other side of the obstacle course. Girls like to size up their options more and take their time. Then they will usually take the easy way out. You can also say that boys are more adventurous and like to take the harder option, whereas girls like the easy way.*

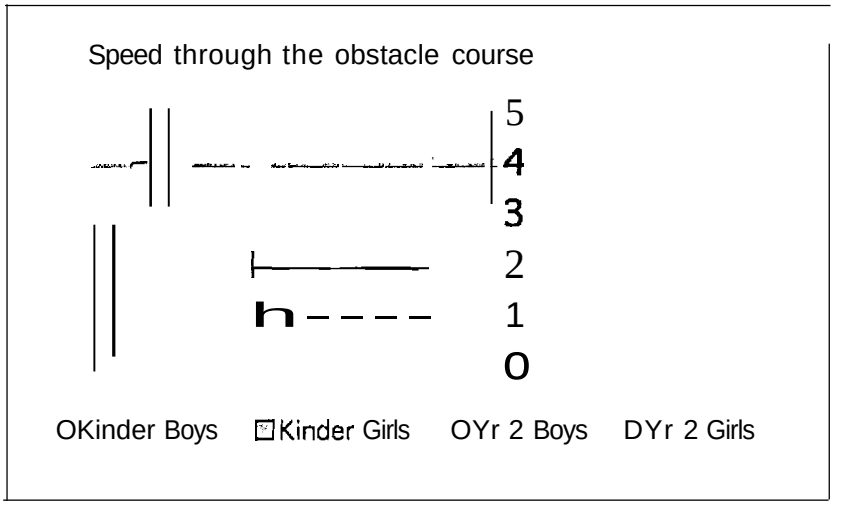


Figure 5.2 Graph made by the boys showing their findings

Josh also recognised that while the girls might take their time, it was possible that they *were thinking about it more* and taking a more efficient route, unlike the boys who *just rushed in.* It seems that Josh was thinking about which decision was of value. Should the speed with which one navigates an obstacle course be considered more highly than the relative ease of the route that a participant selects?

5.3.2 Toy Choice Findings

Max and Josh also graphed the results from the Toy Choice Survey, comparing which toys boys and girls from Kindergarten and Year 2 liked and disliked (see Figure 5.3), and identifying the percentage of children who played with their preferred toy (See Figure 5.4).

When it came time to write the report, Max included this finding about age differences.

> *This experiment shows both the differences in gender and also in age preferences. The types of toys picked by the Kindergarten children were mostly*

what we expected, girls mainly picked the feminine toys and disliked the masculine toys and boys picked the masculine toys and disliked the feminine ones. In Year 2 however, the results were much different. The boys liked the masculine toys and disliked the feminine toys but the girls liked one of the feminine toys (Teddy Bear) and disliked the other (Barbie Doll.)

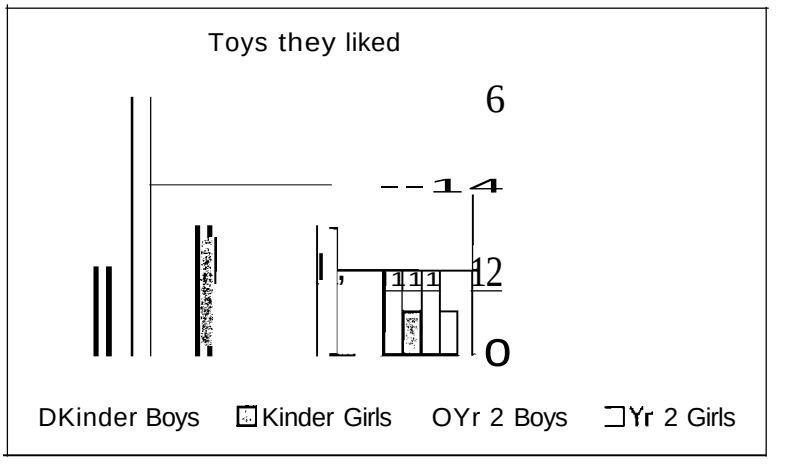


Figure 5.3 Graph the boys made showing children's preferred toys

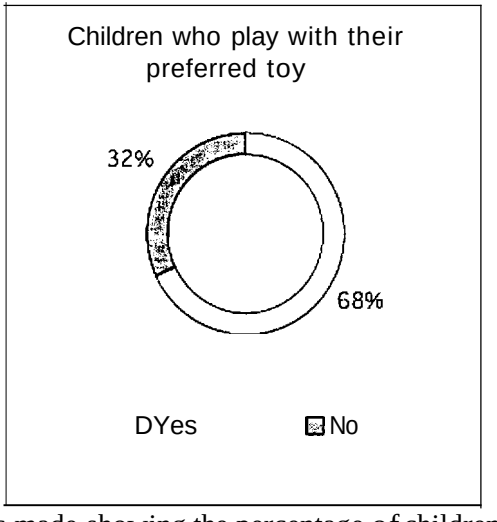


Figure 5.4 Graph the boys made showing the percentage of children who play with their preferred toy

Josh was particularly interested in the strong feelings the children had about the Barbie doll and the Action Man. When it came to the teddy bear and the plastic dinosaur toy, *a few people liked them and a few people didn't.* The results concerning the other toys, he thought, *were more definite. A lot of people liked them and a lot of people didn't.*

In the findings from the Toy Choice Survey, Max had noticed something interesting, too. Not only could he see gender differences, he saw *age difference coming into it, too.* From the findings, he concluded that *as you grow older... people vary more in the sort of toys they like.* These findings, and possibly his own experiences as a member of Team GENESIS, led Max to theorise that this is *sort of typical to life. As we get older we like... a broader range of things whereas when we're young we just like a small range of things.*

5.4 What decisions did the boys make concerning how to represent their ideas and inform others? How did they anticipate the response and reaction of the wider community?

Two members from this group, Cameron and Max, were a part of the Design Team and had been closely involved in developing the concept of The GENESIS Journey. As a result, they were very familiar with the design features that the students had selected to be included and collected, and they were keen and able to prepare suitable content.

In both the Obstacle Course House and the Toy Choice House, a very detailed report is contained in the folder on the desk. The boys revealed that in the report they included the *original ideas for the experiment, in case they're needed... the results that [they] found... and a conclusion underneath it.* These reports include graphs to illustrate their findings to the travellers clearly and quickly, for as Max said, *There's... different ways we can present what we've found here.* These reports also contain instructions for carrying out the experiments for interested travellers to download and make use of as they might wish.

As the boys had filmed their experiments in great detail, travellers can see the boys discussing and reporting their findings and can also see behind the scenes of that reporting, watching the data actually being collected as children go through the obstacle course and take part in the toy choice survey. As is the case in each GENESIS house, travellers visiting these houses also have access to topical Internet links on the computer, facts and opinions on the Ideas Wall and opportunity to discuss related ideas (in this case, gender differences) on the notice boards[9].

The following conversations took place online during 2004. Many times children called on each other to *keep responding.* Late night posts, the use of capital letters and strings of

[9] A transcript of an entire noticeboard from the Dream House has been included as Appendix Three to illustrate the complexity and diversity of the comments posted by children.

exclamation marks indicate the strong feelings children have about gender differences. The frequency with which the children called on each other by name and pursued conversations with particular participants make this one of the most personal conversations within The GENESIS Journey. As well, these features suggest a remarkable enthusiasm for the discussion of these ideas.

5.4.1 Please give me a reason, please keep responding

On 11th May, twelve-year-old Caitlin posted a comment on the Toy Choice notice board that sparked passionate debate. Her comments concerned the reasons boys and girls might prefer different toys. *Boys... because they are immature and like things that are loud and Jast. A car would satisfy their needs Jar noise and speed greatly. Girls have a much better imagination than boys (I know [I'm] being sexist), because normally girls are more calm so they read, that expands their imagination greatly. They can play make [believe] with their dolls. They usually make Jriends oj the dolls. I think [it's] great.* [10] Her post indicates she has some sense of children using toys for particular reasons, of toys having influence over their owner, and makes clear the toys and behaviour she personally values.

A fortnight later, a group of boys from another school came across her comments. Some flared up and posted fiery disagreements. Several boys, however, closely reviewed her comments and challenged her assumptions. Boys *may like things that are loud and Jast,* [11] said Jacob, but that does not necessarily mean they are immature. With eighty-eight exclamation marks included to emphasize his disagreement, Joshua added *[WE'RE] BOYS AND WE DO READ/*[12] Jacob took to task her claim that girls have a better imagination, presenting evidence to support his case. *We don't imagine that dolls are alive [but] we imagine-about Jantasy things like trolls and lord oj the rings. P.S. JRR [Tolhen] wrote lord oj the rings and that has a lot [of] imagination and he* is *a man which is [basically] a boy.* [13]

There the discussion paused for a fortnight, prompting Jacob to take the initiative to post a direct request to Caitlin. He could find no satisfaction in an unanswered challenge. *We would love to hear your [response] and [for] other people [to] come [into] the*

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[10] Toy Choice Two, 11th May 2004, 11.04am
[11] Toy Choice Two, 26th May 2004, 11.56am
[12] Toy Choice Two, 26th May 2004, 12.00pm
[13] Toy Choice Two, 26th May 2004, 12.09pm

argument.[14] Joshua also desired greater community involvement, encouraging readers to *tell your friends about this [conversationj.15* Alexander joined in, stating that *we [boys and girls] should be treated equally* and called for a *truce.*[16] Becky, Cathy and Sarah disagreed. *Boys are immature!17* Jacob was not impressed or persuaded by their claims, calling on the girls to *please give me a reason you have nothing to back up your [view.]*[18]

In response, Becky told Jacob that *boys are [immature] because they don't do as well in school [as] girls and they are just boys.19* Sarah's reasons related to earlier comments: boys play with *stupid* things and if they do read, which she highly doubted, they read *Immature*[20] t'h'mgs.

On 15th June, more than a month after her initial post, Caitlin returned to the debate. She was willing to look more deeply at the issues, past initial appearances, acknowledging and validating the different hobbies and choices that boys make. Over half an hour she posted several comments that illustrate her train of thought.

Many people think that boys are immature [because] like my brother, they are really obsessed with being cool and impressing people of both genders. Boys [most boys, she clarified later] *like fast cars and cute girls. I am not saying that boys are all the same. What do you think of that response[?] Please keep responding.*[21]

If you don't think you are immature [that's] fine. I think boys are judged unfairly. [It's probably] just because they have different interests and hobbies. Do you guys agree with mer?] Keep responding!22

I don't think most boys are. Just the boys that choose to be. They can choose to be mature if they wanted to be. But some don't. And girls really only notice the immature ones.[23]

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14 Toy Choice Two, 9th June 2004, 11.44am
15 Toy Choice Two, 9th June 2004, 11.45am
16 Toy Choice Two, 9th June 2004, 11.48am
17 Toy Choice Two, 9th June 2004, 12.16pm
18 Toy Choice Two, 9th June 2004, 12.19pm
19 Toy Choice Two, 9th June 2004, 12.21pm
20 Toy Choice Two, 9th June 2004, 12.21pm
21 Toy Choice Two, 15th June 2004, 11.19am
22 Toy Choice Two, 15th June 2004, 11.30am
23 Toy Choice Two, 15th June 2004, 11.43am

Caitlin clearly didn't want her comments to conclude or simply win an argument. Four times in that half hour, she requested the other children respond and let her know their thoughts on her reasoning. She did not have a long wait. The next day Joshua responded, won over by her comments. *I agree and I think Jacob, Luke and [Charles] will [too.]*[24] Joshua's comment was posted well after school hours, but he was not the only one keeping an eye on this conversation at home. Jacquelyn and Nancy both had ideas to share that same evening. Jacquelyn looked to particular immature behaviours boys participate in. *Boys are immature because they fight more than we do and act very silly like [Charles] did today when he [showed om to the camera.*[25] She also saw a difference in how girls and boys play, believing boys *like to be playing in the dirt and rougher sU/jaces.*[26] Nancy wrote, *Caitlin, boys are immature sometimes but so are girls.*[27] Jacob again challenged a peer's evidence, asking Jacquelyn why she had a problem with boys playing rough and in the dirt, and more particularly, questioned that it was evidence of immaturity: *Does this make us immature? !fit does, how?28*

5.4.2 Where we look, what we see

Throughout June, July and early August, the children continued to discuss immaturity and to compare the ways boys and girls think. This discussion took place on both the Toy Choice notice board and the Obstacle Course notice board. The children considered physical differences, the possibility that we are influenced by the activities we engage with, the effect diet may have and how parental expectations impact our behaviour.

Neil and Emily thought girls matured faster than boys. Neil reinforced his statement saying, *Take a look at Britney Spears!29* Luke considered immaturity might be a dietary reaction, telling Caitlin *boys are mainly only immature when they drink too many things with drugs such as coke, which has [caffeine] in it.*[30]

Namratha had a theory about why boys and girls think differently. *There are different choices between girls and boys both [physically] and mentally for boys and girls are*

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[24] Toy Choice Two, 16th June 2004, 4.44pm
[25] Toy Choice Two, 16th June 2004, 5.39pm
[26] Toy Choice Two, 16th June 2004, 5.41pm
[27] Toy Choice Two, 16th June 2004, 6.17pm
[28] Toy Choice Two, 23'd June 2004, 12.11 pm
[29] Toy Choice Two, 23'd June 2004, 12.33pm
[30] Toy Choice Two, 23'd June 2004, 12.16pm

exposed to different things and therefore think differently.[31] Katarina was also wondering if boys think differently because they do different things. She had noticed that her behaviour changed when she played 'boys" games, *war hammer... and computer games. ...They make me [immature.j32*

With so many opposing opinions, comparisons and personal challenges, Neil encouraged the participants in these conversations to realise that *we are all good at different things* and that *we are all immature at times but don't realise it and [criticize] each other unfairly.33* Katarina also had advice concerning how the children might consider another's point of view. *The thing that boys are [immature] to the girl's [eye unless] a girl [puts] her mind into the boys', and trust me, I have had lots of [practice}.*[34] Like Neil, Katarina's post encouraged fellow travellers to recognize that there is more than one way to see and understand the world, and that with effort and sensitivity, you may be able to appreciate another's view.

5.4.3 There must be a reason

While Namratha and Katarina considered how choices and activities might influence immaturity, Leanne was looking for a biological explanation. From what understanding she had and the observations she had made, she concluded *boys must have a different things [their] brains to girls that make boys more rough and tough and girls more quiet and beautiful and [concentrate] more on school and [studying] than playing around.*[35] Jessica had a reason why it might be so. *Due to hormones mostly boys have different things their brains [than] girls.* She also acknowledged that differences are *due to the way they [boys and girls] are brought Up.36* Julianna, who had heard that boys' and girls' brains *differ a* also replied. *There are two parts to your brain and there one cord connecting both of them. the girls' brain the cord very thick and the two sides of the brain communicate clearly but a boy's brain the cord quite thin and [doesn't] communicate well.* If this was the case, she saw a possible consequence. ...*Here we have the [concept] that girls are smarter than boys what do you think?37* Alana was

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[31] Toy Choice Two, 11th May 2004, 11.33am
[32] Toy Choice Two, 30th July 2004, 6.40pm
[33] Toy Choice Two, 20th June 2004, 4.55pm
[34] Toy Choice Two, 29th July 2004, 1O.34am
[35] Obstacle Course One, IIth May 2004, 11.33am
[36] Obstacle Course One" 26th May 2004, 11.56am
[37] Obstacle Course One" Ist June 2004, 2.24pm

more than happy to claim *IT'S TRUE!*[38] Katarina was struck that her father, *and take note he is a male,* also believed that *girls are [smarter] than boys.*[39]

Navroz believed that social interaction influenced behaviour, notably *school life, how friends treat each other, what they [friends] like and how they behave.* She also noted the effects family members may have, *the [views] of your parents, aunties and [uncles].*[40] Similarly, Becky believed that boys and girls think differently as a result of *being brought up in different ways. Some parents might buy some different toys for them. Or take them to different places, causing them to like different things.*[41] Mark also thought our behaviour was influenced *by [what] our parents get for us.*[42] Autumn wondered if boys and girls *adapt* and start to like the things that are made especially for their gender. She had seen that sometimes *children who play with their older/younger brother or sister, they like the toys their siblings are playing with.*[43] To what extent, these children wondered, do gender, cultural influences and personal experiences shape and adapt our behaviour?

5.4.4 Out of their own free will

Leanne wrote of an age where she believes children **aren't** yet influenced by gender expectations. *Why my little cousin plays with cars not because they are for boys but because to her she sees them as rolling coloured things.*[44] Jacob supported her thinking, acknowledging that *I sometimes play with dolls.*[45]

Hilaire introduced the idea of tomboys, posting, *Some girls might be tomboys and some boys might hope that they were born as girls.*[46] Sarah thought that may be *[because of the way they are brought up.*[47] 'Caitlin wondered about how the experiences of parents might influence such a child. *Maybe the father wanted to be a girl... the boy would take that opinion and call his own. Maybe the mother would have done well and been happy, and*

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38 Obstacle Course One" 1st June 2004, 2.24pm
39 Toy Choice Two, 28th June 2004, 6.45pm
40 Obstacle Course One, 11th May 2004, 11.46am
41 Obstacle Course One, 19th May 2004, 12.12pm
42 Toy Choice Two, 29th July 2004, 10.29am
43 Toy Choice Two, 15th June 2004, 12.15pm
44 Toy Choice Two, 11th May 2004, 11.58am
45 Toy Choice Two, 26th May 2004, 12.15pm
46 Obstacle Course One, 26th May 2004, 11.47am
47 Obstacle Course One, 26th may 2004, 12.03pm

always said how great it is *to be a girl.* She also acknowledged that *in other cases they [might} just be like that out of their own free will. That* is *a bit weird, but there are Drag Queens, and there* is *nothing wrong with them. It* is *perfectly respectable to be one.*[48] Caitlin appears to consider that there are some behaviours that individuals exhibit that stem from a 'free will' that is independent from the influences and expectations of others.

5.5 Summary of Chapter Five

The boys who built this house for The GENESIS Journey were fascinated by these questions. In the house they built they took care to present their findings in a variety of ways, including the original ideas for the experiments, their results, findings and conclusions. In this way they richly resourced their fellow travellers who came to visit, equipping them to enter into a passionate discussion.

The group's discussions began from a common interest in *investigating the differences between* males and females. While Jessica (5.4.3) acknowledged that gender differences might be influenced by the way boys and girls are brought up, she also had a theory that hormones shaped boys' brains differently. Significantly, gender differences are of strong interest to adult researchers and scientists as well. They are seeking to understand the influence hormones may have on gender behaviour (Geary, 1999, Hines et aI, 2002, Lutchmaya et aI, 2002), and are disclosing the influence hormones have on foetal brains during development. The cascade of hormones provoked by a male foetus *physically alters that male foetus' brain, slowing the development of certain parts and speeding the development of others. The effect of this* is *to masculinize the foetal brain, priming it to produce male sexual behaviour. It also creates many of the typical differences seen between the sexes, girls' superiority at speech and boys' at special tasks.* (Carter, 1998, p.21)

The children's consideration of how the structure of girls' and boys' brains might differ, their discussion of the cord connecting the two sides of the brain and Julianna's (5.4.3) statement that this cord is thicker in girls, very likely refers to the corpus callosum. This *band of tissue through which the two hemispheres communicate* is *relatively larger in women than in men.* (Carter, 1998, p.7l) Julianna moved that this presented the community with the concept that girls are smarter than boys. The scientific community speculates that *this may explain why women seem to be more aware of their own and*

[48] Obstacle Course One, 22nd June 2004, 10.55am

other's emotions than men - the emotionally sensitive right hemisphere is *able to pass on more information to the analytical, linguistically talented left side.* (Carter, 1998, p.71)

Interest in gender differences also impacts science and technology education. There has been sustained investigation of students' experiences, interests and attitudes towards science and scientists (Jones et aI, 2000), their performance differences in competitive situations (Gneezy et aI, 2003) and in higher education and career decisions (Correll, 200 I, Reay et aI, 200 I). Scientists are also researching differences in the brain activity of male and female subjects in situations such as experiencing sadness (Schneider et aI, 2000), completing navigation tasks (Gron et aI, 2000) or the functional organization of the brain for working memory (Speck et aI, 2000). In this investigation, these children's thinking appears aligned with several significant research lines, revealing the depth of what they know and of their interest and curiosity about learning.

The conversations reveal how attentive children are to their own thinking and to that of people around them. **In** seeking to understand if, why and how boys and girls think differently, many children demonstrate well-formed opinions, as well as the ability to speculate, based on a wide range of experiences. The children are able to continue to debate and value ideas when the discussion moves into a new arena, considering possibilities as well as actual incidents. As previously stated, this discussion board hosted one of the most personal online conversations. Children sought out by name particular participants with whom they wished to pursue discussions and frequently logged on after school hours to continue discussion. Clearly the work of these boys was of significant interest to these participating children, tapping into thoughts and theories many were already thinking about.

Chapter Six

How People Learn: Building and visiting The Chatterbox House and The Recall and Recognition House

Natalie Y, Hannah, Alysha, Melody and Marie Claire were in a Year 5 class at Girls' College that was involved in The GENESIS Project. With their teacher, they had thought about The GENESIS Question and had decided that for their investigations they would like to focus on knowledge and memory. These girls in particular were interested in how people learn.

6.1 What questions did the girls generate and select for investigation?

The girls generated two questions to investigate. The first was 'Do you learn better by recall or recognition?' The girls were wondering if people were more able to demonstrate what they know when asked to recall knowledge from their memory, such as a phone number they have been asked to remember, or when asked to recognise something they know from a group of similar objects, such as a face in a police line-up. Their second question asked, 'Do people learn better by seeing, hearing or doing?' They wanted to know if the most effective way to ensure someone understood instructions was by watching the task be done, listening to instructions on how to carry it out or by doing the task with the instructor. By investigating these questions the girls hoped to be able to better understand how people come to know things and how people best remember what we know.

6.2 What approaches did the girls choose and develop for this investigation?

To be able to answer these questions, the girls developed two experiments, The Recall vs. Recognition Experiment and The Chatterbox Experiment.

6.2.1 Experiment One: Recall vs. Recognition

Of the first experiment the girls wrote, *The aim of the Recall vs. Recognition experiment was to help answer the question, "Do you learn better by recall or recognition?"* They decided upon a list of ten words as the thing that was to be learnt. They planned to carry out their experiment to find out if, in their own words, *it easier to remember words you've seen when you have to recall them (dredge them up from you mem01Y without any prompts) or when you are shown some words and have to recognise the ones you are supposed to remember.*

To carry out their first experiment, the girls prepared a PowerPoint presentation that displayed ten words, one at a time. (See Figure 6.1) These slides were shown to groups of girls from their school. At the end of the presentation, half of the girls would be asked to write down from their memory the words they had seen on screen. The other half of the group would be given a list of thirty words and would be asked to circle the ones that had been included in the presentation. This experiment was repeated several times, each time with a slight variation. The first group heard the words read aloud as they watched them appear on screen. The second heard a conflicting word read as they watched the screen. The third group watched slides that included matching images alongside each word, while the final fourth group had an image on each screen that did not match.

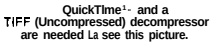

Figure 6.1 The girls demonstrate their first experiment and refer to their findings.

The girls thought carefully about the words they would include in their list of ten. They were also very thoughtful in deciding how to alter each session. For example, much thought was given to the distraction words, the words read that clashed with the correct word on the screen or the other twenty words on the page to be used by those girls

attempting to recognise instead of recall. The experimenters decided to include in these distracting words that were similar to the correct words, and words that were totally unrelated (See Figure 6.2).

> Natalie Y: *This is the list of words that the people doing recognition got, and* we *had the 10 words that were actually on the PowerPoint presentation in the lists, and then* we *put words relating like 'doctor'* we *might put 'nurse' which is on here, and* we *also put some that were totally unrelated that somehow ended up in some people's recall [lists].*
>
> Hannah: *And when* we *did the mismatching audio* we *put words related to the um, like Natalie said when it said with 'doctor'* we *put 'nurse' so it might confuse people because they're so closely related.*

It appeared as if they were attempting to investigate an idea they had about memory. While people might not remember the actual word they had seen, say 'doctor', might seeing the word 'nurse' prompt some part of their memory and that word have an appeal to them? When they examined the words that had been incorrectly recognised, would there be more similar words than unrelated words?

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Figure 6.2 Natalie Y demonstrates the Recall/Recognition experiment

Before they carried out their experiment, the girls predicted what might occur.

> *We thought that recognition people would get more answers correct [than people being asked to recall]. We also thought that students should be given five minutes to finish, and that would give them enough time, and most people would be*

finished. Besides this, the words most likely to come up were the beginning words, and the end words, in this case, 'bird', 'snow', 'brick', and 'spoon', 'car', 'mouse'. A lot of people said that 'arrow' would be one of the hardest words to remember, as it is in the middle of the slideshow, and it is one of two words that have two syllables.

One of the members of our class said that plain visual would be easier than the rest, because there would be no conflicting parts to it. We also predicted that factors - age, gender, nationality and learning experiences - would affect the results though we didn't test these other variables.

It was important to the girls that they made sure they had an assortment of participants taking part, so they involved children from several classes. To be sure of their findings and to be able to draw conclusions, they classified their participants considering their age and ability and did their best to *mix them up* so that each session contained representatives.

And when we did the different classes and the different grades and things we tried to mix then up, so *that, like 'cause there's only one PowerPoint - each group can only do one PowerPoint 'cause they've already, 'cause they've all got the same words, we tried to mix them up* so *there were some Year* 5s *and some Year* 4s *and some Year* 3s *and if we knew that some people were a little bit more clever than others we'd try to mix them up as well.* (Hannah)

As well as taking care of variables concerning participants in their experiment, the girls also considered the environment in which it would take place. What environmental factors might influence the participants' performance and how could they be taken into account? Melody and Hannah had several idas.

Melody: *And also we had to make sure there was recognition and recall on one side and then recall and recognition* so *wouldn't be because of the windows and the door and the pictures on our wall and all that,* so *it'd be the same.*

Hannah: *Yep,* so *we didn't get 'cause we wanted to see, 'Do people recall better or recognise better?'* so *if we had say, all the recognition people on the side with the door and all the recall people on the side with the windows, with the sun coming in the windows, like the sun coming through the windows, or if it was raining or somebody coming through*

the door or anything like that, people walking outside the door. So we had to mix up how many people were on each side so that all the factors were the same and it was fair and everything.

The girls had worked hard to do their best to ensure that their experiment was, in Hannah's words, fair. Even with all this detailed planning, the girls discovered a 'bug' in their presentation while they were testing it. A slide included in the presentation that was actually an instruction, 'please wait' was thought by some participants to be words they were supposed to recall or recognise.

Natalie Y: *We tested them, and the reason we've got 'please wait' in a different colour,*

Hannah: [it] *is so they don't confuse it with the words.*

Natalie Y: *Because we tried two of them, we tried just visual and we tried this one and in the visual one the 'please wait' was in white like the rest of them and some of the people wrote down 'please wait'!*

Through taking the time and care to trial their experiment, the girls were able to identify and eliminate a bug. This done, they could now carry out their experiment with confidence. This they did, collecting their findings to examine.

6.2.2 The second experiment: The Chatter Box

The aim of the girls' second experiment *was to discover and conclude whether people learn better by seeing, hearing or doing.* To do this, the girls decided to teach participants to make a Chatterbox, a toy made by folding paper in a particular way to form a contraption you can play with. Four sets of girls participated in this experiment. The first group listened to a set of instructions for making a Chatterbox. At the conclusion of the instructions the girls were given a sheet of paper and asked to carry out from memory the instructions they had heard. The second group had no instructions to listen to, but watched a video showing how to make Chatterbox. Again, when that finished, they were given paper to fold correctly. The third group was able to both watch and listen to instructions before being asked to complete the task. (See Figure 6.3) The final group as well was able to watch and listen to the instructions, but instead of being required to wait until the end of the video to start, they were able to make the Chatterbox in time with the video.

The experimenters reported that *the students were seated in rows of double desks and the instructions were viewed on the white-board. Each person was timed when they were making the Chatterbox after the instructions.*

Once again, before carrying out the experiment, the girls made predictions. As a group they *that the Audio Only experiment would probably be the least successful if the subjects didn't understand the instructions and the Audio and Visual would be the most successful because the subjects would be able to both see and hear the instructions.*

When testing their Recall vs. Recognition experiment the girls had identified a 'bug' that needed to be fixed. Now working on the Chatterbox experiment, they again found challenges they needed to overcome. The first involved ensuring their instructions were clear and fool proof. When testing their first draft of instructions on their friend Cathleen, Alysha and Hannah discovered that they were not.

> Alysha: *My friend was pretending to be like she had no idea and* so *I told her, 'Fold your piece of paper in half' and then she goes and does it diagonally, and I'm like 'Oh no!'*
>
> Hannah: *We were testing it on Cathleen, and she was being really annoying and taking into account everything that could* go *wrong and it was really annoying and so, yep, we had to [LX everything up. And we got the part where, 'cause she was folding it diagonally, where the two make it into a rectangle and things like that.*

While Hannah's record frustration with Cathleen, her animated face displayed her regard for the challenge Cathleen proved to be and the value in having such a pilot test to secure their experiment. Cathleen had shown that their first draft of instructions was open to a wide range of interpretations, a fact she made plain to see when she folded her sheet of paper in half diagonally. This complied with the instructions, so if a girl were to do this at the end of listening to instructions, her memory would be correct, but she would not be able to fold a Chatterbox successfully. The girls saw that this would invalidate their findings and rewrote their instructions until they were convinced that any mistake would be due to forgetfulness, not ambiguity.

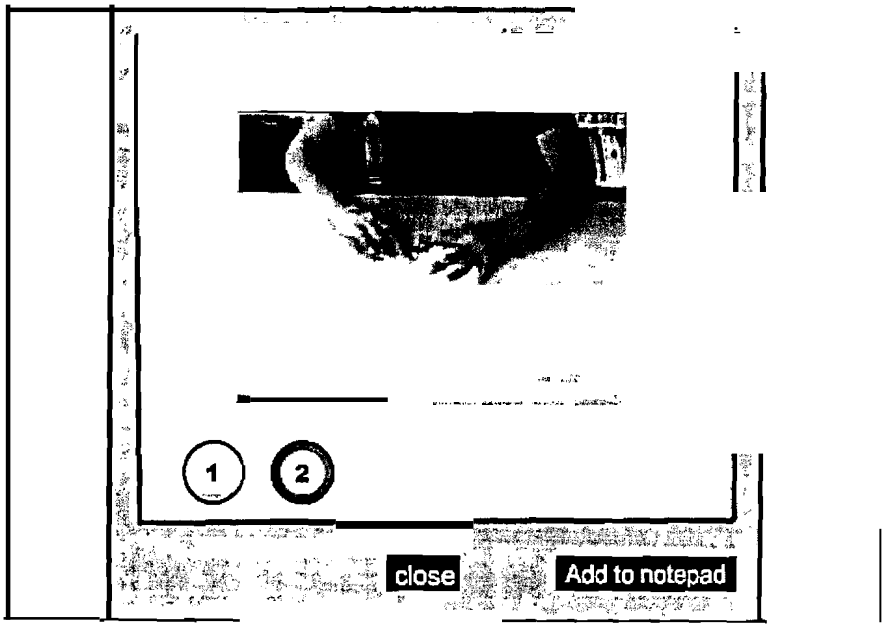

Figure 6.3 The instruction video for travellers to watch in The Chatterbox House

While the girls were able to overcome this 'bug' by ensuring they had explicit instructions, other factors, set out in section 6.3 emerged that greatly challenged the validity of their experiment as they worked to make sense of their findings.

6.3 What methods did the girls employ to make sense of information and findings?

In working to draw conclusions from their Recall vs. Recognition Experiment, the girls acknowledged that there were several factors working against them. They reported that

> *There were many problems that prevented us from drawing conclusions. The main problem was that we needed more organisation. We did not do this for the first two of our four experiments. Papers were jumbled and we did not know which ones were visual, and which ones were visual with audio. Besides this, people helped each other, as they were sitting next to their friends. The multi-media projector had problems. and the sound didn't work. Nevertheless, we continued with the experiment with a green screen, no sound, misunderstanding of instructions, or technical problems.*

Despite these frustrations the girls did not despair of their investigation. While acknowledging these problems, they had done their best to adapt and refine as they continued on and believed that they had data worth working with. Here is their account of making sense of their findings.

We interpreted the results by grouping the results into their categories, and then separated each category into recall and recognition piles. After that, we tallied how many people got each word wrong. We then used Microsoft Excel to make pie graphs showing the percentage ofpeople that got each word wrong.

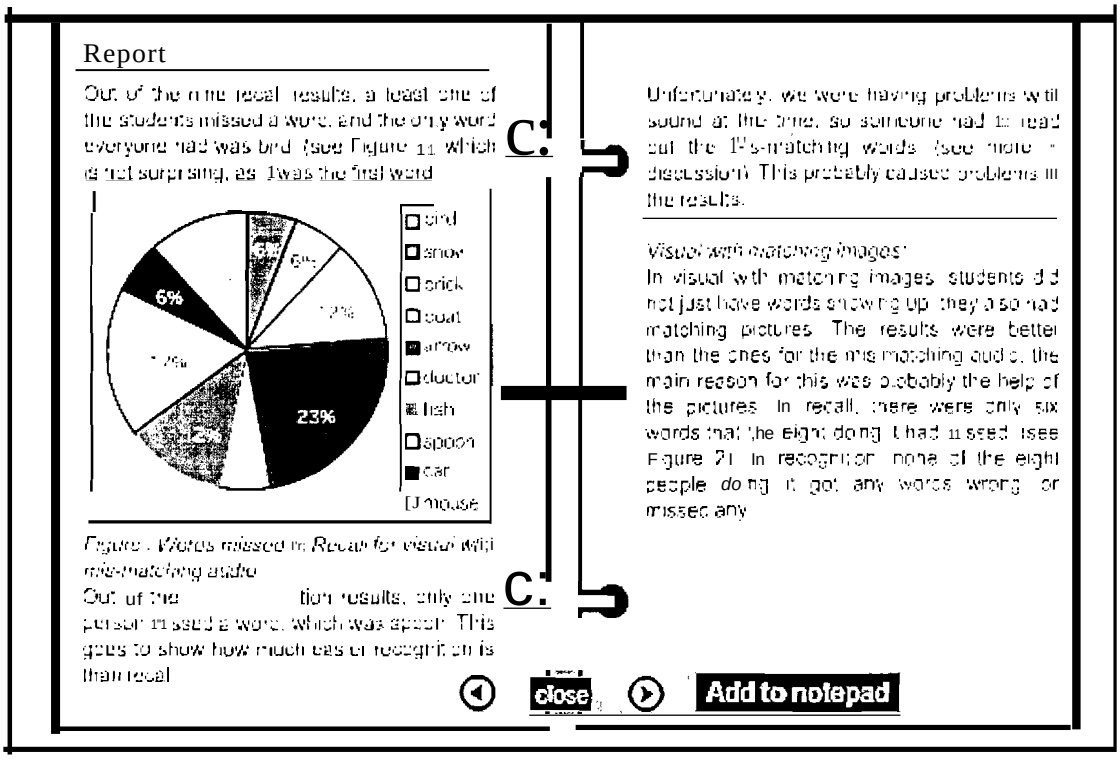

Figure 6.4 A page from the report found in The Recall and Recognition House

From this work, the girls felt secure in drawing these conclusions.

> *Our results showed that people learn better by recognition, and people do better with a helpful factor, such as matching pictures, which means our predictions were right. The word, 'arrow' was missed the most in [the] mis-matching audio [presentation], yet it was not missed in [the] matching images [presentation).*
>
> *We concluded from this experiment that it is easier to learn with plain words or something helpful such as matching images or audio. Besides this, lots ofpeople missed the middle words, yet nobody missed the first word. Despite numerous problems, our final conclusion is that people remember better by recognition than by recall.*

Having made sense of their findings, the girls turned to consider of what benefit, if any, conducting this experiment had been for them in finding infonnation to help answer their

first question: Do people learn better by recall or recognition? This they could do. *This [experiment] helped us to learn about learning and memory, because it helped us to find out about learning styles. It also made us curious about the way both people and animals learned, and looked at the memory of people.* As they draw this experiment to a conclusion, the girls are indicating that when setting out to find out one thing they became curious about another idea along the way.

While there had been factors that had hampered the girls' work of analysing their data in the first experiment, drawing conclusions from the Chatterbox Experiment proved to be a trickier, unresolvable challenge.

First, this experiment was to make better sense of how people learn something. The girls came to recognise that they couldn't be sure that the participants were actually learning to do something new. This being the case, they might actually be studying memory instead of learning. Here Hannah acknowledges the difficulty.

> *The results were a little messed up because we asked for people who didn't know how to make a Chatterbox and nearly everybody knew how to make a Chatterbox. So it was a bit weird.* (Hannah)

In their reports, the girls also identified other variables that affected the validity of the experiment. People had *helped each other, the amount of subjects in each group varied* and they had noticed that *subjects were distracted by certain things.*

To be able to draw conclusions about how people learn best, by seeing, hearing or doing, the girls had planned to time how long each participant took to make their Chatterbox. If the participants were to complete the challenge more swiftly after only listening to the instructions, this might be an indication of a more successful learning approach. On the day of the experiment however, Hannah recognised that there was a significant problem with this plan. It concerned the final group, the one that would be able to carry out each step while both watching and listening to the instructions.

> *For the hearing and doing we were going to time them, except that then on the day we realised that, just before the experiment, we realised that it wouldn't work to time them because some people might be able to make it in 30 seconds except 'cause of the instructions they'd be held up. So we didn't time those - we just said 'completed' or 'not completed'.* (Hannah)

The girls graphed *and interpreted the results by seeing ffor each group} out of* 16 *people. how many could or could not correctly complete the Chatterbox.* From the first group who had only listened, 14 were able to complete the task. For the second group that had only watched the instructions, 15 were successful. For the third group, the audio and visual group 13 participants managed to make a Chatterbox. The final group, those who had been able to watch and follow along with the instructions, 12 were able to complete the task.

The girls *also found out the average time for making a Chatterbox:* Group One: 1 minute 34 seconds, Group Two; 1 minute and 52 seconds and Group Three; 2 minutes and 18 seconds. As Hannah reported above, there was no reason to record the time for the fourth group as those girls had followed the instructions step by step with the video, keeping pace with the time it took to play through.

Having worked to collect and organise this information, the girls explained in their report why they chose not to make any deductions from this data. *We cannot draw any conclusions from our experiment seeing as the variables do not allow the results to be accurate.* They knew it wasn't the valuable information they needed to draw conclusions. Not to be deterred by this, the girls considered how they could go about rectifying this situation if they were given the opportunity to undertake this task again. *Something we will do next time is make a type of origami not many people know how to make.* This way they could be sure that their participants were learning something new. This was what they needed if they were to be able to answer their question.

6.4 What decisions did the girls make concerning how to represent their ideas and inform others? How did they anticipate the response and reaction of the wider community?

Two of the girls involved in this group, Hannah and Natalie Y, had been members of the Design Team. Indeed, it was the two of them who initially brought forward the idea that the e-learning environment might become a learning journey.

From their investigations, Hannah and Natalie Y and their fellow experimenters prepared content compatible with their design. Each investigation was organised into a house. The folders in these contained very detailed reports of their investigations and their conclusions. (See Figure 6.4) The actual experiments that they designed were included in the houses for people to download and try for themselves, to have their own thoughts and

opinions about. Three versions of the Recall vs. Recognition experiment were placed in the folder and the Chatterbox instructions were provided as a video to watch on the television. Most particularly, along with these reports and information, there were noticeboards available to *learn about other possible answers* from each other and opportunities on these boards to be persuaded by someone else's belief.

6.4.1 *Honest responses: but to tell you da truth ...*

On the noticeboards, students started to discuss the girls' questions: Do you learn better by recall or recognition? Do people learn better by seeing, hearing or doing?

Yun shared her thoughts *that there is a big difference when you are listening or watching and listening at the same time. Watching and [listening] is better because there might be a picture of what they are saying. Just listening to [instructions] can get confusing.*[49] Yun knew what Cathleen had demonstrated to the girls when they were testing their Chatterbox instructions and she pretended to be confused by imprecise directions. Angela had an idea about why watching and listening might be more successful. *...if you watch, it is like experiencing but when you listen, your brain might not work so fast and not be able to understand [quickly].*[50] Her comments indicate that she considers experience to be a most powerful learning event, and that watching more closely resembles this than listening, and that somehow the brain is able to quickly make sense and retain things that are seen. At least, it might be able to do so to a greater extent than with things that are heard. Chrissy disagreed with this, posting that *yes it [the brain] would*[51] be able to understand just as much from listening. From her experience, Angela was able to attest that *honestly [I] learn betta [when] I look and [listen].*[52]

Alysha brought the discussion into an actual context. *What about if you were trying to memorise something (lines for a play)? Would listening only or both visual and listening help you remember it?*[53] Angela appreciated this question and the line of thought behind it. *I think what Alysha asked was a real Question. I think [visualisingJ and listening will be better [than] listening because you'll be able to remember better if someone acted and*

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[49] Chatterbox One, 4th May 2004, 3.00pm
[50] Chatterbox One, 4th May 2004, 11.51am
[51] Chatterbox One, 11th may 2004, 10.56am
[52] Chatterbox One, 11th May 2004, 10.58am
[53] Chatterbox One, 11th May 2004, 11.08am

said it to yoU.[54] Maggie wasn't certain. *Me not sure Angela. I do better when me listen then visualising. But to tell u da truth, I sometimes actually do better when people act it out then rather telling me to do [something}.55* Maggie, like Angela before her, was able to make sense of her own learning experiences and use this understanding to question those she was conversing with. Leanne identified a difference she saw between the seeing and hearing of information or instructions. *When you see instructions you know exactly what to do but when you are only told instructions you have a little exploring and [experimenting] to do.* 56 Similarly Melissa posted that she thought *when a person watches they know exactly what to do.* 57 Maggie tentatively agreed. *I kind of agree with u. [When] a person is actually watching someone do [something,) I'm not [quite] sure they would understand what the[y] r suppose to do.*[58] Ciao wasn't certain enough to speak for everyone that *if they r combined [listening and watching] it will improve [results] or not* but she had found that for her, she would *still rather a [physical] example and I must be taken through the steps one by one!* !59 After reading through this discussion and possibly using her own observation, Jessica came to the conclusions that *there are [surely] learning styles, for some people like to learn by [watching] or by visual learning.* 60 Her comment seemingly satisfied her discussion group, for at this point Joshua stepped in to agree, *you are h, Jessica.* 61

6.4.2 Discussing The GENESIS Journey: a place to say whateva u want without feeling embarrassed

Amongst the discussion about how we learn and remember, clusters of students began to talk about the website itself. On 11th May, Stephanie wondered if others were enjoying it as much as she was. *Hi [isn't] this fun??/ Very interesting website!*[62] Marina was quick to agree. *I like the chatterbox it is fun and is [educational.]*[63] Before half an hour had passed, other students entered this conversation. Like Marina, Keewa was impressed by both the site and its content. *HEY whoever gets this* 1 *think this program is really cool*

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54 Chatterbox One, J1th May 2004, 11.58am
55 Chatterbox One, 25th May 2004, 1O.03am
56 Chatterbox One, 11th May 2004, 12.01pm
57 Chatterbox One, 25th May 2004, 2.13pm
58 Chatterbox One, 25th May 2004, 2.15pm
59 Chatterbox One, 1·1 June 2004, 11.58am
60 Chatterbox Two, 25th May 2004, 9.57am
61 Chatterbox Two, 16th June 2004, 5.11pm
62 Chatterbox One, 11th May 2004, 10.57am
63 Chatterbox One, 11th May 2004, 11.11 am

and exiting. It has all these cool informative places and it is also fun. [64] *I agree with you Keewa,* wrote Chrissy. *This is a mad website and fun I especially love the GENESIS cinemas.* [65] Marissa saw one enjoyable feature that was lacking: *I want to go to the candy bar in the [cinemas].* [66]

Other students identified the particular features of the environment that they were enjoying so much. On 25th May, Maggie posted that not only was this website *colourful, educational and fun* it was also *a place where u could say whateva u want [without] feeling [embarrassed.].* [67] Mary thought so too, saying it was *cool* to be able to *chat and ask [questions] and people can answer u and it could be like a debate.* [68] Maggie jumped back into the conversation to acknowledge *u have a point there.* Not only was it fun and a place to have your say, but it provides a chance to *[know] what other people think.* [69] Here we see the students not only taking advantage of the features Hannah and Natalie Y saw as priorities for this environment, but recognizing and agreeing about their worth.

Participants also appreciated an opportunity for learning new things in such an enjoyable way. Marissa posted *This site was helpful to me with because it gave me information that I had never [known] about. Great website.* [70] Riana was also appreciative. *This site is really I learnt [a lot] of stuff about our brains and how they work. Thanks everyone!7}* Riana thanked everyone – both those who had designed the site and developed the content for it, and those who were participating in this learning journey alongside her.

Interestingly, the conversations on these noticeboards frequently strayed into other content areas, including the discussion of twins and dreams. In response to this, there were very few comments of a slightly bossy nature. They didn't try to stop or hinder discussion; they just wished to direct participants to a place where they believed it was more appropriate for such conversations to take place.

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64 Chatterbox Two, 11th May 2004, 10.54am
65 Chatterbox Two, 11th May 2004, 10.00am
66 Chatterbox Two, 11th May 2004, 11.27am
67 Chatterbox One, 25th May 2004, 9.57am
68 Chatterbox Two, 25th May 2004, 9.51 am
69 Chatterbox Two, 25th May 2004, 10.06am
70 Chatterbox One, 11th May 2004, 11.08am
71 Chatterbox Two, 8th June 2004, 11.25am

While some students were happy to share with each other the interesting ideas and questions that they had encountered elsewhere, some participants became very frustrated and suggested where they should move their thoughts. *Talk about dreams in the dreams postbox!*[72] requested Ciao at one point. Again, finding a discussion about twins she pointed out to the participants that *the topic u r [talking] about is [nothing] [relating] 2 topic if u wanna know about da twins our fingerprints maybe u would [like]* 2 *go* 2 *da twins postbox.*[73] When Janet spied a question about dreams, she went to the extent of reposting the original wanderings from the start of the conversation. *What happens when a person listens to instructions? Do you think this is somehow different from what happens when a person listens to and watches instructions at the same time? How? [That's] wat the topic is - so write about*

6.5 Summary of Chapter Six

The girls' exploration of memory, of recall and recognition, grew from an interest in how people learn and remember. They sought to uncover if people are able to better remember key words when asked to recall them from memory or to recognise them from a list. Research scientists have conducted similar recall and recognition studies, particularly looking at false recall and false recognition (McCabe and Smith, 2006, Chan, McDermott, Watson and Gallo, 2005, Dodd and MacLeod, 2004) by examining, as the girls did, the impact of the inclusion of what the girls referred to as 'related words', words not present in the list, but closely connected. Scientists refer to these words as critical lures. (Gallo, Roberts and Seamon, 1997) As well as considering factors that might contribute to false recall and recognition, the girls also consider factors that might contribute to correct recall and recognition. As well as including critical lures, the girls also included 'helpful factors', matching images placed alongside words visually presented. Their findings indicated that such factors were helpful, and increased success.

The girls conducting the experiment, as well as the children who discussed it online, were interested in what impact, if any, the way in which the list of words was presented to participants had on the results. Their study compared the results of children who had seen the list, heard the list, seen the list with matching images and finally, seen the list with unrelated images (see section 6.2). Scientists are also interested in understanding how the modality of the test influences participants' success in recalling or recognising words.

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72 Chatterbox One, 1st June 2004, 11.28am

73 Chatterbox One, 1st June 2004, 11.30am

74 Chatterbox One, 1st June 2004. 12.03am

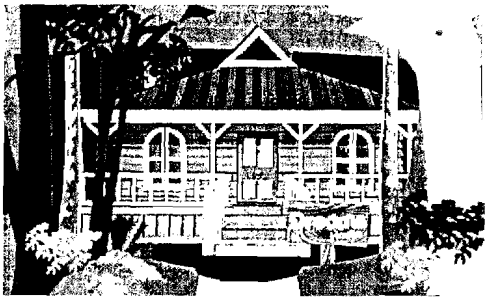
Like the girls, they have varied the presentation of the list of words, but they have also varied the modality of the test. Such studies have found higher rates of false recognition when the modalities of the study and test were different (Maylor and Mo, 1999).

Researching and comparing people's ability to recall and recognise words from lists is also of interest to those who are studying the human brain, for example those who research amnesia, (Bright et aI, 2006) hippocampal damage, (Holdstock et aI, 2002) right temporal-lobe excision (Milner, 2003) or aging (Gallo and Roediger, 2003; Benjamin, 2001).

The events that took place as the children built and visited The Recall and Recognition House and The Factors Affecting Learning House reveal the precision and integrity with which these children investigate, report and discuss topics of interest. Natalie Y, Hannah, Alysha, Melody and Marie Claire took exceptional care planning and trialing their experiments, and correcting bugs. The girls were very explicit concerning their dissatisfaction with some of their findings, and their understanding that other findings were compromised to the extent that no valid conclusions could be drawn. They let all visitors read about their concerns and watch video of their discussions regarding them. Notably, the visitors to these houses also demonstrated a high regard for precision. When Alysha moved a conversation regarding the preference of auditory and visual learning into a particular context, learning lines for a play, Angela applauded her initiative. Here was a *real question,* one that facilitated a very enlightening conversation where students described and debated most particularly, and honestly the value of visual and auditory learning experiences (Maggie actually prefaced one of her comments with the phrase *but to tell you da truth).* I find it particularly interesting that it is in these conversations, ones where the children are discussing their understanding of valuable learning experiences, that we find conversations beginning that comment on the children's appreciation of The GENESIS Journey environment. Furthermore, not only do the children appreciate the content contained in it, but of the enjoyment and satisfaction it brought those who were engaged with ideas, and connected with peers, within it. The builders of these two houses appeared, most successfully, to initiate and support an exploration of how people remember.

Chapter Seven

What actually is a Dream: Building and visiting The Dream House



7.0 The story so far

This is the third in a selection of four accounts detailing the investigations children undertook to develop and design material to contribute to The GENESIS Journey environment. So far, in Chapters Five and Six, the accounts have involved groups of children working together to investigate a question. Now Chapter Seven brings to light the work of an individual student and his pursuit of an understanding of what dreams actually are. Not only does this account contribute an alternative view to group work, the manner of Matt's investigation is in contrast to the approach undertaken by the Gender Differences and Recall and Recognition investigators. Matt sought and appraised current theoretical positions regarding his topic, and then worked to research their plausibility through his own research. Matt continued his investigation, making use of the reaction and response to his work by the online community to deepen his understanding of his topic, and also, most the worth of the environment for addressing the GENESIS Question: *How and why do we think? How come we're not born with the knowledge* we *know now?*

7.1 What questions did Matt generate and select for investigation?

In early May 2003, the Year Seven classes from West Grammar School gathered in their school library to unpack The GENESIS Question, *How and why do* we *think? How come we're not born with the knowledge* we *know now?* to identify questions and ideas that might further their attempts to answer these questions.

Matt was part of a group of four boys who were interested in dreams. He was wondering *What actually is a dream? 'Cause it seems like a picture in your head.* A supervising teacher called on each group to report to the whole grade the ideas they were thinking about. Matt got up and shared some of the thoughts from his group.

> *Some people don't remember that they dream and think that they don't. Is dreaming thinking while you're asleep? Dreams sometimes clash with reality, for example dreaming of falling and then to realise you have fallen off your bed. Strange things happen in your mind when you're dreaming. And that's it.*

As group time resumed, Matt commented that *If you find out what a dream actually is, it will allow us to know what happens when we dream.* Already, he appeared to want a satisfying explanatory mechanism for dreaming and he saw the task of understanding dreams themselves, by way of people's actual and diverse experiences of them, as a way towards understanding the dreaming process.

The boys' discussion continued as they shared ideas about hallucinations, deja vu and daydreams. When the time came, Matt again represented his group in sharing their thoughts with the grade. (See Figure 7.1) The boys had identified features of dreams based on their experiences: Dreams can repeat, they can imitate reality, there can be emotions in our dreams, some people do not remember them and dreams can become nightmares. The groups' 'What I want to know' questions make clear their need to understand the dreaming process:

> *Do dreams mean something? Can dreams tell us what will happen in the future? Does what we do during the day affect our dreams?*

Figure 7.1 Matt reports his group's thoughts and questions about dreams.

As the session drew to a close, each group brought forward questions they had identified as 'light bulb' questions, a term used by our project (as already noted) to indicate a

question identified by the students as worth pursuing. Matt took two questions forward from his group.

> *We had 'Does what we do during the day affect our dreams?' And 'What actually* is *a dream?'*

7.2 What approaches did Matt choose and develop for his investigation?

Matt's first venture was to locate ideas and knowledge about dreams other researchers had discovered. He sought answers in his school library, but did not highly value the information he found there, *J can't exactly find anything, well, books... they have some information but they don't have enough detail.* Matt was *trying to get the facts,* but he was encountering theories that *tell you what they [dreams} mean, not what they really are.*

Using both this library and the Internet, Matt had ascertained that Sigmund Freud considered dreams to have hidden meanings too psychologically harmful for conscious thought and that Carl *lung* held that dreams relate to the past and future, have no set meaning but can be informative if studied over a period of time. Matt considered these theories *not very satisfying.* To him, *they didn't seem to make a whole lot of sense.* Pondering Freud's views, Matt came to question them. How exactly could dreaming about *pink bunny rabbits* be *very harmful for the conscious mind?*

For Matt, the work of Crick and Mitchison which he located at http://www.columbia.edu/cu/21 stC!issue-3 Albreecher.html after searching Google for websites about dream theories was of a different nature. (See Figure 7.2) In Matt's words, their theory posits that dreaming *gets rid of unwanted or useless information the cortex can't store.* Matt quickly appreciated the fit -- or relation, in his terms - between the fact that dolphins have *an abnormally large cortex... and the fact that they don't dream.* He seemed to be weighing each part of the description of the theory in his own particular value balance; and, while Freud's theory had failed the bunny rabbit test, there was for him a particular appeal in the consistency between these facts about dolphins and Crick and Mitchison's theory - certainly not enough, though, to clinch the case.

Figure 7.2 Matt researches Crick and Mitchison's theory online

Matt acknowledged that so *far* he was *going for* Crick and Mitchison's theory, but, as his next initiative shows, he was delaying his final judgement and keeping his mind open to accumulate and consider new and, for his purposes, useful information.

Matt's next endeavour was to design and implement a survey to find *out, for the majority of people, what happens when they dream.* For his pursuit to continue to be profitable, Matt believed he needed the experiences of other people as well as his own to put alongside the theories he had located: *One person ... they could just be unique. If you ask a lot of people, you can get more of a generalisation.* It was Matt's plan to be able to say, *the survey proves this, this and this about the theory, but it disproves that and that and that about the theory.* His survey would provide him with data about what happens for the majority of people when they dream, which he could compare to dream theories. He hoped he would gain greater insight into the plausibility of these various theories by determining how closely the data and theories aligned. As a result, Matt anticipated he would be able to *look into research and say ... why does this [people's experience} happen?*

Matt's survey asked the following five questions:

I) Can you remember your dreams?
2) Do you ever have a repetitive/recurring dream?
3) Do you ever sleep walk? Sleep talk? Do other things?
4) Do you ever lucidly dream? (Know that you are dreaming)
5) Do you ever dream about things that have happened/are happening/are going to happen?

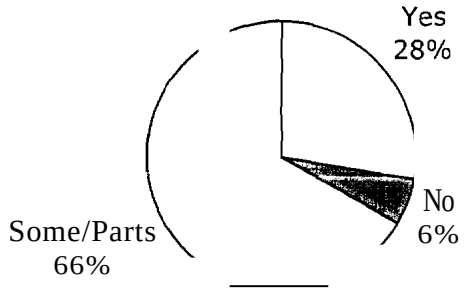
Fifty surveys were returned from students and teachers at his school.

7.3 What methods **did** Matt employ to make sense of information and findings?

Matt's first step in making sense of his survey's findings was to go about *bundling it all up.* He organised the responses to each of the five questions into pie graphs and then went about developing a *'for and against'* for each theory. His plan was to *match [the findings] up [to a theory] and say, well, this part of the theory sounds great and this part of the theory sounds right but this bit doesn't match up.*

His analysis of the responses to his first question (Can you remember your dreams?), taken from the report he wrote and from a conversation with I had with him about this work, is a case in point (see Figure 7.3).

1. Can you remember your dreams?



You can see that most people can only remember parts of their dreams or some of their dreams. would probably have something to do with the fact that we're not conscious. (You can never remember the exact time you fell asleep but you can roughly guess.) This could support Crick and Mitchison's theory because they say we are getting rid of unwanted or useless information by dreaming. Maybe the parts of the dream that we do remember are the bits that show slight Significance. It could also indicate that Freud's theory is correct - maybe we remember the bits that are extremely harmful or not harmful at all. However, J think this poses a problem for Jung's theory because if you can't remember dreams, how are you going to study them?

Figure 7.3 An example of Matt's findings

The language used by Matt to measure what he perceived as matches and mismatches between his data and the theories demonstrates a cautious, contemplative analysis: for

Freud, *it could indicate*... for Crick and Mitchison, *this could support*... in Jung's case, *it poses a problem.*

Matt had developed and implemented a thorough and systematic method for making sense of his findings. It did not, however, satisfy his curiosity or exhaust his zeal. The following dialogue presents a snapshot that is characteristic of Matt's diverse and sophisticated ways of interrogating what he found.

Matt began by reporting his findings to his third survey question: Do you ever sleep talk, sleep walk or other?

> *Most of the people said that they didn't do. A little more than a quarter said that they slept talked, but only one person said they did both, sleep walk and sleep talk.*

Matt then considered the relevance of this finding to his research.

> *I don't think this has much to do with the actual dream theories because it relates more to the physical state rather than the psychological, when you're asleep.*

From this point, Matt identified what would be valuable to know and understand, pinpointing significant additional information.

> *I think it would be interesting to see if they were dreaming when they were sleep talking or sleep walking because that might prove there's a certain thing in the dream that ['s] causing them to want to sleep talk or sleep walk.*

Matt then connected his thinking with his earlier research, searching for an explanatory coherence between sleep behaviours and the nature and content of dreams.

> *Also, it could be, I've read a little about this and they think it could be sort of like the nervous system sort of having repercussions, like if you were a radio station talkback person you're talking all day* so *maybe it's a sort of like [the] nervous system carrying on in that way while you're asleep. Or say you're a cross-country runner and you do four hours of running evelyday and then walk to work or whatever, maybe you're more inclined to sleep walk.*

These comments display the sophistication and depth of Matt's knowledge. His remarks show that he has an understanding of behaviour in terms of nervous system traffic.

However, his speculation does not rest here. Again, fluidly and almost immediately, he moves his thinking on, generating a converse theory that might also be able to account for such sleeping events.

> *Or could be the opposite, maybe it's, like, the body fulfilling those sort of things that you haven't done during the day.*

7.4 What decisions did Matt make concerning how to represent his ideas and inform others? How does he anticipate the response and reaction of the wider community?

Matt was attentive throughout his investigation to the fact that his work was destined for an e-Ieaming environment. The following examples show how this influenced

1) The way he went about his enquiry,
2) How he organised and presented his work, and
3) How he anticipated an e-Ieaming community might respond to his findings.

First, Matt decided to conduct a survey partly because this would result in a form of information that could be effectively presented within an online environment. *People don't want to look at page after page of information, [they} might not be interested [in} so [you could do} just a pie graph or something.* Matt thought *by doing it this way it'd probably be better for the e-learning environment.*

Secondly, Matt thought in detail about how he would prefer to see information and ideas presented inside the environment. He wanted people to have a choice of buttons, one for *Jung, Freud and Crick and Mitchison, and maybe they could [click to} go into sort of like a description of what their theory means.* (See Figure 7.4) Matt wondered whether, as well as describing each theory, there could be an image or picture that represented the meaning, *to show how he [the theorist} perceives dreams.* Matt also saw a need for there to be a place for people to respond and contribute to questions such as, *"What do you think dreams are?" "Do you agree with Crick and Mitchison [or} Freud?"*

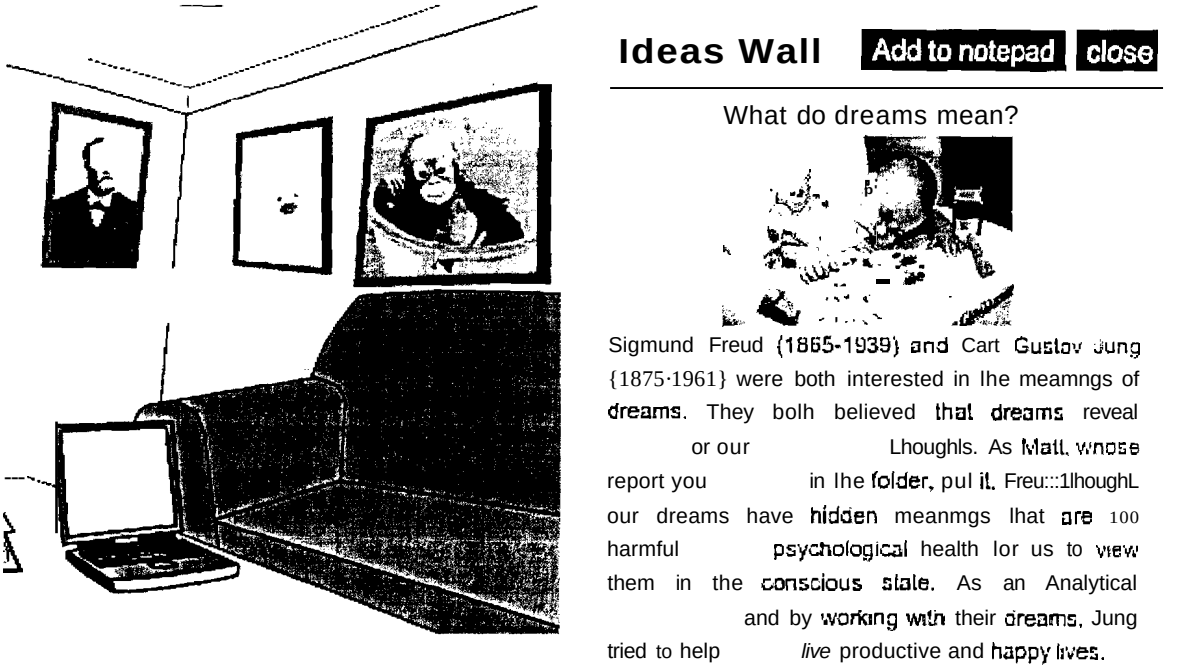


Figure 7.4 Inside Matt's Dream House, showing the theories on the wall and Freud and Jung's theories explained

Thirdly, Matt was ready for travellers to respond. Matt saw ways in which the reaction and interaction of the community could be of benefit to him and his research. *What I was thinking with them is that I'll put my original survey on the web site and I think I could, like, get the people who are using the e-learning environment pursuing the survey too, and that way I could have like a continuous one and see if the 50 people or whatever, they may have been different and - so a continuous survey.* Matt appreciated the worth of having a large sample of respondents, and so lessening the risk that the original 50 respondents had been unrepresentative. As well, he wanted the environment to provide an opportunity for him and fellow students to keep challenging and considering the theories he had uncovered, his opinions and his findings through sharing experiences and opinions on the discussion boards and expanding and analysing his survey.

Matt's house was built closely to his description but necessarily shaped by the environment's overall design, budget and technical restrictions. It contained many items for travellers to engage with. On the desk lay a folder containing excerpts of Matt's report and a link to download all his findings. As Figure 7.4 shows, on the desk sat a computer with links to websites associated with dreaming and the theorists that Matt had researched. The television on the wall held three videos of Matt talking about his work and his ideas. On the wall were three pictures. While these linked to a description of each of the theorists' ideas as Matt wished, the images were, unfortunately, generic rather than

representative of how each theorist perceived dreams. A link on the wall launched a notice board where travellers could discuss and debate Matt's questions and their own questions about dreams.

Matt's Dream House was a popular place for travellers to visit. While the environment did not keep track of the number of visits, indications of its popularity and the sustained, frequent visits by many children can be found on the Dream House notice boards. This house had the most discussions, the most posts, the longest duration and a wide variety of visitors. Over 160 posts were spread across 26 discussions. These started on 4 May 2004 and continued on until 24 September, with a visit from a student in February 2005 to see if there was any continuing discussion.

Within the 26 conversations discussion topics were raised, questions asked, theories presented and challenged. Several popular and reoccurring conversation topics could be considered 'light bulb' questions or topics, in the same way that this term had been used in earlier times in the project to identify questions or topics frequently present in children's conversations and suggestions. These light bulb topics were:

- Remembering and forgetting of dreams;
- Reasons for nightmares;
- Blind people seeing in their dreams; and
- What we need to find out about dreams [What are dreams? What causes them?]

The following excerpts are from 'light bulb' conversations that took place online during 2004. Each demonstrates ways that ideas were presented and negotiated within the community.

7.4.1 Excerpt 1: *Is that right? I'm not sure: It depends*

On 1st June, Stephanie presented a theory and asked for community response. *We [forget} most of our dreams because our brain is working so fast that when we wake up suddenly our brain wakes up. Is that right?*[75] That same day, Elisa responded, *I'm not sure.*[76] Ciao stepped in with her view on 8th June. *I think it depends on what the dream was about!!!! !f it was [exciting] and u [really} liked it then I think u may [remember} it!!!!! But if it*

[75] Dreams Two, 1st June 2004, 11.36am
[76] Dreams Two, 1'1 June 2004, 12.02pm

was boring and very dull then I think u will rather forget it quickerl1/I1[77] In response to this entry, Stephanie, the initiator of this discussion thread, adapted her ideas that day. *I now agree with Ciao. I think she is right.*[78]

7.4.2 Excerpt 2: *I agree but I disagree: Debating, developing and disputing beliefs*

There were many discussions about nightmares on the notice boards. Opinions and theories that students presented were challenged by the experiences and beliefs of others. There was to be no quick consensus.

Justin initiated a conversation on May 26, *I hate dreaming. Do you?* One minute later he posted his reasons, *I hate nightmares and I hate being woken up.*[79] Stephanie agreed with Justin when she responded on June 1, *I hate dreaming too because you never know if it is going to be good or bad. Why?*[80] she asked. Half an hour later, Elisa offered her ideas to the discussion. *I think that u sometimes can work out wether u are going* 2 *get a bad or a good dream that night. For instance if before u went to bed u watched a scary movie u are most likely* 2 *get a bad dream, or say u watched a movie for little kids because your [little] sis wants to watch it with u you will probably get a good dream. What does everyone else think?*[81] A week later, Jialin had a response, *Well I think and agree with you Elisa but you would eventually get over it and plus sometimes you don't even have dreams when you [sleep}.*[82]

Having shared her experience that *sometimes you don't even have dreams* in the above conversation, Jialin commenced a new conversation the following week to pursue this idea. On June 15 she asked, *Do you know why we have the ability to dream and why we dream? Anyone?*[83] She needed wait only fifteen minutes for a response. Winnie posted her thoughts, *I think we dream cause we have experienced things and we just think about it and we just see our dream.*[84] Two minutes later Elisa was giving her support, but with a further idea for discussion. *I think Winnie* is *probably right. Just* 2 *add though I think that*

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77 Dreams Two, 8th June 2004, 11.27am
78 Dreams Two, 8th June 2004, 11.39am
79 Dreams One, 26th May 2004, 11.47am
80 Dreams One, 1st June 2004, 11.34am
81 Dreams One, 1SI June 2004, 11.53am
82 Dreams One, 8th Juen 2004, 11.33am
83 Dreams One, 15th June 2004, 11.17am
84 Dreams One, 15th June 2004, 11.32am

we might dream for pleasure.[85] A little while later that same day, Jialin returned to the conversation. *J agree but J disagree also because if you really do dream for pleasure why do we have nightmares?*[86] Elisa responded to this challenge. *Yes, but [that's] not important. U are right J guess but still [that's] only when u have nightmares and sometimes [that's] your own fault cause u might have watched a scary movie so you are probably going 2 get a nightmare.*[87] Jialin's experiences caused her to question this view. She shared that she had *never watched a scary movie, ever since 1 was* [7,88] but did have nightmares. Her experiences did not correspond with Elisa's theory.

The following week, conversations turned to what nightmares actually are, and what they might mean. The following comments were posted over the course of a month. Katarina believed that *nightmares are not scary if you don't tell yourself that it is and each dream has a meaning, like, if you had a dream of your little brother [dying] the dream would mean new life, so that dream might mean that you will get another sister or brother or it might mean that you will [really] ill and almost die but you don't die, it would be like you had an extra life.*[89] Hilaire questioned this belief and put forward her own. *It doesn't happen all the time. Once I had a nightmare and it didn't take away my fear in my mind. You still remember your nightmares most of the time. I think that the only way you can make your nightmares go away is by not do anything wrong. Cause I [reckon] that you get your nightmares by doing something that is not right.*[90] Hailey disagreed. *I think that nightmares are just [stories.]*[91] Katarina returned to the conversation to restate her belief, *They are images of the future.*[92]

7.4.3 Excerpt 3: *Is that true? It can be true: Identifying a need for new knowledge*

As the following conversations about blind people dreaming show, many children were very curious about this topic and were able to generate many ideas. However, as it was an event they were unfamiliar with, they could not use their own experiences to work towards an answer. These children seemed to appreciate that learning involved testing

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[85] Dreams One, 15th June 2004, 11.34am
[86] Dreams One, 15th June 2004, 11.40am
[87] Dreams One, 15th June 2004, 11.45am
[88] Dreams One, 15th June 2004, 11.47am
[89] Dreams One, 23rd June 2004, 12.11pm
[90] Dreams One, 23rd june 2004, l2.14pm
[91] Dreams One, 22nd July 2004, lO.l5am
[92] Dreams One, 29th July 2004, 10.42

and challenging their ideas as a learning community. However, in this situation, until someone with relevant experience could be found, the conversation could not resolve.

On 25 May, Katrina asked, *Does anyone [know] if blind people see [their] dreams or they [don't?]*[93] Checking responses to her question one week later, she found a reply from Daniel, but no definitive answer to her question, *I also wonder if blind people can 'see' dreams??*[94]

Katrina posted her question again, and then minutes later added a tentative possibility. *[Maybe] blind people [don't] see [their] [dreams] because they [haven't] seen [objects] or colours but [they] have [probably] felt some objects.*[95] Almost at once Stephanie put forward her thoughts for consideration. *I think that they don't know what [a] dream is because since they were born they have never been able to see. Is that true?*[96] Katrina wasn't sure. *I [don't] no if [it's] true but it can be [true.]*[97] She went on to clarify her thinking: *when blind people feel [objects], say like a cube they [know] what it looks like* so *they can [maybe] dream about a cube.*[98] A week later, 8 June, there were no further replies forthcoming. Katrina persisted, posting her question again. *Do blind people see [their] dreams and if they do what do they see?*[99]

Noticing Katrina's perseverance, Elisa had had started a whole new conversation thread with the question, 'Do blind people have dreams?' *I've posted this question cause a girl in my class really wants* 2 *know the answer* so *does anyone know? I think it's a really good question. /*[100] Over the next two weeks, Elisa and four other students considered the possibility that blind people have dreams in different ways, perhaps dreaming story lines or 'seeing' pictures that have slowly built up in their mind. Is eyesight needed for dreams, *coz dreams r just a pic in ur... u [don't] open ur eyes to* c *dreams do u?/o/*

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93 Dreams One, 25th May 2004, 11.01am
94 Dreams One, 1st June 2004, 9.30am
95 Dreams One, 1st June 2004, 11.22am
96 Dreams One, 1st June 2004, 11.29am
97 Dreams One, Ist June 2004, 11.31 am
98 Dreams One, 1st June 2004, 11.37am
99 Dreams One, 8th June 2004, 11.26am
100 Dreams One, Isl June 2004, 11.56am
101 Dreams One, 8th June 2004, 11.35am

Meanwhile, in the original conversation, Keewa had exciting news for Katrina: *My aunty is blind J will ask her if she can see in her dreams.*[101] One week later on June 15, Katrina received an answer, and also some advice on how to imagine the experience. *Katrina, blind people for [example] my aunty they do see in their dreams [it's] just they may not see what we see because we know what things really look like but for blind people its different because they have to get an object or a picture in their mind. Like if J said to my aunty do you like the [colour] red she would not know. Just imagine that you [cannot] see and you will see what it feels like just say you did not know what a tree looked like and try to imagine and see if it is easy.*[103] Having found an eligible informant, the children's curiosity and speculation could be satisfied.

7.4.4 Excerpt 4: *This is the REAL question: Holding on to core beliefs*

As the designers had before them, the visitors to this house identified and worked on questions they saw as central. As Angela said on June 15, *This is the REAL~ question.... Why DO we dream, and how do we dream ...*[104] Alice had her theory ready to share, *J think when you dream your mind is sorting out what you have done and thought during the day.*[105] Autumn's thinking was similar; *J think we dream at night [because] we are reflecting on our day.*[106] She also thought when we're dreaming *we are imaginating [sic] things so we do them.*[107] Justin's view was that *you dream when your sleeping because your brain* is *still thinking when your asleep.*[108] Elisa connected with his thinking, *Really?! I never thought of that but it is true now I think of it cause your brain has* 2 *tell u 2 keep breathing.*[109]

Rebecca also had a theory about what dreams are. *J think dreams are made up entirely of small things in the of our minds, all mixed up to make a group of images rather like a movie that we can't make much sense of*[110] Katrina saw things quite differently, *J think that a dream tells you what your future is or a dream reminds you of the past, for instance, my [mum's] friend had a dream that all her teeth [fell] out and when she looked*

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[102] Dreams One, 8'h June 2004, 11.44am
[103] Dreams One, 15'h June 2004, 11.06am
[104] Dreams Two, 15'h June 2004, 11.13am
[105] Dreams One, 15th June 2004, 11.26am
[106] Dreams One, 15th June 2004, 11.50am
[107] Dreams One, 15th June 2004, 11.49am
[108] Dreams Two, 26th may 2004, 12.17pm
[109] Dreams Two, 1st June 2004, 12.01pm
[110] Dreams One, 17th June 2004, 12.24pm

it up in a dreams book it said that soon people will die or a Jew people have already died. It was true because in that week 3 *members oJher Jamily died.* ,,, David also believed that *[your} dreams convey a message oj some sort... For example iJyou are Jalling offa cliff in your dream you may be soon Jaced with a negative event in your life or something like that.* ,,,

7.4.5 An attentive designer: Matt's reaction

While Matt had not participated in any conversations online, he was well aware of the nature and enthusiasm of the discussions.[113] He noted that the children had *honed in* on the topic of what blind people see when they dream, and that he had been discussing this at home with his family. Matt showed his familiarity with the notice board conversations when I informed him of the theories that have been developed over the months. Right away he noted one I had failed to mention, that dreams might be clearing your mind of thoughts - an echo of the Crick and Mitchison theory he had found so compelling at the beginning of his dream journey.

Matt was surprised by the popularity of his house, but believed that it was because *dreams are interesting* and that dreams are *something that most people had a lot of experience with.* Referring back to his data, he noted that very few people said *they hadn't had a dream before and most people had at least had a dream before so they knew what it was about.* Matt considered that the fascination travellers had with dreams could be because *they're 'out there' and a bit individual.* Thinking further about why the individual nature of dreams might have spurred on conversations, Matt noted,

> *Very rarely will you hear of two people having exactly the same dream and 1 think draws people in and kind of makes them want to contribute more because they can add their own individual unique thing.*

He recognised that there is a place for people's opinions when discussing dreams, as they are *open to perception* and what may be *exciting* for one, *another person might see... as being terrifying.*

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111 Dreams One, 31·1 July 2004, 7.18am

112 Dreams One, 23'd July 2004, 11,48am

113 Unfortunately, as noted previously, Matt's school had experienced networking and download difficulty that made it challenging for him to remain closely in touch with these discussions as they took place live.

7.4.6 *Drawing conclusions and making comparisons*

From his own research, and the diverse discussions of theories on the noticeboards, Matt concluded that this was *a hard topic to make any clear-cut decisions [about] or [find] answers.* He compared his house to another that investigated choices children made about toys. That research had involved a choice between five options. Matt saw thinking and making choices about the nature of dreams as offering an infinite number of options, *there's ending to the amount of stuff [to consider).* The children visiting his house, by their rigorous and persistent questioning, had proved ready for the challenge. Matt claimed it was *good to see how they're thinking and they're really putting a lot of thought into their answers.* He recognised a quality and authenticity in their posts.

> *It seems like they are not having a stab in the dark. It seems like they've really got something worked out like they know what they're talking about and they're not just making something up just for the sake of making something up.*

Matt wondered at the connection between theories developed by children as young as eight or nine and those belonging to *professors that are forty or fifty years old with PhDs. I still can't get over it,* he exclaimed when returning to this thinking towards the end of our interview, *they're [the children] making these theories up and they're the same theories as people have who are like doctors and psychologists and stuff and they're like almost exactly the same.* Matt discovered significant value in pursuit and consideration of children's ideas and theories.

7.5 Summary of Chapter Seven

Matt acknowledged that it was challenging to come to clear cut decisions about dreams. He recognised there was a great deal to consider when attempting to find answers. He is not alone in his assessment. For questions such as Jialin's *[why do we have the ability to dream and why do we dream?]* questions that consider the nature and function of dreams, *there is little scientific consensus about the answers.* (LaBerge, 2003, p.61)

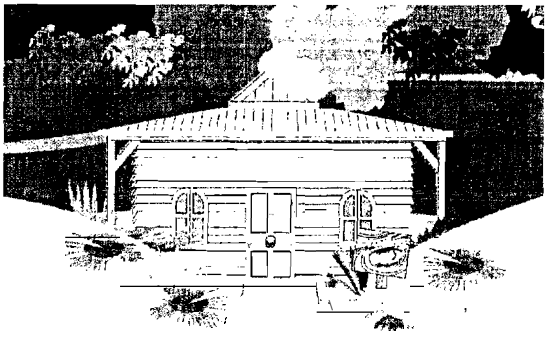
Alice and Autumn theorised that dreaming was to do with reflecting on our day, sorting out in our minds all the different things we have done. Their ideas are close to those of scientists whose research is indicating that dreaming is to do with memory consolidation. Such scholars believe that *dreams reflect a biological process of long-term memOlY consolidation, serving to strengthen the neural traces of recent events, to integrate these*

new traces with older memories and previously stored knowledge, and to maintain the stability of existing memory representations in the face of subsequent experience. (Payne and Nadel, 2004, p.671) While considering connections between sleeping, dreaming and memory storage has previously been *rarely acknowledged in the neuroscience community,* the *hypothesis* is *gaining empirical support.* (Paller and Voss, 2004, p.664) Alice and Autumn might soon have their answers, or perhaps they might contribute some in their turn.

Although Elisa was challenged to explain why nightmares occur, she maintained that we dream for pleasure. Indeed, some researchers of dreaming are highly interested in the pleasure of dreams, particularly the possibilities of lucid dreaming, and are developing techniques and technology to develop *effective lucidity induction devices [that are] bringing closer the dream of world simulation for evelyone.* (LaBerge, 2003, p.66)

In both Matt's learning journey and the online conversations of travellers to his Dream House children are shown to be perceptive and persistent learners. The children are keenly aware of what it is they wish to know and understand. Matt wanted to *get to the facts* about what dreams actually are, not simply discuss *theories about what they mean.* The children online wanted to know, *Why do we have the ability to dream? Can blind people 'see' dreams?* Like Matt, the visiting children were curious, persistent and took initiative. They continually questioned each other about their dream experiences online, returning week after week to a discussion board to monitor updated conversations, challenging their peers to return to the *real question -- why do we dream and how do we dream?* They took initiative, contacting people outside their immediate school community to pursue questions or, as Elisa did, starting up a new discussion thread for a highly valued question. Her view that people dream for pleasure was promptly challenged by Jialin's question, *Why [then] do we have nightmares?* Such an exchange indicates the manner in which they sought and debated the knowledge, experiences and theories of others in the community, while offering their own thoughts for scrutiny. Indeed, as his final comments recorded in Section 7.4.6 indicate, Matt was happy to consider the worth of these discussions as highly as he would those of professionals.

Chapter Eight
The Nature of Uniqueness: The story of The Drawing Test House



8.0 The story so far

This chapter is the final account that looks in detail at the activity of different children as they investigate questions that would build both the form and the substance of The GENESIS Journey e-learning environment. The first of these, Chapter Five, examined the work of a group of boys from West Grammar School, whose common desire to *do an event* brought them together. Widely differing in ages, they co-operated strongly to complete two investigations concerning gender differences, their work provoking much heated debate on discussion boards. Chapter Six presented an account of five classmates' experiments to examine the nature of memory and learning. These girls from Girls' College designed, tested and redesigned experiments for comparing memory recall and recognition, and to uncover ways people like to learn, and ways they learn best. Chapter Seven expounded Matt's investigation of dreams, his individual pursuit of *the facts* of what dreams actually are. This chapter reports the work of two Year 6 girls from North Primary School as they pursued the nature of uniqueness.

8.1 What questions did Kirsten and Ashleigh generate and select for investigation?

The idea for a drawing test had occurred to Kirsten and her then partner Natasha early in April 2003. At the time, their class was working in the school library on their GENESIS class question, *How do our senses affect our thinking?* Some students were working online, researching people's sensory responses when asleep. Others were having phone conferences, one with a doctor discussing how our senses stop when we die, another with a blind lady to find out how she made use of her other senses for assistance. Students started work developing surveys and interviews that would provide them with useful

information and uncover people's knowledge and opinions about their topic. In an interview in September 2003 Kirsten recalled how at this time of early investigation she and Natasha had generated an idea for a different research approach.

> *I think we were just sitting down and we were, everyone else was doing tests and we thought, 'Well, we want to do a test but we want to do it differently to everyone else.' And so, we thought about the sense, someone was doing a taste test, which is what we could have done, someone was doing an interview, which is talking, and* so *we thought we'll do something that people can listen to. And* so *we thought, what can we do? We could do a video with them talking to us about what they saw, and then it came to us about drawing. And we said, 'Oh you know they can listen to us actually saying the thing and we can see how much they take in.*

In this initial decision, Kirsten demonstrated her appreciation that people go about things differently.

The two girls conducted a small experiment to see how people responded to a set of instructions. Participants needed to *draw how they thought of something - say, something shiny.* Natasha and Kirsten compared the drawings. Some were of planes, one was of a bee, and one they found particularly interesting was that of a boy who *actually drew a flying turtle.* Kirsten suggested that this might be *because that's what he imagined -- something that he thought would be interesting.*

Earlier on during The GENESIS Project, Ashleigh had been working with Harriet, investigating how the media influences our thinking, through what we see and hear. During Phase Three, Ashleigh continued to work with Harriet, carrying out an experiment to see to what extent their opinions could influence others, but she also started to work with Kirsten, who, spurred on by her early findings, was wanting to develop and carry out a more careful investigation.

8.2 What approaches did Kirsten and Ashleigh choose and develop for their investigation?

The girls chose to build on the earlier drawing test that Kirsten and Natasha had carried out. When comparing the earlier pictures, Kirsten had been struck by the originality each artist showed. Kirsten pursued a new initiative. She wanted to use the drawing test as a

tool to *see how everyone's minds are unique and different.* Together with Ashleigh, she wanted to compare participants' drawings to show, *how they're different and how people's minds work differently.* In this way, the test that they designed had two jobs to fulfil. One was to show how people's minds are different by collecting data that demonstrated contrasting responses to an identical prompt. The second job, a subtler task, was for the drawing test to act as a tool to reveal to the girls how minds might work to generate such unique responses. It is significant that the girls' test was to show how, not if, people's minds are different. They were not interested in locating commonality, like those who determine educational levels or benchmarks might be. The girls' test demonstrated their conviction that each mind is unique and showed their desire to uncover how and why this is so.

The girls decided to invite a selection of students, boys and girls, from Kindergarten, Year 2, Year 4 and Year 6 to participate. The children were given paper and pencils. While Ashleigh supervised and sometimes filmed, Kirsten read a short passage describing a scene that the girls had written especially for the experiment.

> *Once there was a small house. Beside the house was a tall tree. Under the tree was a rock and on top of the rock was a small child. There was another child picking flowers from the lovely garden placed beautifully around the house. On top of the house was a chimney and through one of the windows you could see Mum sitting in front of the fire. On top of the house was something that couldfly.*

This passage was carefully and purposefully composed. Kirsten and Ashleigh explained that we *hoped in saying that Mum was sitting in front of the fire that the children would realise that smoke should be coming out of the chimney.* To be able to make comparisons, the girls knew they needed to read *the same passage to every person ... so we could see how different [the older children} were to the Kindergartens - to see how they all drew different things.* They had taken care not to muddle their research by using a complicated description, noting that *the passage was really quite basic - it's just a little theme.* The girls did not want their instructions to be so complex as to cause confusion, particularly for the younger children. At the end of their research, the girls had dozens of drawings to make sense of.

8.3 What methods did Kirsten and Ashleigh employ to make sense of information and findings?

When all of the participants had finished drawing, Ashleigh and Kirsten sorted the pictures into year groups. One group at a time, the pictures were laid out on desks in the girls' classroom. Ashleigh filmed the pictures and Kirsten provided a commentary, sharing her appreciation of what the pictures showed about everyone's mind being unique and different. Here are two of her observations for the drawings done by Year 2 students:

> In response to Hayden's drawing: *He drew a flying turtle and he drew a castle when we were talking about a house 'cause there's no right or wrong answer so it was velY, very smart, I think it's just really interesting all these things, how they're really unique 'cause they're all different. They all use their own ideas and imagination to come up with these things.*
>
> In response to Gina's drawing: *She did a fantastic drawing of a computer. And actually, we were in the librmy at the time and we read out, 'Draw something that could fly' and she was thinking, 'Oh, what can I draw that could fly?' She was looking around the library and she spotted the computers, and we could tell she'd spotted computers because her eyes just lit up. And* so *she [drew] a flying computer. As you can see the mouse, and the computer screen and the [keyboard] and everything.*

In these comments, Kirsten appears to be recognising and valuing the delight she believes these two children had while drawing, that they could *use their own ideas and imagination.*

Kirsten and Ashleigh had expected the children to approach the task differently. But the uniqueness of these children's responses intrigued them: no two drawings were the same. From Gina's and other students' work, they were beginning to recognise that the children were drawing on aspects of their situations, such as their environment or current interests, as they took the drawing test. Kirsten wondered if age and imagination might also influence participants' thoughts.

> *This one kid used his imagination and drew a flying turtle, something that he probably likes. You know, those sorts of things like straw monsters and things, he's at that age, and yeah, he drew a flying turtle.*

Did these two factors alone explain the differences? Where else might such differences come from? Why might participants choose to draw *particular* objects? The girls decided to prepare a report and some video examples of their research to show what they had done and to address such questions. In their report they wrote,

> *In this test we have discovered that children express things that they have seen before and the things they are interested in, throughout their drawings... We liked how all the children thought differently when we told them to draw something that could fly.*

The girls were captivated by what they had discovered. Kirsten was startled by how diverse the drawings were:

> *I thought some of them would be similar, like just drawing a roof and a thing, but the features that they actually put into the house was like, wow, they're all different.*

During another interview, Kirsten declared, *We found [people} have different thoughts about everything!* Ashleigh agreed, *Everyone thinks differently... and the test sort of proves it in a way, because no two pictures are even almost the same.* Ashleigh had been amazed to see that when an identical passage was read *their [the participants'] brains are influenced in different ways... they all draw it* so *differently.* Kirsten was interested to see which children had realised that with Mum in front of the fire, it would be appropriate to have smoke coming from the chimney. *Some of them didn't quite get that but a lot of them did.* Kirsten thought Rebecca's drawing was *pretty cool* because she had drawn a dragon as her 'something that could fly' and not only had Rebecca realised smoke needed to be billowing from the chimney, she had drawn her dragon breathing fire alongside the smoky stack.

Kirsten and Ashleigh were very satisfied with their test. It had achieved both its tasks. The drawings they collected affirmed their hunch that people are unique. Their observation of the children while drawing and close analysis of the drawings themselves had also begun to uncover some ways that people's minds respond differently - by way of people's circumstances and the specific implications people had begun to make from the words of the drawing test. The girls appeared to be developing a picture of how people think as complex, dynamic and opportunistic - one in which thinking is not a clockwork function, determined by a single factor, say, one's sex alone, but rather is influenced by

environment, life experiences and imagination. They also indicated time and time again a deep appreciation for and delight in the imaginative ideas of each individual child.

8.4 What decisions did Kirsten and Ashleigh make concerning how to represent their ideas and inform others? How did they anticipate the response and reaction of the wider community?

While Ashleigh had been a member of the Implementation Team, Kirsten was chosen to represent her class by becoming a member of the Design Team. In this role, Kirsten participated directly in bringing her own ideas and the ideas of her school to the design of The GENESIS Journey and in developing the features that would be available to travellers spending time within it. She was aware that the design community valued access to reports and findings, the ability to see 'behind the scenes' and watch actual experiments taking place and the opportunity to discuss ideas and questions with other people in the online community.

Kirsten and Ashleigh wrote a report about the Drawing Test for people to read and consider. It was important to them that they share this work, and to encourage others to appreciate what they had come to see. Ashleigh spent many hours editing video to enable visitors to see the Drawing Test in action, and see for themselves the pictures the students had drawn, possibly remembering from her earlier work with Harriet the powerful influence media can have on people's thinking. She also made videos of Kirsten's reporting for visitors to watch (See Figure 8.1). In the end there was over ten minutes of film to watch, which meant, due to download restrictions in the environment, some of the girls' work overflowed into the Movie Theatre. Visitors to the girls' Drawing Test House could also visit websites and read about how some scientists and psychologists think about individuality. Kirsten had been adamant that the environment should *have a place where you can post a question* and let *other people give feedback.* Visitors could do this on the Drawing Test discussion boards. The following conversations took place online during 2004.

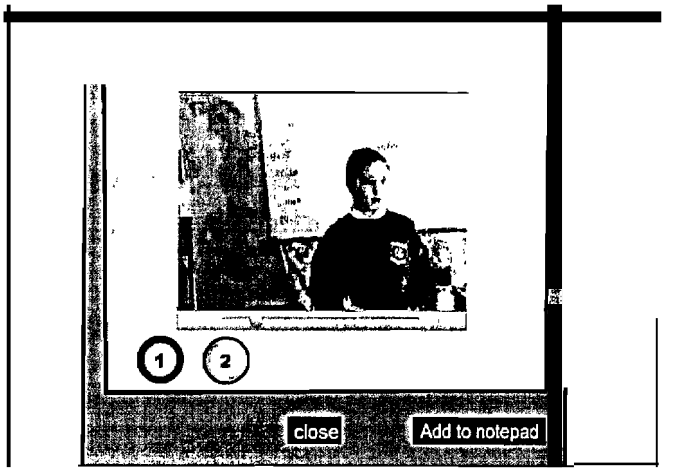


Figure 8.1 The video of Kirsten conducting The Drawing Test for travellers to watch

8.4.1 Depending on life experiences

As reported earlier, Kirsten had noted when discussing Hayden's drawing, that in the Drawing Test there was *no right or wrong answer.* One prompting question on the discussion boards asked if any travellers had experiences or opinions about when different people respond to the same thing in different ways. Ruth was first to respond on August 13, keen to share her own experience of interpreting information in ways quite different to what others expected. *Yes, I think different responses can be right. It depends on the listener's experiences, understandings and beliefs. I remember being asked at school to draw a Martian - but I'd really been asked to draw a margin! Problem was, I didn't know what a margin was!*[114]

Almost exactly one month later Natalie Y responded, writing, *I totally agree with Ruth and I think that it would especially depend on the listener's life experiences.*[115] The very next day Kirsten picked up on Natalie's idea about the significance of people's life experiences. *I think that because Ruth had never heard the word margin before her brain went to what the closest word which she knew [was], which was of course a martian.*[116] It appeared as if the free-flowing conversation with others about complex ideas was sharpening Kirsten's own thinking about how the human brain might work.

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114 Drawing Test Two, 13th August 2004, 1.13pm

115 Drawing Test Two, 14th September 2004, 5.46pm

116 Drawing Test Two, 15th September 2004, 12.41pm

8.4.2 *Unique in different ways*

Other students, too, were fascinated by the nature of uniqueness. Many students responded to Elizabeth and Fiona's questions on the Discussion Board, *What* is *it about you that makes you unique? Is it to do with who you are, what you do or how you look - or something else altogether?ll7* The following comments consider these ideas, and also discuss whether or not people have any influence over how it is they are unique. Mark thought, *It's a combination of all those things ... nothing we do on purpose, just the way things are.*[118] Nicola disagreed. She did not think that we are born with characteristics peculiar to us but rather, she wrote, *Choices affect what makes you unique, you have many choices in life and your choices affect how you act, look and feel inside. Others, of course, put their own spin on why people are unique.*[119] Kathleen agreed with Nicola's idea and a fortnight later, responded, writing, *That's true. Almost everything about you is unique, except for maybe the things that you like, and the type of clothes that you wear.*[120]

On May 25 Namratha identified two particular things about herself that made her unique. *What makes me unique is my name for it isn't very common and I think my name reflects on my personality, because my name means 'Great wisdom and very humble'. Also I have a birth mark on my finger which not many people have.*[121] Some students agreed with her idea that uniqueness could be defined by physical marks. Kathleen responded that very day, *True, Namratha. Birthmarks are just some of the things that make people unique, because it's highly unlikely that people will have a birthmark the same shade as you, or on the same place. Even more unlikely is the chance that they would have a birthmark the same shape as you.*[122] Other students, however, agreed to some extent, but weren't yet satisfied. They believed there were more things to consider. Riana held that it was not only her unusual name that distinguished her from all others but also her physical appearance and particular skills. She wrote, *There is [not} another person in the whole wide world that would look EXACTLY like me ...* (then adding) *I think that you can also be unique by the things you can do like i am pretty good at hockey and tennis.*[123] Alana thought that *God made us all unique in our different ways.*[124] whilst Ajeet directed

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II? Footprint Question from North Primary School Year 6 students

118 Drawing Test One, 13th April *2004,* 10.29pm

119 Drawing Test One, 11th May *2004,* 11.05am

120 Drawing Test One, 25th May *2004,* 10,48am

121 Drawing Test One, 25th May *2004,10.03*am

122 Drawing Test One, 25th May *2004,* 1O.53am

123 Drawing Test One, 8th June *2004,* 11.04am

124 Drawing Test One, 25th May *2004,* 10.05am

people to the DNA House for insights.[125] DNA and genes were his areas of interest after all, and he had gathered many significant insights from his inquiry.

8.4.3 What makes different thoughts?

Emily's post contained a thought that took the conversation in a new direction. On May 26 she wrote, *I think it's how they think*[126] that makes people unique. A month later, Jennifer replied, writing, *I think, in everyone's brain, there is a part which is different to any other person's part. It makes you think differently, do different activities, move differently and eat differently and* so *on. This varies the type of person* we *are. By doing these activities differently,* we *develop different habits. They can be good or bad but they are different in some way. Everyone has been through different times, good or bad.*[127]

Now, with ideas that the brain itself might contribute to individual differences, Kirsten keenly entered both conversations. She wrote to Emily, agreeing with her but also sharing what more she had come to understand, that had satisfied her thinking, saying, *So do I [think how people think makes them unique} but it can also have something to do with what* we *have seen in our past that makes us think those thoughts.*[128] The same day she responded to Jennifer saying, *Yes there is a different part in everyone* ['s *brain}, though would you say that many people's thoughts are similar or completely unique?*[129] The same Kirsten who deemed each different drawing as *marvellous* and *very clever and interesting* appeared to delight in having a chance to agree with, develop and challenge the different thoughts shared in these online conversations.

At the time of writing, Jennifer had not followed up Kirsten's question about similarity or uniqueness in people's thinking.

8.5 Summary of Chapter Eight

By now sixteen months had passed since Kirsten and Natasha had carried out their initial drawing test, an experience that had provoked Kirsten's deep thinking about people's uniqueness. Now, perhaps Emily's and Jennifer's ideas are approaching the issue that seemed to have been puzzling Kirsten: whether brain function is determined (like

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[125] Drawing Test One, 23'd September 2004, 5.45pm
[126] Drawing Test One, 26th May 2004, 12.18pm
[127] Drawing Test One, 22nd June 2004, 11.00am
[128] Drawing Test One, 14th September 2004, 5.51pm
[129] Drawing Test One, 14th September 2004, 5.44pm

clockwork connections) or opportunistic (influenced in fluid, not necessarily predictable ways). Kirsten is keen to know how strongly Jennifer feels about the point she is making: whether people are just different or actually unique. If people's brains are unique, she might be asking, then would a unique brain dictate a particular way of thinking? Or are people's brains similar - and can unique thinking still result? As well, the extent of agreement between Kirsten and Jennifer on the question of the different part in everyone's brain remains unclear. Do the two girls differ on how that came to be? And on how much of the brain it encompasses? Whatever the precise details of their agreement and disagreement, it is remarkable to note the resonances between these young people's sustained concentration on individuality and the recent writing of a Nobel Prize winning scientist now at the frontier edge of neuroscience,

> *The most important thing to understand* is *that the brain is 'context bound'. It* is *not a logical system like a computer that processes only programmed information; it does not produce preordained outcomes like a clock. Rather it* is *a selectional system that, through pattern recognition, puts things together in always novel ways. It is this selectional repertoire in the brain that makes each individual unique, that accounts for the ability to create poetry and music, that accounts for all the differences that arise from the same biological apparatus -- the body and the brain.* (Edelman, 2005, p. 1)

Kirsten's appreciation of the context bound nature of our thinking, of our brain's selectional system that *puts things together in always novel ways* (Edelman, 2005, p.l), is made clear in her admiration of Rosie's drawing.

> *This* is *Rosie's [drawing}. She's done wonderful drawings of people and see how she's done little lines? It's a bit like scribbles really. But see how effective it comes out? She's actually just like a little artist really. And she's done a flying TV. It's just like the flying computer although we didn't have a TV there at the time. But obviously she likes watching TV a lot.*

While Kirsten had been able to detect the source of the inspiration for the flying computer that had been drawn, having seen the child spot the computer in the school library during the drawing test, she had come to understand that there must be a reason for Rosie's choice. Something had influenced her selection. To Kirsten, it was obvious: *she likes watching TV a lot.* What a delight it would be to uncover the source of Kirsten's inspiration for exploring humanity'S uniqueness.

Chapter Nine

Gauging success (Part 1): Did the children consider this initiative successful?

9.0 The story so far

Chapters Five to Eight, have reported

- Questions the students generated and selected for investigation;
- Approaches they chose and developed for their investigations;
- Methods employed to make sense of information and findings;
- Decisions made concerning how to represent their ideas and inform others; and
- Students' anticipation of the response and reaction of the wider community

They have revealed many dimensions of the children's activity during The GENESIS Project, including:

- The evolution of the children's diverse working relationships; including mixed genders, ages, previously known and unknown peers.
- The depth and variety of questions they asked, concerning dreaming, learning, decision making and the nature of uniqueness.
- The range of investigative strategies they undertook, such as surveys, experiments, interviews and observation.
- The detailed analysis and varying degrees of students' satisfaction with their data, providing adequate or inadequate data, confirming or challenging previously held understanding.
- The scope of content they submitted for inclusion in their e-Ieaming environment, such as reports, videos, experiment instructions and graphs, and
- The reactions and responses of the GENESIS community, seeking and appreciating the ideas of others, such as examples, new evidence, vIgorous discussion and the generation of new questions to investigate.

To complete my research investigation, I am now able to examine these accounts as required by Papert's fifth step: to answer his question, Did the experiment succeed? Chapter Nine lays out the steps that I will take to address this question and present a satisfactory response.

9.1 Papert's model has driven this study so far

According to Papert's five-step process which has guided my research investigation, the last remaining task is for me to gauge the success or failure of this experiment. Thus far, I have

1. Selected a theory of learning, a biologically based generative theory (Chapter One, Section 1.4);
2. Developed the consequences of this theory clearly enough to design a suitable set of conditions for children's intellectual growth (Chapter Three);
3. Implemented these conditions;
4. Equipped the research with all of the resources required by the design: and
5. Run the experiment and presented four accounts in this thesis (Chapter Four to Eight)

Having run this experiment for the time required by the theory of learning, it has either succeeded or failed. If it is a failure, it is to be declared so, my task becoming the unravelling of why it failed, and possibly working towards a retrial. If! detennine that the experiment succeeded, the task is then to understand why - whether it can be generalised and what can be learned from it.

9.2 The outcomes

This thesis asks the question, *Can I find out how children understand learning by engaging them with an e-learning design challenge?* For my research to successful, it needs to disclose children's views of learning. In this study, there are several ways of examining success and failure, the first two of which contribute to the third (which is the major thrust of my doctoral research). These are:

1. Did the children determine that they had succeeded? (Did they consider that they were able to solve their e-design challenge?)
2. Did the children learn?
3. And, most crucially for my work, am I able to see their views of learning?

This chapter addresses the success or failure of this experiment in terms of the first layer of analysis: Did the children detennine that they had succeeded? The following chapter, Chapter Ten, addresses the success or failure of this experiment in terms of the second

and third layers of analysis: Did the children learn? and, am I able to see their views of learning?

9.3 The first layer - Learners' success

In order to gauge the success of this initiative in the children's terms, it is necessary to sample a broader, more general slice of the project data than I have so far done in the form of specific accounts given in Chapters Five to Eight. In particular, it is necessary to draw such data from the final phase of The GENESIS Project when the children themselves implemented and evaluated the Journey with a view to describing its worth for learning. I will then distil from this account, in conjunction with the work of the children recorded in Chapters Three to Seven, the criteria the children generated for gauging the success or failure of their e-Iearning environment, and, based on these criteria, determine if the children believe they had succeeded or failed.

9.4 How did the students gather evidence on which to gauge the success of their e-Iearning design?

Close to 500 students and teachers were given logins to be able to enter The GENESIS Journey. These students included those who had previously been a part of Team GENESIS and had a role in selecting the topic, investigating research questions, designing the environment and developing materials to be included within it. Other students were also invited to participate, students who had had nothing to do with the project up until this point. In the same way that the project had given students the leading role in designing and developing The GENESIS Journey, so students were also given the tasks of implementing ifs launch and evaluating its success. To manage this task, approximately eight students from each school came together to form an Investigation Team - the iTeam. Some students who had been a part of the Design Team continued to represent their school in this role. As well, some new students became involved to replace Design Team members who had moved on to other schools.

9.4.1 Laying a foundation for gauging the worth of their e-learning environment

Each of the three iTeams met with university members of the GENESIS Team and teachers from their school to consider how to introduce The GENESIS Journey to their school, to whom and when. It was the task of the iTeam to make sense of what happened

when students made use of this environment, designed for them by their peers. After all, many of these students had driven the conception and prototyping of The GENESIS Journey; so, it was imperative that, as its designers, their anticipation of how it should run, their expectations of how it should be monitored as well as their criteria for determining its success or failure should shape the implementation and evaluation phases of The GENESIS Project.

At each school, in consultation with teachers and relevant school executive, the six to eight members of the iTeam developed an implementation and evaluation program that would run for the course of one school term (May-July 2004) and involve students from Year Four through to Year Eleven. Deciding upon what information they believed they needed to collect to be able to understand and evaluate the worth of The GENESIS Journey for learning, iTeams planned to interview, observe and survey classmates, to monitor 'traffic flow' through the environment, review discussion boards and request access to some students' notebooks. Before the iTeam could begin their investigation, they need to submit their plans to their school's principal for approval. At each school approval was given for the iTeam to carry out their investigation.

Members of the iTeam introduced The GENESIS Journey to a wide range of students and teachers. At one school, the entire Grade 4 was chosen by the iTeam and staff to participat. At the other two schools, selected classes across several grades participated, ranging from Primary school classes to Year 10 science classes and Year 11 psychology classes. All students were assigned individual logins and were able to access The GENESIS Journey from any computer at home or at school that had Internet access. Time for students to access The GENESIS Journey was allotted in different ways. One school had a set lesson each week where the children were given time to explore The GENESIS Jouseny, while at the other schools, time was given during specific subject lessons at various points during the term. Students also accessed The GENESIS Journey during lunchtime and at home at the end of the day.

During this phase, the iTeam implemented their investigation plan. Surveys were conducted, class discussions and one-to-one interviews took place, discussion boards were monitored, and interest levels and initial responses were observed. Students, teachers and community members shared their opinions with the iTeam. At one primary school, students who had previously been involved but had now moved onto High School were invited to return for a special GENESIS event, to reunite with their peers and

teachers and explore the environment. Survey results, video footage and discussion board postings were collected and analysed. iTeam members from each school shared their findings with university members of the GENESIS Team and were invited to come to the university to debrief together, to tour the Institute for Interactive Media and Learning facilities and meet some software developers face to face.

9.4.2 What worth did the children perceive in their e-learning environment?

Each iTeam began the task of investigating the impact of The GENESIS Journey at their particular school. From a survey she had developed and carried out in her school, Hannah had found that *most people actually rated the site very highly.* Alysha and Marie-Claire had investigated if students who had spent longer within the environment had engaged more deeply in it. They had looked at the noticeboards and believed they could deduce from their observations that *those who used the website more than others and had explored it thoroughly posted more questions and contribute more information.*

iTeam member Emily had noticed that *from the information we got -even if they were on the same House, they wrote... they had different points of view on it.* Max had been monitoring the discussions on the noticeboards. He too had been recognising that children were sharing different points of view. *[The students] were talking about [ideas] and it was good because they were having a discussion with someone else from another schooL [via the noticeboards] - and it was really good because they were both talking from different points of view. And they both had different ideas. It was really good – listening to it.*

Max was encouraged he took time to talk with some children they showed that they had been deeply engaged throughout their journey. *I've asked them a few things in the one-on-one [conversations] I've done with them and in small groups - andfound out that they're not actually looking at it and saying, 'Woo!' But they're actually absorbing some of the information. I've asked questions about things and they know the answers - and things like that. That's just a sign that they're actually learning it.*

Some members of the iTeam used this further opportunity for investigation to continue to explore their original question in this new context: the context of the implementation and evaluation of their environment. Josh, who had spent much time comparing the responses and choices of boys and girls, had looked at this again while observing and surveying

children's responses to The GENESIS Journey. From his earlier work, he had had some hunches about what he might find. *I think confidence was the first. We thought that the boys would be a lot more confident going around the site but I think it was the reverse for a lot of classes, which was interesting - well, at least that's what they expressed in their survey - I don't know if that's true.* Josh's abiding interest in his original question (about gender differences) had clearly been sustained during the five-month gap between his personal investigation (August - December 2003) and the exploration of his findings by the GENESIS community (May - July 2004).

These few comments from the iTeam evaluation appear to indicate that the environment was in tune with many of its designers' wishes. The children themselves had found it was a site that students enjoyed and appreciated, *rated very highly,* where different points of view could be expressed and discussed within a learning community, users demonstrated signs they were *actually* and it was a place for interests and questions to continue to be investigated. The pride and sense of achievement these children felt is captured by Cassie's passing comment, *'I can't believe that* we *actually did all this!'* and Cameron's declaration, *never done anything like this before... I wish* we *could do more GENESIS. '*

The iTeam's exploration and evaluation of the worth of The GENESIS Journey allows me insight into the children's own criteria for the success of this experiment as they came to perceive it and then examine whether they saw these criteria as having been met in The GENESIS Journey. As I have explained in Chapter Three, section 3.4.1, such analysis will allow me to gauge whether the children believed they had succeeded or failed in **their** overarching experiment: their design of their own e-leaming environment to explore a scientific question of their choosing. Whilst demonstrating success or failure in the children's tenns is not crucial to demonstrating the success or failure of my own experiment (the eliciting of children's views ofleaming), it is an ethical requirement. To omit such analysis would undennine those key democratic principles of respect for children's ownership, adaptability and diversity put forward, as consequences of this study's learning theory, in Chapter Two. Moreover, given that the children's topic for investigation was the nature of thinking and knowing, it is likely that, by examining whether the children believed they had been successful in their design of an e-leaming environment, I will gather key insights into what they think about learning.

9.5 The children's criteria for successful e-Iearning environments

To distil children's criteria for success in their e-design, I consider not only the design discussions of the students but also the design itself. Then, I seek to detennine if the students considered they had been successful in meeting each criterion, considering the results of the environment's implementation. Some of the comments and ideas come from children and from conversations that have previously been presented in other accounts for other purposes. However, new children are also introduced, whose contributions clarify how others made sense of this design.

9.5.1 Successful e-Iearning initiatives are engaging

As the Design Team worked to identify their priorities for the site they were planning, they were aware of time and budget restraints. Despite these constraints, many times they insisted that the site had to be *enjoyable* and had to be *interesting.* Danica, Shelli, Cameron, Alice and Felicity believed that the site *should be educational, [but} in a fun way. Not all these facts piled on top of you.* In these words, these children graphically describe an education system that positions a learner beneath a 'pile of facts.' Natalie Z voiced their frustration saying, *We've got all those educational programs where you go on the Internet but it doesn't really give you the answer, what you're looking for. It just gives you a whole lot of writing which you can't be bothered to read.* In choosing to reject this model for their own environment, they demonstrated their strong dissatisfaction with this restrictive arrangement. In the educational environment they designed, they were seeking room for movement. Hannah and Natalie Y wanted people to be *doing things to learn,* trying experiments and posting results. In doing so, *information* is *expressed in fun ways.* Ajeet and Trisha also wanted the site to be an enjoyable one for children, but were careful to ensure that *games and activities that are fun [relate} to the topic being researched.* They were not looking for bells and whistles purely incorporated for decoration. They wanted their peers to find delight in the exploration and comprehension of the topics they were investigating. Indeed, Natalie Z saw the aim of their site as not only to help the children to learn about this topic in an enjoyable way, but to develop an experience *so that people think learning's fun!*

Not until users, travellers, embarked on their journey through the site, would it be revealed if the designers had managed to develop the interesting and enjoyable environment they had hoped for. Anticipating a favourable reaction, Joshua, a member of

the iTeam who was familiar with the environment, introduced it to his peers with confidence: *Welcome to The GENESIS Journey. It is the Journey of great discovely which I think you will enjoy.* Joshua had been won over by what he had seen and experienced. He had not encountered a 'pile of facts' but had found instead a journey of discovery, *great discovery,* that he believed his classmates would enjoy.

Fortunately, as well as discussing topics and questions on the noticeboards, travellers also discussed The GENESIS Journey website in its own right. Mary asked, *Do u guys like this site [?J I think it is [educational]. sought offun but cool.* Keewa wanted to share her opinions with everyone. *HEY who ever gets this I think this program is really cool and exiting. It has all these cool informative places and it is also fun.* Chrissy posted a reply, *I agree with you [Keewa,] this* is *a mad website and fun I especially love the GENESIS cinemas.* Not only did Marissa agree with Keewa about the cinemas being enjoyable, *I want to go to the candy bar in the [cinemas!J* and with her friend Hannah that it was fun, she acknowledged that it was informative as well, another criterion so important to The Design Team. *This site was helpful to me - because it gave me information that I had never [knownJ about. Great website From Marissa and Hannah.* Riana had praise for the site and also appreciation for the designers and the community; *This site is really cool. I learnt [a lotJ of stuff about our brains and how they work. Thanks everyone!* These travellers' comments clearly demonstrate that they were having an enjoyable time, they were pleased to be a part of this experience and that, as Natalie Z had hoped, it was learning itself that they were excited by and celebrating.

The following exchange captures most delightfully students' enjoyment of the site and interest in its topic. In a discussion board conversation, Maggie posted, *This website* is *fun and educational.* What was Jialin's response? *I know but hey do you know why we can't remember some dreams?* She was happy to recognise the good time she was having, but keen to continue to pursue a line of questioning, for it was that activity she was most enjoying. This range of reactions and responses from their peers, allowed the children responsible for the design, development and implementation of The GENESIS Journey to recognise their success in designing an engaging e-Ieaming environment.

9.5.2 Successful e-learning initiatives equip individuals' inclinations

The Design Team spent time thinking about features they could develop that would best help travellers manage their interests and ideas as they made their way through The

GENESIS Journey. Natalie Y had an idea about how a notebook might be helpful. *Maybe if you've got a Notebook on the side... when you read something that you think is important, put that on the Notebook - when you're asked a question you could refer back to that.* She didn't see using the notebook as a task or a requirement, but as an optional asset, giving children a chance to glean from the environment information of particular interest to them. It was a personal place to keep and ponder knowledge you may find useful. Kirsten recognized that a notebook of this sort might also be useful to travellers who were quickly on the move, whether because a lesson was about to wrap up, or because their interest was tempting them to move on to a new location within the journey. *If you don't want to read it at that specific time, maybe you can do - like - a Copy and Paste - you copy it and put it in your Notepad - and then move on.* This feature was another way in which the designers could provide travellers with the ability to be flexible with time and with thinking throughout their learning journey.

According to the designers' wishes, each item inside a GENESIS House, the report, the video, the links to website or the ideas wall could be added to a traveller's notebook with a click of a button. As well as a place to tuck away content, a traveller could type in their own thoughts and wonderings. While comments posted on noticeboards were public, notebooks were password protected, only allowing their owner access.

Max and Cassandra had both been a part of The Design Team. They were also part of the iTeam at their school. Max had noticed children using the notebook. He was troubled by their actions. *They are reading it but they're not taking it in ... they open a Folder but instead of reading it they quickly go to the end and copy it into their Notebook. They're not really reading it - they're just putting it into their Notebook.* Max was concerned, because he believed that just collecting information, *not even really reading it* was a sign that these travellers were not comprehending or understanding what they encountered, not, in his words, *taking it in.* Cassandra however observed that the children weren't *just putting it into their Notebook.* She had noticed other thoughtful behaviour. *I've seen people copying info into their Notebook, and then they [go] back to their Notebook and they look to see what interests them. And they go back to that House and really - like - look at it properly.* The children she had watched had used the notebook to collect a wide range of reports or videos that they considered might be interesting to them, returning to this distilled collection to select ones of particular value. This was how they chose where they would go and spend their time. When Max had observed the children tucking information away into their notebooks, he did not consider it to be a worthwhile activity.

Cassandra, however, seeing the consequences, recognised this behaviour as a learning strategy, one the designers had anticipated and provided for. In these respects at least, the Team GENESIS children could identify that they succeeded in designing an e-Iearning environment that catered for individuals' inclinations.

9.5.3 Successful e-learning initiatives inspire ideas and discussion

Being able to encounter and engage with the ideas, interests and experiences of others was a top priority for The Design Team. They discussed having a *forum, a discussion board* or a *community noticeboard,* a place where visitors could *post a question* or *could share their ideas.* Natalie Y explained their motivation for such a feature. It would allow travellers to be *a part of the learning journey... that you learn from each other, not from just what it says on the site.* Learning from each other, valuing and being interested or persuaded by answers or opinions was highly prized by these designers, as a complement to having access to current theories and knowledge. They wanted to ensure that this e-learning journey was not one that travellers simple undertook, following paths laid down to determined destinations. It was a journey where they were to be *a part of* it. Hannah made clear the philosophy of the designers and their plan for nurturing this feature of the environment. Visitors would be given *lots of different theories and stuff.. that could be discussed on a chat forum, but we weren't actually going to give them an answer* so *that they would have to discuss what they thought and which [idea or theory] was more convincing to them.* Natalie Y envisaged these noticeboards as a place where people's assumptions of ways of knowing could be challenged. *If you thought there was just one right answer, you could go in there [and] learn about other possible answers and you might actually think, 'Hey, that's a good suggestion. That's better than what I thought it was!'* So *you [were] leaming through the journey.*

In three different ways, Team GENESIS children could identify how the travellers within The GENESIS Journey responded to this feature and the extent to which they appreciated it. First, within the noticeboards themselves, comments were posted as travellers recognised how they might utilize them. *This site is* so *cool,* posted Mary. The feature that she used as a case in point was the noticeboards. *You can chat and ask [questions] and people can answer u and it could be like a debate.* When Maggie claimed that *this website is fun,* she too went on to single out the noticeboard feature: *u would [know] what other people think.* In an environment containing theories, information and explanations,

it was the noticeboards that were acknowledged as *cool* and *fun,* the feature the designers had identified as one where travellers got to *be a part of* the journey itself.

Secondly, throughout the posts on the noticeboards, the following frequently found phrases demonstrate how travellers went about their GENESIS activity, comparing and discussing ideas in the way The Design Team had foreshadowed. Travellers asked Is *that right? What does everyone else think? Do you guys agree with me? What do you think of that response?* They responded *I agree but I disagree. I never thought of that but it's true. You are wrong in my opinion. I totally agree. I think that too. Please give me a reason.* So, not only did some travellers openly acknowledge their appreciation of this noticeboard feature inside it, the manner in which hundreds of students made use of it, comparing and adapting ideas, indicates to the designing children the success of their environment in delivering to their peers an experience of learning they all valued.

Thirdly, further evidence indicating The Design Team's accuracy in identifying community noticeboards as a key feature of successful learning environments can be found in interviews with students who undertook a GENESIS journey. Joshua volunteered that he *liked it how you could kinda* go *into the forums and express your opinions and stuff like that. It has all [sorts of] opinions* so *that was a very good idea.* Sophie agreed with him, *You were able to read what other people thought ." I liked that.* Being able to have access to *other people's perspective on the same thing* was something that Charlene too found interesting.

It is significant to note that while The GENESIS Journey provided an opportunity for sharing and debating opinions and ideas, there was no guarantee that travellers would make use of it. Indeed, while people might be happy to post comments, the designers could not ensure they would commit to sharing ideas and experiences of such significance as to be able to persuade or convince other travellers of their thoughts. The designers developed no rules for these noticeboards; no terms of use were to be agreed to before entry. It is as if the designers anticipated there would be little resistance or inappropriate activity. The only explicit step that the designers took in this regard, was to make it clear to the teachers and multimedia developers that this was not to be a place where comments would be marked as 'right' or 'wrong.' Max was most particular about this. If The GENESIS Journey were to become such an environment, he claimed *it would be very hard to write a sentence that is 'safe.'* With this safeguard in place, the designers provided the online community an opportunity to develop the nature of the noticeboards

themselves. It was an astute move, for the community came to consensus amicably. While discussions were robust and challenges personal at times, the majority of users complimented, enthused about and respected each other's ideas.

Maggie's recognition of this is particularly poignant. She posted that *we know this is fun and educational* – but she identified another feature - indeed the feature that made it possible for children to enjoy having ideas and also to enable them to learn and understand new things. It was, as Maggie described it, a place *you can say whatever you think without feeling embarrassed.* Here children could move into rich, authentic discussions supported not only by the new media, but also by the willingness of participants to share thoughts and experiences deeply significant to them. Not only did Maggie recognise this, she was secure enough and committed enough to contribute very personal insights.

Maggie was participating in a conversation about stress. She told her peers that *things scholarship exams and [selective] school test really worry me because your parents always want you to do well.* Maggie didn't say whether or not her parents directly informed her of their expectations, but she was perceptive enough to draw this conclusion from their actions. She confided that the 4 *lessons of coaching a week puts lots of pressure on me.* Possibly indicating frustration with the situation, Maggie lamented that *my parents aren't going to change my school they just want to see how well I go.* As well as coping with coaching and exams for no reason but for her parents to *see how well* she goes, Maggie also posted that her *piano lessons stress [her] out too!* In this environment, as a part of this community, Maggie was not embarrassed to share such personal thoughts, ones that she was not willing to disclose to her family. Indeed, she posted that apart from these already numerous stresses she was also concerned about her big sister reading what it was she had posted here. Contributions such as these provide rich data with which the designing children could gauge the extent to which they had succeeded in designing an environment that inspired ideas and discussion.

9.6 **In** their view, did the children successfully meet their criteria for success?

So, this analysis of the data concerning the children's design and development of The GENESIS Journey has identified three key features they saw as being critical for the success of their design. It was to be engaging, adaptive to the inclination of individual users and inspiring and supportive of discussion and debate.

With the children's criteria in place, I can determine from the data presented above, from their posts on discussion boards, conversations and their own work undertaken to evaluate the environment, whether they felt that they had succeeded or failed in their design of an e-learning environment.

1. Were the children able to see travellers engaged in their environment? As the above three accounts testify, from the moment it was launched at each site, children were captivated. While they were expected to be involved during class time, posts on the discussion boards indicate children also returned to the environment during their recreational time, whether during school lunch breaks or at home in the afternoon or evening. A particularly strong example of such engagement is the conversation between Caitlin, Jacob and Joshua concerning gender differences. This conversation was sustained over two months with many posts being submitted out of school hours.

2. Did the environment adapt to the inclination of individual users? The children identified different ways in which their peers navigated their journey through the environment, noting the features different people found most enjoyable and interesting. Most clearly the discussion between Max and Cassandra concerning the use of the notebook demonstrated to the children that their peers were adapting the features ofthe environment to suit their individual inclinations.

3. The children recognised and participated in discussions concerning deep, personal and immediate questions. As seen most particularly on the Dreams discussion board, the environment rekindled, provoked and provided a forum for their ideas and opinions. Matt commented directly on the significant connections between the ideas and theories his peers were having about dreams, and those held by professionals, stating he *couldn't get over* his discovery that eight or nine year old children could form and express such opinions.

These children considered their design a success.

9.7 Summary of Chapter Nine

Selected observations presented in this and the preceding chapters confinn that the children viewed the experiment as a success. Based upon their criteria, they had designed a successful e-Ieaming environment. It was engaging, it equipped individuals' inclinations and it inspired ideas and discussion.

In Chapter Ten I tum to address two further ways to ascertain whether this experiment was a success or failure. I detennine if the children learned, and then, whether I am able to see their views of learning. This done, the presentation and analysis of my study will be completed and my final task of considering, critically, the implications of my work and directions for possible future study will be addressed in Chapter Eleven.

Chapter Ten

Gauging success (Part 2): Can I find out how children understand learning by engaging them with an e-Iearning design challenge?

10.0 The story so far

Having reported the research I undertook in Chapters Four to Nine, my task now is to answer my research question, *Can I find out how students understand learning by engaging them with an e-learning design challenge?* In addressing this question I am able to complete the fifth step of Papert's approach to educational research: determining whether my experiment was a success or a failure. As argued in Chapter Three, there are three questions that may be addressed when examining the success or failure of this experiment.

1. Did the children recognise their success? (That is, were they able to design and implement an e-Ieaming environment to explore a science-and-technology topic of their choice?)
2. Did the children learn? And, most crucially for my purposes,
3. Am I able to see their views of learning?

The first of these questions was answered in the affirmative in Chapter Nine. I sought to determine what criteria the children themselves set for successful e-Ieaming environments. The data showed that the children perceived successful e-Ieaming environments as,

- Engaging,
- Equipped individual's inclinations, and
- Inspired ideas and discussions.

I established, from the data, that the children's design had in fact met the standards that they had set, and they themselves recognised and delighted in their accomplishment.

10.1 Overview of Chapter Ten

I now tum to consider the second and third questions. In answering the second question, I seek to establish whether or not during this experiment the children learned. To answer

the third question, I will focus on determining whether or not this experiment has enabled me to see and give an account of children's views oflearning.

As I noted in Chapter Three, even if the data had shown little or no evidence of learning, I still may have been able to acquire some understanding of the children's views of learning, both from their attempt and also their possible dissatisfaction. However, if deep learning has occurred I will have been provided with a strong starting point for uncovering an understanding of their views of learning, for they will have had an object-to-think-with (after Papert, 1980) about what it is to learn.

10.2 Did the children learn?

To answer my second question, Did the children learn? I will first return to the theory of learning that underpins this study: the biologically based generative theory of learning. On this view, learning is understood as an adaptive behaviour of generating and testing ideas on their value for learners, and then keeping or discarding them based on the result of these tests. I can discover whether children learned in this study by analysing the particular work of an individual child, then examining a broader range of children's activity, seeking verifying and contradictory accounts from the data. Naturally, such scrutiny also requires me to seek evidence of Schaverien and Cosgrove's (2000) six generatively principled acts oflearning, or at least some of those acts.

Josh was a member of the group of boys who investigated gender differences. He was interested in whether boys and girls make decisions in different ways. As reported in Chapter Five (see Section 5.1), his group carried out two experiments, an obstacle course and a toy choice survey, to gather information to help them make sense of their topic. From these experiments they formed the view that boys are quicker and more confident, more adventurous than girls in their decision making. Josh, however, was hesitant to consider the case closed. He wondered if the delay they had noted in the girls' decision making wasn't due to lack of confidence or an adventurous spirit, but rather because they were *thinking about it [their decision} more.* As a part of his school's iTeam, Josh was able to regenerate his ideas and again investigate the differences between boys and girls' decision making as he observed and evaluated their interaction with The GENESIS Journey. Based on the findings of his group's previous investigation, Josh had *thought that the boys would be a lot more confident going around the site.* Interestingly however,

the survey that he and his partner Max carried out found *the reverse.* The girls were not as overwhelmed and reported being more confident in interacting with the environment.

Josh's account most clearly displays learning activity as understood by the biologically based generative theory of learning. As outlined in section 1.2.3, this theory conceives of learning as generating ideas, testing them based on their value and keeping those ideas that survive the test. It recognises three characteristics as central to learning, these being that:

1. Learners' values drive their learning
2. Learners' generating and testing of ideas is the essence of their learning
3. Learning proceeds developmentally as learners capitalise on opportunities (Schaverien and Cosgrove, 1999)

I can see evidence of this activity in Josh's learning journey. He generated questions and ideas, tested them, evaluated his findings and regenerated ideas to develop a new test to further pursue understanding. Significantly, Josh's learning journey did not come to an end at this point. He was hesitant to draw final conclusions based on the results of his survey. He acknowledged that *what they [the boys and girls] expressed in their survey* might not necessarily be accurate. As he stated, *I don't know if that's true.* Josh found himself again in a position of regenerating his question and possibly considering a new test for working towards gaining information that would satisfy him.

The activity of Josh and his team of investigators clearly comprises of the interwoven acts of Schaverien and Cosgrove's (2000) model of technology-and-science learning; designing, making, exploring, operating, explaining and Josh investigated gender differences with Cameron, Hamish, Shaun and Max. The boys **explored** a question they were interested in, the possible influence of gender on our decisions and choices, and **designed** two experiments to seek evidence to use to help them to **understand** what happened when children made choices. They then analysed their findings and sought to **explain** such behaviour. The boys **made** reports, videos, graphs and activities for children to access, to both share their **understanding** and to equip a larger community to **explore** this question.

Importantly, these acts of learning were not occurring in isolation. Throughout the GENESIS community ideas were being generated, then refined through diverse, idiosyncratic, imaginative and critical tests. Whilst Josh sought to **explain** and

understand gender differences, other children were concerned with understanding DNA, exploring the influence of media or explaining how animals learn (for example, Ajeet's DNA investigation, Year 6 girls' media survey and Year 5 girls' rat experiment). Whilst Josh designed, made and operated an obstacle course experiment and conducted a survey, Matt explored existing dream theories. Matt sought to understand their validity by designing a survey to determine his community's and his own understanding of dreams, then comparing his findings to these theories and seeking confirming and disconfirming instances. He made graphs and a report that explained his own theory of dreaming, and continued to explore people's opinions and experiences with The GENESIS Journey's discussion boards.

While considering in detail the variety of learning activities the children engaged in, it is significant to consider their approach in light of Multiple Intelligences and learning styles (after Gardner, 1999). While the children in this investigation consistently approached learning generatively, the nature of the idea they were exploring seemed to determine the style of learning they selected for testing, evaluating and regenerating their idea. Rather than categorizing themselves as a particular style of leamer, they approached each learning activity in what they believed to be the most suitable, constructive learning style. For example, a group of children who investigated and reported one experiment in a visual way, changed to an auditory approach to collect the information they needed to test a different set of ideas.

The diverse inquiries of the children in this study are rich with Schaverien and Cosgrove's (2000) acts of learning, consequently qualifying as learning in generative terms.

10.3 Did this experiment reveal children's understandings oflearning, and, if so, what is the nature of their views?

Having answered the questions 'Did the children learn?' the penultimate analytical task of this study is to determine whether this experiment has disclosed children's views of learning. Once this is done, all that remains is to consider the implications of this work, including suggestions for possible future studies.

Through careful analysis of the data from this study, I have been able to form some inferences regarding children's understanding oflearning. In particular I consider that:

1. Children understand learning to involve generating, testing and modifying ideas, and appreciate that these ideas, tests and modifications are influenced by each leamer's values. Moreover, they recognise great value in undertaking this knowledge gaining activity as part of a learning community (to follow in Section 10.3.1).
2. Children explicitly enact opportune learning experiences, particularly technologically (to follow in Section 10.3.2)

I now detail each of these findings.

10.3.1 Children understand learning to involve generating, testing and modifying ideas. and appreciate that these ideas, tests and modifications are influenced by each learner's values. Moreover, they recognise great value in undertaking this knowledge gaining activity as part of a learning community.

To an extent, this might appear to be a self-validating proposition. A generative theory of learning underpins this study. Indeed, earlier in this chapter I presented and analysed data (Josh's story) to show that the children had learned, as described by this theory. Here however, the case is being made that children themselves comprehend generating, testing and modifying ideas as learning. More particularly, the following accounts detail the extent to which children understand the value and nature of generating ideas. I will analyse a conversation concerning the generation of an idea, and what the children saw this entailed. Then I wi11look at how paramount this understanding of learning appears to be to these children. So, my findings are in tune with earlier findings from our research group: that children learn generatively - through generating, testing and keeping or amending their ideas on the basis of such tests. As well, my findings also contribute new insights in regards to:

1. Children's explicit recognition and articulation of such learning behaviour,
2. Children's appreciation and examination of the nature of the value system that drives both the ideas that are generated and the nature of the testing process, and
3. Children's desire to broaden and enrich their opportunity to generate and encounter ideas of worth by seeking and appraising the experiences, understandings and beliefs of others.

Kirsten and Ashleigh's Drawing Test (see Section 8.2) was designed as a tool to see *how everyone's minds are unique and different,* as a tool for uncovering *how they're different and how people's minds work differently.* This investigation, and the girls' findings, were

discussed by the GENESIS community online. Within this discussion, the children shared their ideas and experiences about what was happening when different people respond to the same thing in different ways. Ruth stated clearly that she believed people can have different responses, and that one response does not have to be right and one wrong. She shared her belief that people's individual responses depended upon their *experiences, understandings and beliefs.* As such, the ideas that you are able to have, depend upon what you currently believe, understand and the wealth of experiences you can draw upon. She offered an example, a personal experience, to illustrate her point. She told of a time at school when she was asked to draw a margin, but not knowing what a margin was, instead drew a Martian. Upon reading this account, Kirsten offered an explanation about what might have caused Ruth's mind to offer up the 'Martian' idea in place of the margin. Kirsten proposed, that because Ruth's mind had never before experienced a margin request, it *went to the closest word which she knew, which was of course a Martian.* In Kirsten's thinking, Martian was no chance response. In her words, Ruth's mind *went* to the most valuable idea it could rally, *the closest word which she knew.*

This account does more than demonstrate that children understand learning to involve generating, testing and modifying ideas. It shows that they perceive that an individual's ideas, tests and modifications arise from their experiences, understandings and beliefs. As a consequence of this perception, it appears that children place a high priority on enriching their experiences, understandings and beliefs (and as a result, their ideas, tests and modifications) by seeking and appraising the experiences, understandings and beliefs of others.

Seeking and appraising each other's ideas and experiences formed the foundation of the children's entire learningjourney. In the very nature of the design process and the design, the children went about seeking, considering and selecting topics or solutions from the ideas and experiences of their peers. Together they explored the nature of the three short listed topic questions on the Team GENESIS website, and decided upon the most valuable idea from within their community as the topic for the environment they were to design: *How and why do we think? How come we're not born with the knowledge we know now?*

During the Design Days, student representatives from each school became familiar with the ideas and experiences of children from of all classes, pooling knowledge and research tactics that had proved to be of value. Members of the Design Team also amalgamated

their opinions and concerns about existing e-Iearning environments, developing a shared appreciation of what to avoid in their own attempt. Accordingly, the design they did develop highly prized the ability to encounter and appraise the ideas of others. Indeed, when required to cull some aspects of their design in response to their limited budget, removing discussion boards was not a consideration.

Moreover, in the designs they developed, not only did the children want others to appraise their results and findings, they wanted their community to have access to and discuss 'behind the scenes' details. That is, they wanted to inform their community in detail how experiments were carried out, and also provide instructions for others to download and trial these experiments themselves. The students wanted to accurately share their findings and made themselves and their work fully accessible to their peers. This provided greater credibility for their conclusions and also enabled the students to discover if others saw something that they had missed, or if the conclusion they had drawn might possibly be biased.

Not only did the children thread this feature into the design of the environment they were creating, as they moved to develop the material to place within this environment, they sought, appraised and offered for discussion the ideas and opinions of their peers. The children wanted those who entered into the learning journey to access and have ideas and opinions about their research. The research they undertook to develop material ready for discussion and appraisal, frequently consisted, in itself, of the ideas and opinions of their peers about a certain topic: sought, collected, appraised and interpreted.

Clearly, Matthew's dream survey, reported in Chapter Six, is evidence of this. His approach to gauging the value and worth of the dream theories of Freud, *lung* and Crick and Mitchison demanded that he obtain information about the experiences and understanding of others about dreams, what they are and why we have them. In this way, with the ideas and opinions of many, he believed he would be in a position to converge on an accurate understanding. He was not the only student to go about learning in this way. Four students in Year 6 wanted to find out if other people's opinions affect our own, and if so, how. Their research question itself displays a hunch concerning the very aspect of thinking and learning that I am currently addressing as I look at their work: what is the role and influence of the pool of ideas and opinions that we share as a community on our own thinking? Particularly, how do children access and make use of this thinking? These students developed and carried out three tests to make sense of their question. One of

these tests was a survey where they asked questions to find out children's ideas about how messages conveyed to us through the media influence our choices and opinions. Another group of students in Year 5 also carried out a survey. They wanted to discover factors that most affect learning. Again, not only did they seek to learn through seeking the ideas and opinions of others, that very approach to learning, working together with a partner, was one of the learning factors their survey addressed. They identified that their peers valued this approach to learning more than working on a task, trying to learn, by themselves.

This learning function, seeking and appraising the ideas and understanding of others, was also prevalent on the noticeboards. Children had ideas and opinions about research, theories, experiments, and - the ideas and opinions of children. As reported in Matt's Dreams investigation (see Section 7.4.1), Stephanie asked the community if her idea about why we dream was correct. Ciao responded to her with a different possibility and Stephanie's opinion changed as a result. When Elisa responded to a post from Justin, who shared his hatred of dreaming, she concluded by asking 'What does everyone else think?' She wasn't seeking to resolve the matter herself, but to draw in other children's thoughts for consideration. Thoughts and ideas that were shared were scrutinized by others and tested against their understanding and experiences. For example, Hilaire did not accept Katarina's belief about nightmares because she had experiences that disproved it.

The children also identified and built upon ideas and opinions shared that were similar to their own. While discussing factors that affect our learning, Maggie commented that she agreed with an opinion posted by Jennifer. Deanah posted that she agreed with both girls, and went on to then give- an example from real life to support their position. Julianna strengthened their case with a contrasting example still in support of the position. Karen added that she thought they were 'on the right track' but asked if anyone in the discussion group knew the cause of the behaviour they were examining[130]. Abigail so unmistakably captures the essence of this function of learning when, while considering how the ideas and opinions presented on television affect out thinking, wrote, *They [the views of others} can either make us feel more strongly about our opinion on the subject, or make us reconsider our opinions.*

130 Having confinned from shared experiences that their idea was of worth, the girls turned to seek a reasoned explanation.

These children's conversations, considerations and choices demonstrate that they understand learning to involve generating, testing and modifying ideas. This evidence has also indicated that children appreciate that these ideas, tests and modifications are influenced by each leamer's experiences, understandings and beliefs. Moreover, they demonstrate an almost exhaustive desire to both broaden and enrich their opportunity to generate and encounter ideas of worth by seeking and appraising the experiences, understandings and beliefs of others. Indeed, as my second finding illuminates, they are ready and able to draw upon all avenues available to them for developing valuable learning opportunities.

10.3.2 Children explicitly enact opportune learning experiences, particularly technologically

Members of The Design Team gathered together in July 2003 to develop a concept for the GENESIS e-Iearning environment. They were not very complimentary of the existing e-Iearning environments they were given to explore as points of reference. Much of the students' discussion centred on the set circumscribed nature of the solution users aspired to and the frequency with which the paths to these destinations were fixed.

As reported in Chapter Three, the Design Team recognised and appreciated the importance of choice. They were worried about environments where there was only one answer, one way of getting to it and, most notably, environments that involved the user having to agree with the computer. Like Papert (2000) and Resnick (2002), they held an implicit belief that these technologies could create learning environments where computer programs respond and adjust in reaction to the choices of the user. This response or reaction provides users with an opportunity to gauge the worth of their decision by evaluating its outcome. The Design Team's response was to design such an environment. It did not organise knowledge or approach learning hierarchically (after Bloom, 1956): a leamer's progression of ideas and understanding was shaped and directed by their personal values, interests and experiences.

Within the environment they designed, there were no set pathways to follow, no quizzes to pass to achieve access to the next level, no negative consequence for posting an opposing or incorrect opinion and no set, final destination. Instead, users could select where to go, what to look at, what to respond to, and how to evaluate the information and ideas contained within. Indeed, the children who entered into the environment did select different paths to follow, questions to consider, ways of responding and engaging with

the environment, the information and with other travellers. The children were able to see this. As a part of the team of investigators observing children engaging with the resulting environment, Max and Cassandra recognised the diversity of understanding attained by travellers and the variety of ways they chose to go about obtaining and questioning this new knowledge (as reported in section 9.4.2).

During both the design of the environment and the development of the material to be placed within it, the children clearly sought to utilize the potential of technology to enable learners to access people and events otherwise outside of their experience. The Design Team included discussion boards for exploring the experiences and ideas of others, and for sharing your own. The designers also hoped to be able to host online conversations with visiting experts. They also provided places within the environment to put video footage of experiments carried out, or of 'behind the scenes' discussions that shared investigators' contemplation of their findings. These media provided rich detail and authentic information to best equip discussion. Indeed, during debates online, students referred back to this shared data to clarify their views and opinions.

This adaptive functionality within their e-Iearning environment strongly suggests the children recognised that knowledge and understanding are not static, and that new technologies can mediate learning activities that provide for and capitalise on this reality. The children themselves spoke of their appreciation for up to date information, acknowledging that what is known is known to change. On the discussion boards, some students sought participants to engage in future investigations, demonstrating an expectation that their current work was to continue and the present environment would be updated. It was as if they recognised on both a personal level their ideas and understanding might change, and also as a community, the nature of the topics they themselves were exploring might develop further. The GENESIS Journey could cater for both eventualities.

In these ways the children show how they anticipate that e-Iearning environments can enhance their learning. They were not interested in bells and whistles: they didn't include a points system or rewards, certificates to print off or the necessity of completing challenges to enter new levels to progress through. Nor was the environment they designed simply a replication of classroom activities placed online. As the previous section attested, children valued pursuing and assessing the worth of the ideas and experiences of others. It proved most advantageous to entwine the learning tactic and new

technology. This understanding - the children's perception of how encountering and engaging with ideas can be thought of technologically - demonstrates that they are operating at the third and highest level of Papert's (1991) classification of technological fluency. According to Papert's (1991) classification, these children are technological thinkers: they sensed and exploited the recognition that environments such as these could provide them with a new way to relate to each other and a new way to relate to ideas.

10.3.3 Answering my research question and situating the findings within the educational research field

This thesis asked the question, *Can I find out how students understand learning by engaging them with an e-learning design challenge?* Chapter Three established three questions that may be addressed when examining the success of failure of this experiment.

1. Did the children succeed? (That is, were they able to design and implement an e-learning environment to explore a science-and-technology topic of their choice?)
2. Did the children learn? And, most crucially for my purposes,
3. Am I able to see their views oflearning?

The first question was answered in the affirmative in Chapter Nine. It was established from the data that the children's design met the standards that they had set, and that they themselves recognised and delighted in their accomplishment. This chapter has answered the second and third questions, establishing from the data that the children did indeed learn and that this experiment enabled me to see and give an account of children's views ofthe nature oflearning.

Having now completed the presentation of my study, my final analytical task, according to Papert (1973), is to examine why I succeeded, whether my findings can be generalised and what can be learned from them. I shall now consider possible reasons for the success of my study, then turn to Chapter Eleven to consider critically the implications of my work, including what can be generalised and learned from it, and directions for possible future study.

10.4 Why did my study succeed? Two key factors contributing to this success

An analysis of my data has shown that children's views of learning can be uncovered by engaging them with an e-design challenge. This study's experiment was a success. Papert's (1973) five step approach to educational research, the methodological foundation of my study, requires that in the event of an experiment succeeding, reasons are sought for success. Such an examination has revealed two key contributing factors that I now present.

10.4.1 The value of a design context for uncovering children's views of learning

Investigating children's understandings of learning in a design context contributed to the success of my study in three ways.

First, designing is an activity that humanity is drawn to, and satisfied by. We are tuned in to design possibilities, having an *ability to anticipate a hidden potentiality* on which we depend to *arrive at a design goal.* (Snodgrass and Coyne, 1997, p.23) Our mind's ability to envisage, and our capacity to then design *is in innumerable ways at the very core of our existence as a species.* (Heskett, 2002, p.9) It is one of the characteristics of humanity, having been recognized as being *as fundamental as the capacity for language and other practices.* (Roth 1998, p.18) The process of design can also be most satisfying for designers. The process is in two senses: *it builds up the artefact and edifies the designer.* (Snodgrass and Coyne, 1997, p.25) In terms of the artefact, a human *loves to do what he does well and, having done it well, he loves to do it better.* (Bronowski, 1973, p.72) For the designer, engaged in an *inexhaustibly prolific and productive matrix, ...understanding plays back to elicit new responses from the past; and plays forward to elicit new responses from the future.* (Snodgrass and Coyne, 1997, p31) By asking children to design, I was asking them to engage in an activity they were likely to enthusiastically undertake. Indeed, the children were consistently cooperative and motivated, greatly contributing to my study's successful outcome.

Second, the process of design is synergistic with learning - as generatively conceived. In effect, this study comes very close to concluding that technological behaviour, particularly the designing demonstrated by these children, is learning behaviour. A strategic approach of designers is to solve a particular challenge by *generating a set of possible solutions to it.* (Reffat and Gero, 1999, p.2) This involves casting *a web of*

moves, consequences, implications, appreciations and further moves. (Snodgrass and Coyne, 1997, p.22) In the same way that value based choices drive the generative act of learning, design decisions require the designer to make *value judgments about objects and places* (Roberts, 1994 in Roth, 1998 p.18). By asking the children to design, I was setting in place events that were highly likely to engage them in learning activity that I could observe and at times, participate in alongside them, providing rich opportunities to glean their understandings oflearning.

Finally, such an approach provides an artefact to investigate. Examining a design artefact discloses the understanding of the designer, it *reveals one's pre-understanding and uncovers the preconceptions that are constitutive of the design outcome, at the same time [bringing] to light the prejudices that are constitutive of what* we *are.* (Snodgrass and Coyne, 1997, p.2S) As designers, we can express our *designerly way of knowing,* our ability to *both 'read' and 'write' in the material of our culture.* This ability makes it possible for a designer and observers to understand what objects mean, as they *'read' the culture,* and equips them to create *new objects that have novel messages.* (Baker, 1993, p.17) This approach, examining a design artefact, is very different to seeking responses from children by way of predictive evaluation methods, such as SEEM, the Structured Expert Evaluation Method, (Baaus, Bekker and Markopoulos, 2006) or survey methods, such as the FunToolkit (Read and MacFarlane, 2006). By asking the children to design I was provided with another medium for exploring their understandings of learning. They were able to make their views of learning known not only by way of conversation, but also by way of the sophisticated characteristics in their design. I was able to 'read' their design, to uncover in it their understanding, preconceptions and to find, as I did, a novel message.

10.4.2 The value of pursuing a similar research question to the children

The chance choice of the children's chosen topic of investigation *(How and why do* we *think and how come we're not born with the knowledge* we *know now?* See section 4.1) and my research question *(Can I find out how students understand learning by engaging them in an e-design challenge?)* contributed to the success of my study.

My task was to uncover, through involving the children with a technologically mediated design task, their understanding of learning. It is possible, considering those serendipitous characteristics of the design process examined above, that I could also have uncovered

children's understandings of learning if they had voted to select to investigate either of two remaining short-listed questions taken from their original list:

1. How do different medicines work?
2. What is gravity and how is it involved with the pattern and movement of stars and planets in our universe? What happened at the Big Bang and is space really empty?

However, as the following examples establish, my study's opportunity to succeed was greatly enhanced as a result of the children's decision to investigate knowledge and thinking.

If the children had decided to investigate gravity and the Big Bang, instead of exploring people's theories about dreams, Matt might have pursued people's theories about gravity. If this had occurred, I may still have been able to observe Matt generate and test his ideas, search the Internet and evaluate historical and current theories. I may also have been able to track and examine the way children discuss and challenge each other's ideas on discussion boards. I would not, however, had had the opportunity to listen to Matt discuss his ideas about how the brain functions, or his ideas about how our physical state might influence our psychological state. Nor would I have been privileged to analyse the online discussion children engaged in about dream theories, sharing and explaining their thoughts about how our brain engages with images, memories and reflections from our daily experiences. Moreover, if the children had decided to investigate how different medicines work, Kirsten and Ashleigh might have compared the medical histories of children at their school, rather than compare their original drawings. If this had occurred, I may still have observed the girls designing a clever experiment, drawing reasoned conclusions from what they uncovered. I may also have been able to examine a critical online conversation Kirsten and Ruth that discussed an informative experience Ruth remembered in regard to a medicine she had taken. I would not, however, have been fortunate enough to be able to uncover a conversation explicitly articulating a child's understanding of learning, as I did in my study when Kirsten offered her explanation of Ruth's Martian/margin experience. Indeed, because of the topic the children chose, not only was I able to observe the children learning and examine their design, I was also able to see them consider, investigate, theorise and debate the nature of learning. Their fortuitous topic choice was a crucial factor in my study's success.

10.5 Affirming the design-based nature of Papert's research approach and of this investigation

Having detailed the results of this study and accounted for its success, I now tum to consider how the findings of this study might bear on the theory of learning with which it began, particularly by examining the findings in terms of the methodological requirements laid out in Chapter Three.

I have already concluded that my study contributes three new insights into children's understanding of learning (see section 10.3.1):

- That they explicitly recognise and articulate learning generatively,
- That they can appreciate and examine the nature of the value system that drives both the ideas that children generate and how they test them, and
- That they want to broaden and enrich their opportunity to generate and encounter ideas of worth by seeking and appraising the experiences, understandings and beliefs of others.

I now examine these findings to identify if there is evidence of the shared key features of design-based case study research and Papert's approach to educational research, these being:

- The intertwining of the exploration and development of theories of education with the design and implementation of meaningful learning contexts for children,
- The research taking place through cycles of design, enactment, analysis and redesign, and their
- Transformative agenda (see section 3.7).

I can deduce that in my investigation, the development of the (generative) theory of education was intertwined with the design of a significant (in this case, e-)learning context for children. From my findings, I argued the value of design contexts for uncovering children's views of learning (section 10.4.1). My investigation also clearly illustrated the union between (in my case, generative) learning theory and the consequent design of a meaningful learning context in which children's views of learning could be studied (a methodological requirement of Papert's approach, see section 3.7). Children took on the roles of designers, developers, participants and evaluators. Their discussions concerning the creation of The Genesis Journey, and the artefact itself, provided a wealth of opportunities to clarify, confirm and consolidate my understanding of their views of

learning (see data chapters 4 - 8 and sections 9.2 and 9.3). This context placed the children in key design roles, making their views of learning visible, thereby revealing the ways they articulated the nature and value ofleaming behaviour (see section 10.3.1).

This research did evolve through cycles of design, redesign, enactment and analysis. Through cycles of design, evaluation and redesign, I was able to observe in the children's design their deep appreciation of the value system that drove the generation and testing of their ideas, analysing and verifying this observation as they implemented and evaluated their design (see section 9.3.3 and 10.3.1). A generative heuristic (of generating, testing and re-generating ideas) was prevalent; and the children examined the values underlying such testing (in the topics they chose to investigate (section 4.1) and in the manner in which they explored (section 4.3). Their pull towards such generative learning behaviour seemed to be instinctive; and their recognition of the central role values play in learning was conscious.

There was indeed a transformative agenda (see section 3.7). Children were given ownership of the topic, design, implementation and evaluation of The Genesis Project, privileging their role beyond the constraints of conventional schoolwork. This liberty not only disclosed the nature of the content children are interested in, but revealed the centrality of their desire to learn in community (see section 9.3.3) - to connect, compare and comprehend the ideas, values and experiences of others, and to do so technologically (see section 10.3.2). The scope of this study made clear to the children themselves that this was an opportunity for them to divulge an understanding of learning that might transcend the ideas that underpin formal education.

So, I can now affirm that Papert's five-step approach is, in operation, design-based case study research, legitimating its choice as the methodological foundation of my investigation.

10.6 Summary of Chapter Ten

This chapter has answered my research question, *Can I find out how children understand learning by engaging them with an e-learning design challenge?* This experiment was a success. By engaging children with an e-leaming design challenge I was able to uncover that children understand learning to involve generating, testing and modifying ideas, and appreciate that these ideas, tests and modifications are influenced by each leamer's

values. Moreover, they recognise great value in undertaking this knowledge gaining activity as part of a learning community. This study also uncovered that children explicitly enact opportune learning experiences, particularly technologically. This chapter acknowledged two key factors that contributed to the success of my investigation, the choice of a design context for this investigation and the similarity of the children's chosen topic and my own research question.

The remaining tasks of this thesis will be undertaken in my final chapter, where I will consider critically the implications of my work and directions for possible future study.

Chapter Eleven
Summary and Implications

I asked *Can I find out how children understand learning by engaging them with an e-learning design challenge?*

Here, first, I present a summary of the study. Secondly consider the possible limitations of this study and its findings, thirdly, outline some implications its findings have for learning and teaching, methodological implications and fourthly and finally suggestions for further work.

11.1 Summary of this study

To justify asking this study's research question, *Can I find out how children understand learning by engaging them with an e-learning design challenge?* I began by establishing a two-pronged case from previous research findings:

- That children's understanding of learning is of significance, and
- That it appears to be of value to pursue their understanding by engaging them with e-Iearning design.

To demonstrate the value of children's understanding, I presented a small selective set of studies exemplifying growing research interest in the views of young children in a wide range of disciplines and fields. I did not adopt the traditional view of children as incapable, incomplete respondents with research findings showing them to be knowledgeable, sophisticated and at times holding views in sharp contrast to the opinions offered on their behalf by adults. In essence, this study challenged educational practice.

A recent growing interested in children's views of learning was identified, focusing on children's experiences, attitudes and perceptions of school activity and educational relationships. While some research is now pursuing children's views of selected learning experiences and contexts, I argued, on the basis of children's privileged social position and their brain's phenomenal growth during early life, that they may well be equipped to contribute insights, which researchers have thus far neglected or not tried to elicit ingeniously enough, concerning a deep, comprehensive understanding of learning.

I addressed the linguistic challenge of eliciting children's views oflearning by choosing a context for research that would likely provide and provoke situations in which children might be able to demonstrate their understanding of learning. To identify, but also to design such a context, a biologically based theory of learning (in which learning is understood as an adaptive, knowledge gaining behaviour), underpinned the study. This theory acted both as a frame of reference alongside which to make meaning of the children's views and to provide guidance for the design of a potentially significant learning context.

Having established the value of investigating children's views of learning, and having selected a theory of learning to inform the study, I turned to consider the potential of e-learning design as a context in which their views might be elicited. A cluster of e-learning studies was presented. The technological and educational power and legitimacy of these studies was established: first, by interrogating them in terms of the ideas of two key philosophers of technology (Ihde (1990) and Bronowski (1973» and then, by examining them in terms of Papert's (1991) layers of technological fluency and Schaverien and Cosgrove's (2000) generatively principled model of technology-and-science education. The set of studies illustrated the diverse ways that e-learning design can equip learning experiences, suggesting the worth of this attempt to elicit students' views of learning within such a context.

This study's research design and methodology followed Papert's (1973) five-step approach to educational research. A theory of education was selected (a biologically based generative theory) and an ensuing set of conditions for the intellectual growth of children designed (an e-learning design challenge). These conditions were implemented (within the context of GENESIS Project): the children were equipped with the opportunity and resources to design an e-learning environment to explore a science-and-technology topic of their choice *(How and why do we think? How come we're not born with the knowledge we know now?).*

The experiment was a success. First, the children determined that the environment they created, The GENESIS Journey, succeeded in solving the e-design challenge. The environment met the criteria the children had generated. It was engaging, it equipped individuals' inclinations and it inspired ideas and discussion. Secondly, the children learned during this experiment. Their diverse inquiries were rich with Schaverien and Cosgrove's (2000) acts oflearning as derived from the generative learning theory. Most

crucially, this experiment succeeded in uncovering children's views of learning, thereby enabling me to answer my research question. We can find out children's views of learning by engaging them in an e-Iearning design challenge. This investigation has revealed that:

- Children understand learning to involve generating, testing and modifying ideas, and appreciate that these ideas, tests and modifications are influenced by each leamer's values. Moreover, they recognise great value in undertaking this knowledge gaining activity as part of a learning community.
- Children explicitly enact opportune learning experiences, particularly technologically.

Moreover, the findings of this study advanced the theoretical model of learning held by our research group. By adopting Papert's five-step approach to educational research, with its close correlation to design-based research (as presented in section 3.7), this case study revealed the value of design contexts for uncovering children's views of learning (as argued in section 10.4.1). This research context, with children in key design roles, facilitated the affirmation of children's recognition of generative learning, and assisted the revelation of their explicit articulation of the nature and value of such behaviour (see section 10.3.1), particularly within... It also clearly illustrated the value of both research approaches requirement to intertwine the exploration and development of educational theories with the design of meaningful learning contexts (see section 3.7), for the children's discussions concerning the design and development of The Genesis Journey, and the artefact itself, provided a wealth of opportunities to clarify, confirm and consolidate my understanding of their views (see chapters 4 - 8 and section 9.2 and 9.3). Indeed,

Having answered this study's research question, I now tum to consider the possible limitations of this study and its findings, and to outline some implications its findings have for learning and teaching, methodological implications and suggestions for further work.

11.2 Considering the findings and the possible limitations of this study

As a case study, this study's findings are not meant to be immediately generalisable. Furthermore, though data has been accumulated from periodic visits to three schools over a sustained time period, it has been treated as a whole set here. Consequently, the data set

tells a story that is more like a hive mind (after Kelly, 1995) than a set of detailed individual cases. This strongly suggests the need for additional research studies of similar e-design opportunities for young children to address specific methodological constraints of this study, including:

- Researchers' spaced and limited visits to each school site;
- This study's investigation of children's understanding of learning within only one key learning area - science and technology;
- The necessity of out-sourcing the final development phase of The GENESIS Journey to a media design company and university programmers (even though the environment was built to the children's specifications and they, the children, approved prototypes along the way);
- The project's significant technical difficulties at one school as a result of failed broadband access; and,
- The study's difficulty in gaining insights from the broader GENESIS community including parents and teachers.

It was unfortunate that the children were required to return to normal school routines at the end of the fifth phase of the project. This limitation meant I was not able to examine how the children might have regenerated their ideas about their topics and their environment, had they continued being involved in GENESIS activity. Another generation of GENESIS travellers may have provided me with an opportunity to validate or re-examine my findings about children's understanding of learning, and allowed me to explore with the children how their ideas might have advanced. It is significant to note that while the wave of activity ended at this time, the environment that the children had designed would have been able to support continuing learning journeys. Indeed, travellers to The GENESIS Journey had posted ideas about further experiments and sought out fellow travellers who might like to engage in future research. Moreover, even as the demands of the school system once again claimed their time and attention, some children hopefully returned to the discussion boards to see what might be happening in GENESIS.

The study has taken license and attributed a view of learning to a whole body of children. While there is a need for future studies to test the strength of this finding in diverse student populations, this study provides strong affirmation of this finding within the participant population, citing a wide diversity of examples and instances of confirmation from many children that they hold this view of learning.

These limitations suggest that if these findings about children's views of learning in such contexts are to be further tested, there would be value in conducting such research within a single school, or even a single class where the teacher has a strong understanding of the project's underlying philosophy of leaming. Embedding such a project within a school community, securing executive support and providing the needed technical infrastructure, would provide an opportunity to see if these findings can be further validated. As well, it would allow researchers to pursue children's views of learning in other key learning areas and draw a more comprehensive data set from detailed case studies of particular children or groups of children, including insights from their parents and the class teacher. In this setting, the continuing, generative nature of such a research project would not need to come to an abrupt end, and children could be equipped to design and develop all aspects of their anticipated environment.

11.3 Situating this study's findings and considering its implications for future educational research

In order to situate this study's findings and to consider its implications for future educational research, I first examine the three pillars on which it was based, before turning to discuss a current field of educational research which might give further critical insights into this study's contributions.

The present study's search for an education that is in the best interest of children arose from the hypothesis that children may well be strongly equipped to shape such an education. This hypothesis emanated from the groundbreaking work of Piaget, in establishing the understanding of children's developing minds as a serious and worthy field of study. Situated within this research field, my investigation focused upon uncovering children's views of learning by way of e-learning design. So, my study was built upon the particular worth of three initiatives, these being:

- Investigating the potential of uncovering and privileging children's view of learning,
- Examining the learning value of e-designing activities, and
- Enacting the democratic ideals of a number of significant educational theorists and philosophers.

By comparison and contrast, examining the current prevalent educational research focus on students' argumentation (deriving from Toulmin's (1958) framework) provides us with a fertile source of insights into the particular distinctive contributions of my study.

11.3.1 The three pillars on which this study was based

I now briefly revisit each of these initiatives in light of my investigation and consider this investigation's implications for learning, teaching and educational research.

Investigating the potential of uncovering and privileging children's views of learning.
The findings of my study demonstrated that children are competent participants m research and are able to make their views about learning known. Moreover, these views were shown to be sophisticated. In this way, my findings correlate with those of Wall and Higgins (2006), Danby and Farrel (2004), Carney et al (2003), Roose and John (2003), Franklin (2002), Girling, Sparks and Smith (1999) Green and Hart (1998), and Chandler (1997), and their work to uncover and promote children's views. I concur with Danby and Farrell (2004): the children in my study were not too young to be able to communicate their view competently. The children of my study, like those which whom Chandler (1997) worked, were able to make sophisticated judgements, using multiple criteria, without having to be taught to do so. They were knowledgeable and had worthwhile ideas, as were the children with whom Green and Hart (1998) explored accident risk and prevention.

Furthennore, the findings of the present study endorse those who seek the views of children in educational contexts (such as Flutter and Ruddock, 2004; Goodison, 2002; Blatchford, 1996; Pollard, 1996 and Tunstall, 1996). Significantly, however, the findings of this study demonstrate that children can do more than offer views on their experiences, attitudes and perceptions of school relationships and activities, by way of scaffolded conversations. Wall and Higgins (2006) recognised the neglect of looking in detail at children's thoughts and views of specific learning tasks or specific contexts. This study addressed that concern, and demonstrated most clearly that children are able to contribute a view of learning that is more extensive than simply school activity, curriculum or pedagogy.

The children's distinct and knowledgeable views about learning were most clearly revealed in their familiarity with and concern regarding many features of existing e-learning environments. Their frustrations with following set pathways and having to agree with the computer by entering required, set answers were discussed, and such features were avoided in their own design. Moreover, their content concerned a complex and in many ways contentious topic (how and why we think and the development of

knowledge), and the fun they sought and shared arose from engaging with challenging new ideas, not from increasing their point score or printing achievement certificates. Existing environments with which they were familiar, designed by adults on their behalf, did not align with these children's understanding of learning. Similar studies are needed to test and strengthen these findings, for if they are validated they have implications for those who design and implement learning activities for children (in terms of content, sequence, objective, complexity and adaptability), and also those researching learning (in determining what counts as achievement and how learning is recognised and assessed.)

To speculate more fully on the potentiality of uncovering and privileging children's views, I now re-examine their understanding that learning can be thought of technologically, and consider the implications for e-Ieaming research and design if children are recognised as technological thinkers.

Examining the learning value of e-designing activity.

The findings of my study demonstrated the potency for learning of e-Ieaming contexts in which children can be designers, in this way affirming and extending the findings of those e-Ieaming studies presented in Chapter Two. The children involved in GENESIS affirmed Resnick's (2002) conviction that young people are ready and eager to do more with computers, by way of their high level of enthusiasm and tenacity. The GENESIS Project, like the Kaleidostories project (Bers, 2003), sought to explore the role new technologies might play in assisting children to uncover the nature of their own thoughts and those of others. In both cases, the children made use of the e-Iearning environments to share their opinions and to access and assess the ideas of their peers. My study also strengthens the findings of Mbodj's (1995) investigation of Radio Gune Vi. In both studies, children were given ownership of the project and equipped to develop and implement it. Both audiences responded positively, demonstrating children's ability to understand and appreciate the potency of new technology and the nature of their learning community. Moreover, in the same way that the village leader from Nong Baot (Cavallo, 2000) expressed his belief that certain ways of using technology could help his community gain more control over their lives, the environment the children in the present study designed provided them with greater control over their learning. The villagers desire to gain access to knowledge and make decisions themselves on what to do with such knowledge was echoed in the GENESIS children's aspirations.

As I examine the work of my study within the context of e-leaming research, a central consideration emerges. The children involved in this project were operating at the third and highest level of Papert's (1991) classification of technological fluency. These children showed themselves to be technological thinkers, capable of having technological ideas, in this case about learning. This understanding of these children's ability significantly extends research investigations focused on only children's use and practice of technology. To put this in Ihde's (1990) terms, the findings of this study suggest that these children sought out the hermeneutic capacity of the technological media they had at their disposal. The children valued and pursued their capacity as interpretive media for interacting with ideas, and seeking relationships and responses from others.

The children involved in this study produced a successful, innovative e-leaming environment, demonstrating their competence as e-leaming designers. Their design revealed their generative understanding of learning. If further studies confirm that children view learning this way, if they substantiate the aptitude and ingenuity of children as e-designers and technological thinkers about learning, this may lead to the increased involvement in, or ownership of, the design and development of generative e-Ieaming environments by children. The findings of this study point to the following possible consequences of such an outcome.

There would be an increase in the design of e-leaming environments that involve exploring topics selected and valued by children. These would be in contrast to environments that present the predetermined, linear content of curriculum documents. Such environments would enable children to consider, compare, challenge and contribute content and ideas. Children would not have to memorise and recall upon request set material built into the enviro,nment. Generative, child designed environments would allow children to hold differing views based upon their experiences and values, while also providing children with opportunities to test their views. All children would not be required to reach the same conclusion. Such an outcome, the increased development of generatively characterised e-Ieaming environments, presents significant challenges for those currently teaching with and researching e-Ieaming environments. Further research is needed to enable the educational community to rethink how to recognise and assess learning when children investigate topics of their choice, -- possibly exploring the unknown - engage actively within a learning community and generate distinct, personal, technologically mediated learning pathways. The findings of this study strongly suggest the worth of involving children in this educational conversation.

Enacting key democratic ideals.

The findings of this investigation align with the democratic ideals of the educational theorists and philosophers who informed this study. The children continually displayed the unquenchable desire Holt (1970) describes, for understanding their world and gaining freedom and competence within it. As Dewey (1897) counselled, their own instincts and powers proved an advantageous starting point for their learning experience. The children themselves sought an experience that would allow for individual variation and for their participation in the identification of worthwhile activities, envisaging, as Postman and Weingartner (1973) did, learning environments where not all children are required ,to engage in the same activities. The children capitalised on the chance they were given, by way of technological design tools, to step away from being *objects to which things happen,* revelling in the opportunity to become *active shapers of their own school experience.* (Postman and Weingartner, 1973, p.39) Indeed, the correlation between these democratic ideals and the findings of this study build a strong case for there being a place for children to voice their understanding of what education is in their best interest, the education that The Declaration of the Rights of the Child claim they are entitled to.

11.3.2 Examining the current prevalent educational research focus on students' argumentation (derivingfrom Toulmin's (1958) *framework)*

A current research approach to exploring ways of evaluating science learning in e-learning environments involves coding and tracing components of rhetorical arguments that children post online. Many of the tools developed to evaluate the quality of these arguments draw on Toulmin's (1958) perspectives of argumentation and involve classifying children's statements into one of the following categories: claims, data, warrants, backings, qualifiers and rebuttals. The quality of an argument is determined by *the presence or absence of these different structural components. Stronger arguments contain more of these different components than weaker arguments.* (Sampson and Clark, 2005, p.656) According to Sampson and Clark (2005), studies assessing argumentation in science education are looking to answer questions such as:

> *How do students, who are not members of the scientific community, generate arguments? What type of reasoning do students use when they construct arguments and how is it different than scientists? Are students able to assimilate the desired practices of argumentation as a result of classroom instruction?* (p. 655)

Such researchers use the data gathered from such studies to consider explicit teaching strategies that may produce 'stronger' arguments (Park and Kim, 2006), ways of customising e-learning environments to provoke particular components of arguments (Sampson and Clark, 2005) and contemplate questions to pose that would challenge students' assumptions (Foo and Looi, 2006). An examination of several recent such studies brings to light several distinctions between this present study and an argumentation approach to evaluating learning in e-learning environments.

The practice of analysing students' online contributions for evidenced based explanations stems from an understanding that the practice of argumentation is *an essential feature in education* (Mona and Hug, 2006, p.888). Their students' comments are scrutinised, e-learning environments customised and teaching programs explicitly developed to *provide students with opportunities to demonstrate and promote their reasoning skills based on scientific investigation.* (Park and Kim, 2006, p.5) In studies where researchers are keen to obtain students' *written claims to a given question, written evidence, explanation and conclusion* (Mona and Hug, 2006, p.888) it follows that text-based collaborative environments are a *natural choice* (Clark and Sampson, 2005, p.84).

This present study recognises argument, justification by way of explanation, as one act of technology-and-science learning, an act deeply interwoven with five others: exploring, designing, making, operating and understanding (Schaverien and Cosgrove's (2000) generatively principled model of technology and science education). While the data collected from children's written and spoken explanations played a significant part in this study's analysis, the experiments they developed, the videos they filmed and edited and their understanding of the worth of their environment (indicated by the evaluation tools they designed) were equally sought and analysed. Indeed, very early on this study acknowledged our language's sparseness (and hence children's possible linguistic paucity) in describing learning (see Section 1.3). This study pursued a much expansive view of learning, to uncover as many acts of learning as possible, and bring them to light in whatever manner they might reveal themselves. To do so it privileged diverse data sources.

As a result of examining the components of students' arguments in text-based environments, these educational researchers make recommendations for classroom practice and propose ways to customise e-Iearning environments to guide learners' activity. Their classroom recommendations guide teachers to be *focused on creating*

opportunities that convince students of the of epistemological understandings in their decision making process (Kenyon, Kuhn and Reiser, 2006, p.32l). In their view, teachers can employ an explicit teaching strategy to improve student argumentation through prompts and questions, guiding them to express higher quality arguments. (Park and Kim, 2006)

While teachers following such strategies can guide students' learning within the classroom, e-learning environments can be customised to influence students' participation in online asynchronous forums, or Computer-Supported Collaborative Learning (CSCL) environments. Such environments *can implement special tools and scaffolds to guide learners in effective argumentative knowledge construction.* (Weinberger et al. 2006, p.l094) As well as guiding learners' knowledge construction, scaffolding tools can be used for *assessing students' argumentation in online asynchronous forums.* (Clark and Sampson, 2005, p.76) Their scripts can facilitate specific discourse activity (Weinberger, Stegmann and Fischer, 2006) and, as students are guided to construct arguments, it is understood that *their argumentative knowledge can be improved on a cognitive level* (Weinberger, Stegmann and Fischer, 2006, p.l096).

From this brief description of the field of researching argumentation, it is clear that such activities, programming software to prompt children to respond in particular ways and developing explicitly directed classroom activity, *implicitly assume an authoritative relationship between the assessor (the knower) and the assessee (the learner).* (Delandshere, 2002, p.1479) The researchers involved in this present study did not presume that adults alone were 'knowers' or work, by prescribed processes, to direct children to their predetermined epistemological goals, with specific assessment criteria. This study recognised preeminent place of children as learners and looked for their distinctive and crucial role in informing our view of what is valuable and rewarding learning. Rather than researching only how educational environments may be used to shape children's learning, we sought to investigate how insights from children's learning, in their own right, may help to shape educational environments for the better.

11.4 Concluding Comments

Reviewing his chapter on cybernetics in *The Children's Machine* (1993), Papert wrote that the deep point he was trying to make, was to offer examples of children's learning style, *showing different content, different styles of learning, different epistemology, and a*

different medium all matched to one another and to a form of school structured without curriculum Or age segregation (Papert, 1997, p.426). I offer this present study as another example to consider. From it I am able to distil the following characteristics of learning opportunities that the GENESIS children would consider to meet their needs, learning opportunities that:

- Offer personal meaning and challenge, satisfying their innate desire to make sense of their world,
- Recognise the driving force of our value system (consistently with a biologically based generative view of learning) in the pursuit of knowledge and the nature of understanding and appreciate that the ideas each person generates and the style in which they pursue learning are distinctive, and
- Enable children to work alongside others in a learning community, enriching their learning encounters by identifying, pursuing and engaging with those who can challenge or substantiate their beliefs and understanding, and

It is Papert's (1997) view that such a model of learning is incommensurate with the deeply rooted features of School such as *bureaucratically imposed linear curriculum, separation of subjects and depersonalisation of work* (Papert, 1997, p.424). In fact, he considers that enacting such the ideas in the schools of today could be as constructive as strapping a jet engine onto a stagecoach.[131] Such a culture shift would require the fundamental reform of current learning environments, or the evolution of new learning and teaching models. Despite the difficulty of such a shift, it is encouraging that the timidity that prevents flights of such learning departing from standard classrooms has not halted all exploration. Stager (2005) reports students' recognition of their own *growing curiosity and thinking ability as they demonstrate remarkable creative and intellectual gifts* (Stager, 2005, p. 8) while engaged in long-term projects based on *personal interest, expertise and experiences* (Stager, 2005, Stager, 2005, p. 1). It is poignant that a juvenile detention facility is the location granting such learning freedom.

Cavallo (2004) believes that the key elements to enable fundamental change in education are the creation of experiences that challenge ideas about learning and that *simultaneously provide the basis for the reflective development of alternative models* (Cavallo, 2004,

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131 In *Mindstorms* (Papert, 1980) Papert included a parable about an engineer who invented the jet engine in around 1800. *Since he was dedicated to improving transportation, he took his invention to the people most involved with transportation, namely the makers of stagecoaches. He said, "Look, I've got this thing. Find out how to use it." So the makers of stagecoaches looked at it and they said, "Well, let's tie it on to a stagecoach and see if it helps the horses." So they tied the jet engine on the stagecoach and of course it shattered the stagecoach to pieces.* (Papert, 1997, para. 4)

p.109). The children's experience of participating in The GENESIS Project uncovered views that challenge ideas about learning. Their experiences also provide a basis for considering the development of alternative educational models. It is our view that the expansion of child-designed e-learning environments may well cultivate this style of educational change.

Such e-learning environments would involve exploring topics selected and valued by children. These would be in contrast to environments that present the predetermined, linear content of curriculum documents. Such environments would enable children to consider, compare, challenge and contribute content and ideas. Children would not have to memorise and recall upon request set material built into the environment. Generative, child designed environments would allow children to hold differing views based upon their experiences and values, while also providing children with opportunities to test their views. All children would not be required to reach the same conclusion. Such an outcome, the increased development of generatively characterised e-learning environments, presents significant challenges for those currently teaching with and researching e-Iearning environments. Further research is needed to enable the educational community to rethink how to recognise and assess learning when children investigate topics of their choice, – possibly exploring the unknown - engage actively within a learning community and generate distinct, personal, technologically mediated learning pathways. The findings of this study strongly suggest the worth of involving children in this state-of-the-art educational conversation.

The children involved in the present learning journey generated rich, powerful ideas about learning. As technological thinkers, they proved to have informed, beneficial and imlovative contributions to make to our community's understanding of learning, the purpose of education and the promise of technological disclosure as instruments of learning. The next step in the battle for epistemological liberty (after Papert, 1990) will be to explore if children and teachers together can manoeuvre these instruments to implement educational change. Whether our journey entails false starts, time in the wilderness or reaching summits, we will not be exploring alone. As this generation of technological innovators comes to the fore, *there will be more tries, and more and more. And eventually, somewhere, all the pieces will come together and it will "catch."* (Papert, 1993, p.182).

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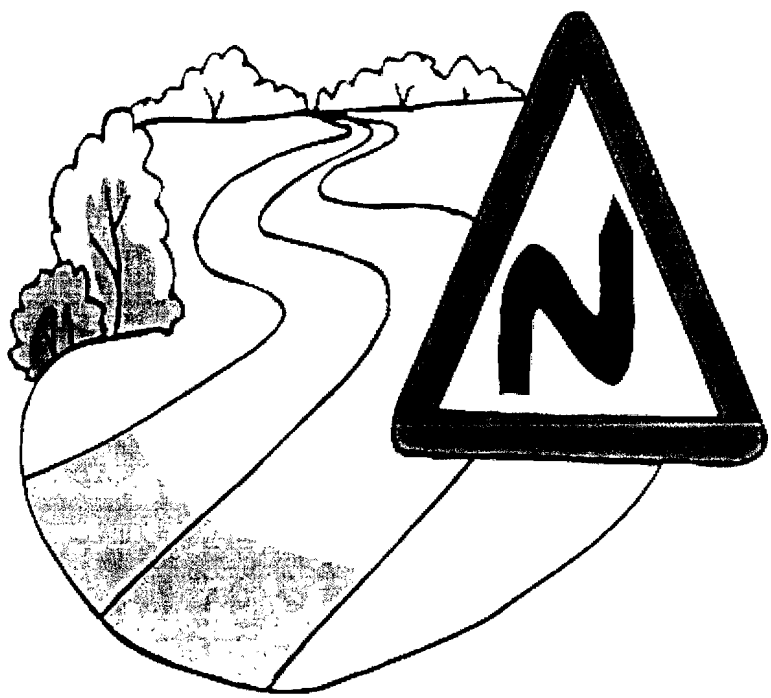
Appendix One
The Investigation Booklet

the Genesis Project

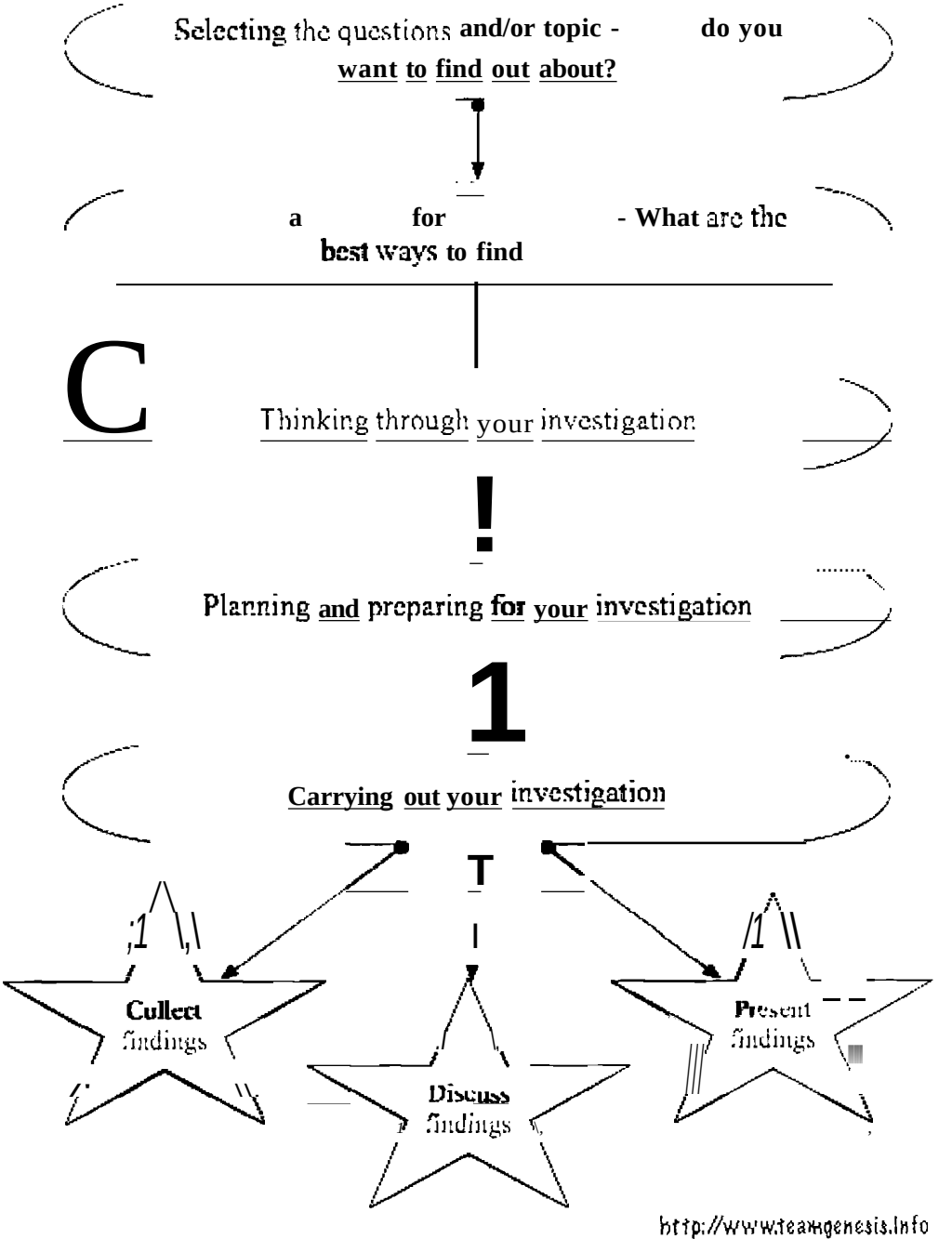
Investigation



Investigate *your* topic:
Ask questions
Try things out
Research
Explore
Ponder
Experiment

The Genesis Project

Stages for Investigation



The **Genesis** Project

Library / Web Research

Things to Think Through...

* What are you looking for?
* Arrange to meet Wilh your school librarian lO with them about

* **Are** there other libraries you can visit?
* What can you do with the information you find?
* What web sites are going tu be most helpful?
* Who has published these web sites?
* Keep a list of the resources you find alld use.

Thoughts...

Contact Over"view;

Libraries lt) visit.

Web sites to search for.

Possible outcomes of research:

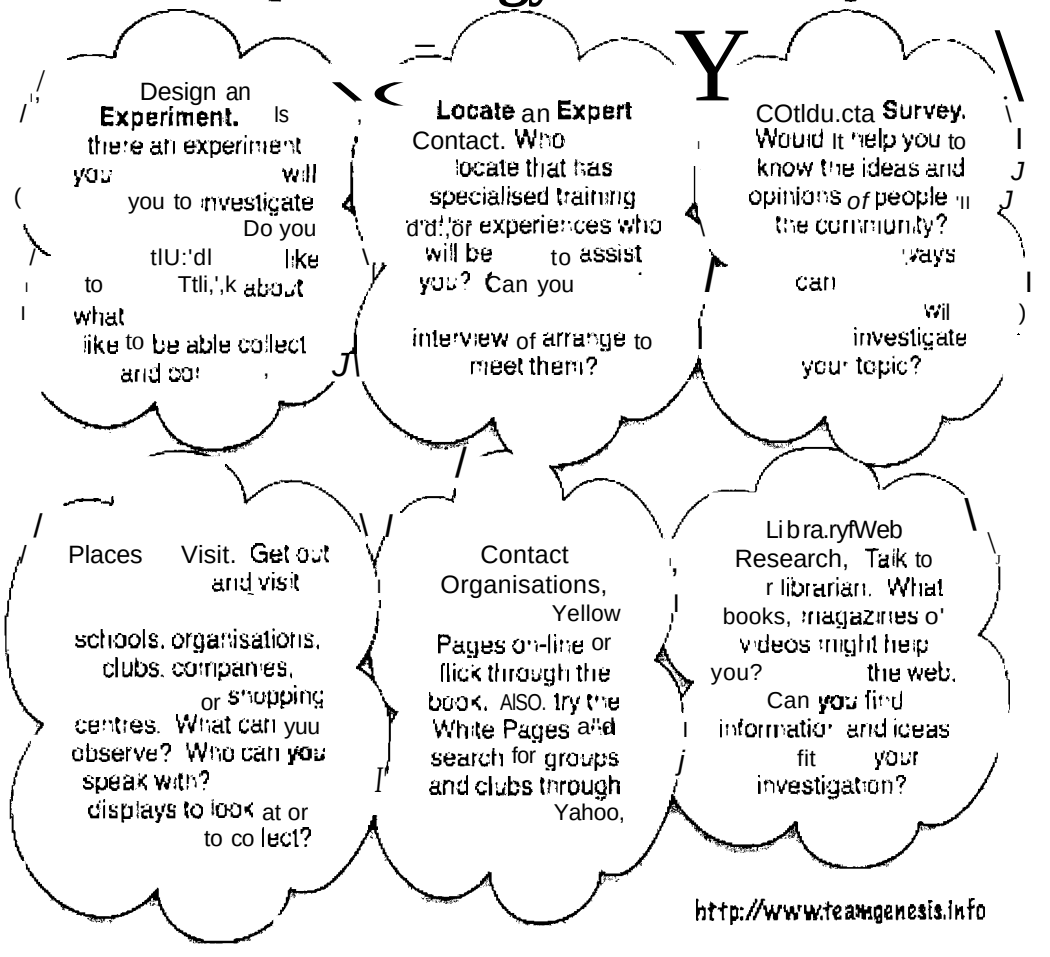
Records to take and information to collect.

Thoughts, expectations, concerns...

The Genesis Project

Selecting the Question/Topic

Selecting a Strategy for Investigation



http://www.teamgenesis.info

The Genesis Project

Contacting an Expert

Things to Think Through...

- Where will you find them on-line, Yellow Pages, through
- **What do you want to ask about?**
- How will be able to help you?
- Be prepared to explain who **you** are and what you are after.
- What is the best way to communicate with them?
- Can they put you in touch people?

Thoughts...

Contact Overview:

Possible experts to get in contact with:

How contact will be made with each.

Possible outcomes of contact.

What needs to be prepared:

Thoughts, concerns and expectations...

The Genesis Project

Experiment

Things to Think Through...

.. What you to try to

* How can you make sure your experiment will find this thing out?
.. Is it safe? Is it
* What are you to need to prepare?
* How many people will need tu be involved? What sort of people?
.. What will need to let know?
• low will the results? How will you make sense of them?

Thoughts...

Experiment Overview:

Description of the experiment:

Who will be involved?

lind it will happen:

What needs to be prepared:

Thoughts, expectations, concerns...

The Genesis Pfoject Contacting Organisatio ns

Things to Think Through...

- How are you going to get in contact?
- Check willl your teacher before you attempt to contact an organisation.
- Be ready to you are and what you want.
- Do they have a person whose role it is to communicate with
- Do they resources available for you to look at - Videos or pamphlets?
- Can they give you advice about who else to contact?

Thoughts...

Contact Overview:

Possible organisations to **get** in contact with:

How **contact** will be made with **each.**

Possible outcomes of contact.

What needs to be **prepared:**

Thoughts, expectations, concerns...

http://www.teamgenesis.info

The Genesis Ptoject

Conducting a Survey

Things to Think Through...

* What exactly do you want to fiml out?
* the yOLI will need to ask?
* liow many questions? Who will you ask?
* What type of answers do you want - sentences, select from choice, scale or rank?
* liow much time will il take fur people to complete?
* 1low are you going to collect the answers?
* How wi]] of your findings?

Thoughts...

Survey Over-view:

Description of the survey, including questions and answer options.

Who will be involved.

What needs to be prepared:

Where and when it will happen.

concerns...

The Genesis Project

Visiting a Venue:

Things to Think Through

- **What is the purpose of** your trip?
- When will be the most suitable time to visit?
- Make sure is amUlged.
- What will you need to take to record useful information?
- Prepare for the visit - what is there to see and try, who can you speak with?
- Are there resources ca11 collect?

Thoughts...

Visit Overview:

Possible places to visit:

to and a selection.

Possible outcomes of visit:

What needs to be visit:

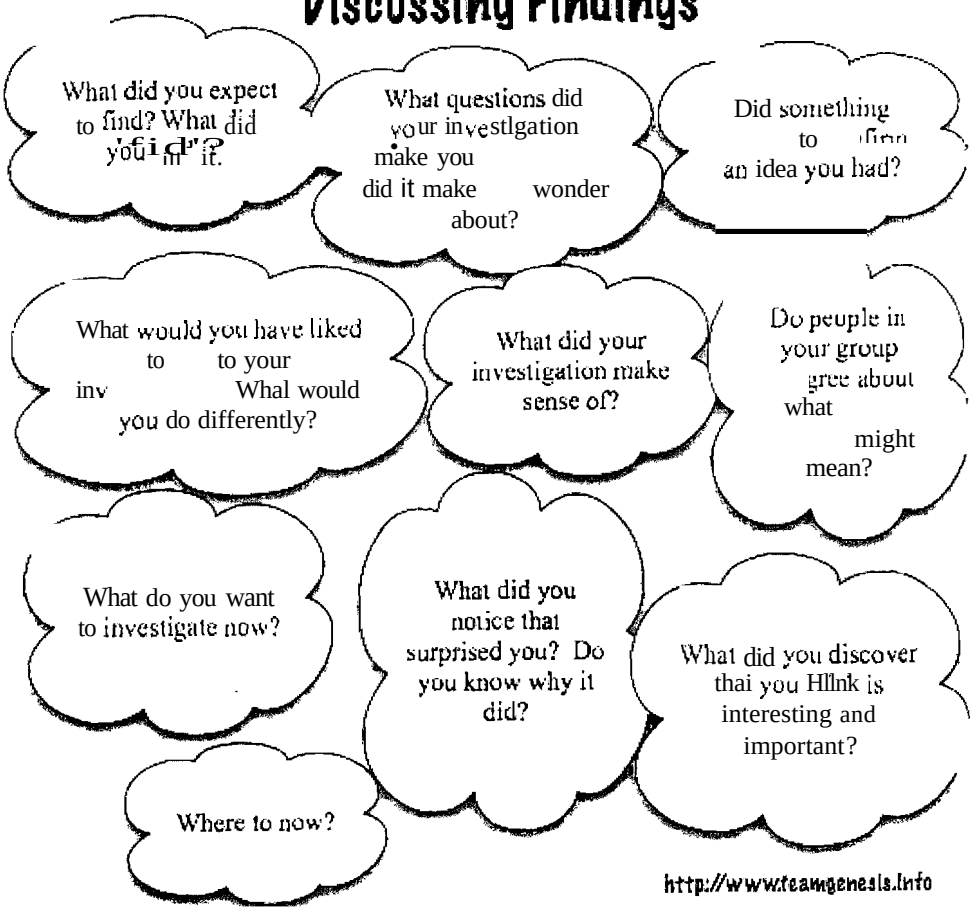
expectations, concerns...

The Genesis Project

Collecting Findings

What information have you collected?
How are you going about making of your

Discussing Findings



http://www.teamgenesis.info

the Genesis Project

Presenting Your Findings

Think fo,. moment .boul how might p,esent you' findings, You might like to make a poster, make an iMovie that tells your story or results, a script of show ora taJkback radio program that deals with)'out topic - or you might different idea. Different investigations will suit report styles. What are your at the moment?

Look for links between the diITercnt ideas you hav your lm'estigation. Can you use these as categories for reporting your findings? Make sure report about what you were trying to do, how)'ou wellt about it, why you tried strategy, what you found out, how successful you think your investigation was and what you think the next step ill future investigations should be.

Have you included in your presentation to all the buuks, web sites and people you used to help you?

Appendix Three:

The discussion boards from the Toy Choice House, Obstacle Course House, Recall and Recognition House, Chatterbox House and the Drawing Test House.

Toy Choice 1

Wondering One
Can you think of a toy that both boys and girls enjoy? What do you think makes this toy appealing to both sexes?

Jessica on 11 May 2004 (10:46 AM)

A pencil that has 10 different colours, an eraser, lollies installed into the tip and little rolls of paper to write on.

Responses:

Kathleen 11 May 2004 (10:53 AM)

But would something like this exist currently? Perhaps other people could invent such a toy.

Stephanie 8 lun 2004 (11:55 AM)

Probley because they want people to buy it and they want more money. They want to be famous.

Caitlin on 11 May 2004 (11:01 AM)

I can think of one game, Monopoly. It doesn't have absolutely everything either femine or muscular. It can be enjoyed by both genders. I think a game like Monopoly is much needed serenity from this sexist world.

Responses:

Constance 11 May 2004 (11:48 AM)

i think toy story is a boy and girl thing

Mary 11 May 2004 (11:51 AM)

but a toy and a game are not the same. so monopoly is not a toy yoyo is

Marina 11 May 2004 (11:51 AM)

I think an yo yo will be good

Caitlin 25 May 2004 (2:47PM)

I don't many people cannot master it. if they cannot they will get frustrated and angry, not good!

Autumn 8 Jun 2004 (11:43 AM)

Babies can play monopoly and boys don'y usually be sit there to play games. I think they perfer to run around.

Autumn 8 Jun 2004 (11:44 AM)

Babies can't play monopoly and boys don'y usually be sit there to play games. I think they perfer to run around.

Kathryn 8 Jun 2004 (11:52 AM)

i think that Mega buck's is a good game to play for both genders and i teaches you your mathematics and the buissness of buying and selling.

Shayna 22 Jul 2004 (10:16 AM)

I think Cludo is a great game for boys and girls

Navroz 11 *May 2004* (11:53 *AM)*

i think that most board games are suitable for both genders. Small toys are not always appealling to both genders.

Responses:

Leanne 11 May 2004 (11:55 AM)

both boys and girls card games and bord games

Caitlin 25 May 2004 (2:47 PM)

Board has an A Leanne

Riana 8 Jun 2004 (11:09 AM)

Yes i agree with Leanne.

Stephanie 11 *May 2004* (11:56 *AM)*

I don't really understand what the wondering one is.

Responses:

Caitlin 25 May 2004 (2:48 PM)

Riiiiight

Joshua 5 Aug 2004 (10: 18 AM)

it means what toys are enjoyed by both boys and girls like .
dudo

Navroz 11 *May 2004* (11:57 *AM)*

i think that most board games are suitable for both genders. Small toys are not always appealling to both genders.

Responses:

Riana 8 *lun* 2004 (11 :06 AM)

I agree with Navroz. I like board games and so does my brother. There are also board games for the whole family, ego monopoly and scrabble

---

Deanah on 11 *May 2004* (11:58 *AM)*

i think girls and boys enjoy fluffy animals, electronic moving toys, inflated objects,singing toys, toy phones and many others to come

Responses:

Caitlin 25 May 2004 (2:49 PM)

Boys will not normally enjoy FLUFFY toys. as if1

Riana 8 *lun* 2004 (11 :07 AM)

I agree with Deannah, but i do not agree with boys 1ikeing the fluffy animals and probably not singing toys either!

Charles 19 *May 2004* (11:51 *AM)*

science experiments because a boy could do an experiment he enjoys and a girl could do an experiment that she enjoys

Responses:

26 May 2004 (1] :54 AM)

I think so too charles

Justin 26 May 2004 (12:05 PM)

I agree with you charles.

Riana 8 lun 2004 (11:08 AM)

I agree with all of you.

Hailey 16 Jun 2004 (6:44 PM)

I agree too

Mark 23 lun 2004 (12:10 PM)

i agree as wael

Katarina 28 lun 2004 (6:02 PM)

Yes, I agre to, But not all girls like experiments, a long time ago in another school, it was a sicnce lesson and this realy fusy girl didn't want to do eany of the experements, one was with a dead rat which i can understand but one of the others was"how many marbils can I put in this jug with water before it overflows and she said that she was afrade to get wet, but the teacher mad her do it any way.one toy is the nintendo or computer and pritty much everyone likes them.

Mark 29 lul2004 (10:28 AM)

yes i agreeee

Kathleen *on* 25 *May 2004 (2:05 PM)*

Maybe for babies of both genders, building blocks.

Responses:

Autumn 1 lun 2004 (12:00 PM)

It depends on what colour they are. There are some that are light in colour for girls and daker colours for boys.

Kathleen 8 lun 2004 (11:06 AM)

Not necessarily. My baby cousins play with building blocks, whatever shape or colour. But I agree that the normal human instinct is to think lighter colours for girls, and darker colours for boys.

Kathleen *on* 25 *May 2004 (2:06 PM)*

i think that most movies, such as "Shrek", and "Finding Nemo"

Responses:

Autumn 1 *lun* 2004 (12:01 PM)

They are suitable for primary school kids.

Kathleen 8 *lun* 2004 (11:07 AM)

That's not entirely true. My parents watched "Shrek" and "Finding Nemo" and both of them enjoyed they thoroughly.

Kathleen 25 *May 2004 (2:06 PM)*

i think that most movies, such as "Shrek", and "Finding Nemo"

Responses:

Caitlin 25 May 2004 (2:49 PM)

Movies are not toys Kathy

Max 30 May 2004 (8:58 PM)

same thing, they are an area of entertainment, which could be classed as toys

Joshua 5 Aug 2004 (10:16 AM)

movies arent toys dah

Autumn 1 *Jun 2004* (11:53 *AM)*

Playstation games are enjoyed by everyone every adults.

Responses:

Kathleen 8 *lun* 2004 (11:09 AM)

I don't think that applies to all women. For example, most of the women I know think that Playstation games are a waste of time, money, and that they are childish.

Autumn 8 *lun* 2004 (11:40 AM)

There are adult games for playstation which are only suitable to play at night.

Katarina 28 Jun 2004 (6:08 PM)

But I don't like playstation and many of my friend don't ether and probably a lot of other people, so that counts as not everyone.

Jacquelyn 16 Jun 2004 (5:37 *PM)*

A toy that both female and male like is very hard to find. Since boys like rougher and more dirtier things than girls. Girls like neat soft and mostly cuddly things. Girls are also very sensible compared to boys.

Responses:

Hailey 16 Jun 2004 (6:40 PM)

I agree with you because boys are more rougher

Mark 23 Jun 2004 (12:17 PM)

Not all boys are rough

Annika 22 Ju12004 (10:19 AM)

I think that boys can be sensible as well as girls. Although boys may not seem sensible because they like rugby or tip they are not nescesserally not sensible.

Mark 23 *Jun 2004* (12:15 *PM)*

chess is a game which both girls and boys like. It is a strategy game.

Joshua n 5 *Aug 2004 (10:14 AM)*

Monopoly

Responses:

Mark 19 Aug 2004 (10:54 AM)

no one likes that

Marie-claire 6 *Aug 2004* (11:51 *AM)*

I was thinking, what would make a toy more appealing, its colour or packaging? Think about it

Toy Choice 2

Wondering Two

Why do boys generally like cars and girls like dolls? Perhaps it's not simply because people might laugh if a boy plays with a doll, and vice versa. Perhaps there are other reasons wh ho sand irls have articular references for to s!

Natalie *n* 6 *May 2004* (8:31 *PM)*

Perhaps it is because in the olden days girls weren't very active and did all the house work. What they wore and what was expected of them meant that activities of girls were limited to being indoors. Dolls would be a very good thing to play with because it uses your imagination and isn't very active. This could mean that it became almost a superstition and now dolls are commonly accosiated with girls.

Responses:

Caitlin 11 May 2004 (11:05 AM)

Voodoo dolls! !

Joshua 26 May 2004 (12:14 PM)

THATSRANDOM

Caitlin 15 *lun* 2004 (11:26 AM)

Do you even know what a Voodoo Doll is?
if not it is where you make a replica of someone in doll form. when you want something bad to happen to the person that you have made a Voodoo Doll of you would stick a pin in the doll.

Ingrid 15 *lun* 2004 (11:56 AM)

BUT.....most people do that when they dont like that person or they have done something not nice or bad.
well both boys and girls can use the voodoo doll

Caitlin 11 *May 2004* (11*:04 AM)*

Boys like because they are immature and like things that are loud and fast. A car would their needs for noise and speed greatly. Girls have a much better imagination than boys (1 *know i'm being sexist), because normally girls are more*

calm so they read, that expands their imagination greatly. They can play make beleive with their dolls. They usually make friends ofthe dolls. i think its great.

Responses:

Cassandra 11 May 2004 (11:42 AM)

hi its katrina on cas laptop

Joanna 11 May 2004 (11:50 AM)

A game played by girls and boys is monoply

Jacob 26 May 2004 (11:56 AM)

boys may like things that are loud and fast but were immature

Max 26 May 2004 (11:58 AM)

Hi luke

Max 26 May 2004 (11:58 AM)

not everything boys like is immature

Jacob 26 May 2004 (11:59 AM)

sorry about the misTAKE WE ARE NOT IMMATURE

Joshua 26 May 2004 (12:00 PM)

WERE NOT IMMUTURE BECAUSE WERE BOYS AND WE DO READ!!I!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

Joshua 26 May (12:02 PM)

YOUR IMMUTURE BE CAUSE WE ARE NOT

Jacob 26 May 2004 (12:02 PM)

boys can read

Joshua 26 May 2004 (12:03 PM)

IDESAGREE\

Jacob 26 May 2004 (12:09 PM)

we don't imagine that dolls are alive we imagine about fantasy things like trolls and lord of the rings.

P.s JRR tolkein wrote lord of the rings and that has a lot imagination and he is a man which is basicly a boy.

Joshua 26 May 2004 (12: 11 PM)

GOOD IDEA LUKE CUASE I PLAY LORD OF THE RINGS ON COMPUTER

Joshua 26 May 2004 (12: 12 PM)

I MADE A MISTAKE

Jacob 9 *lun* 2004 (11:44 AM)

caitlin burns We would love to hear your respons and other people come in the argument

Joshua 9 *lun* 2004 (11 :45 AM)

tell your friends about this

Alexander 9 *lun* 2004 (11 :46 AM)

you're immature because you think we're immature

Alexander 9 *lun* 2004 (11 :48 AM)

we should be treated equally truce

Becky 9 *lun* 2004 (12:16 PM)

BOYS ARE IMATURE!!!!
I agree with you Cathy

Sarah 9 *lun* 2004 (12:18 PM)

I agree with Caitlain.

Jacob 9 *lun* 2004 (12:19 PM)

give me a reason becky you could not even give one

Jacob 9 *lun* 2004 (12:21 PM)

sarah please give me a reason you have nothing to back up your reason your exactly like becky

Becky 9 *lun* 2004 (12:21 PM)

boys are imature because they don't do aswell in school than girls and they are just boys.

I think boys are imature because they like to not listen and that is why they don't do as well in school.

Sarah 9 Jun 2004 (12:21 PM)

Boys r immarure cos they r always playin with stupid thjings. Boys may be able to read (which i highly doubt but u reed immature things!

Caitlin 15 Jun 2004 (11:19 AM)

Many people think that boys are immature becasue like my brother, they are really obsessed with being cool and impressing people of both genders. boys like fast cars and cute girls. i am not saying that boys are all the same. what do you think of that response. Please keep responding.

Caitlin 15 Jun 2004 (11 :20 AM)

Sorry i meant to say most boys like things loud and fast.

Caitlin 15 Jun 2004 (11:30 AM)

If you don't think you are immature thats fine. I think boys are judged unfairly. its probaly just because they have different interests and hobbies. do you guys agree with me. Keep responding!

Caitlin 15 Jun 2004 (11 :43 AM)

I don't think most boys are. Just the boys that choose to be. they can choose to be mature if they wanted to be. but some don't. And girls really only notice the immature ones.

Joshua 16 Jun 2004 (4:44 PM)

i agree and i think Jacob, luke and charlkes will to

Joshua 16 Jun 2004 (5:09 PM)

caitlin i agree some boys are immature and also some girls are immature

Jacquelyn 16 Jun 2004 (5:39 PM)

Boys are immature because they fight more than we do and act very silly like charles did today when he showed his bum to the camera

Jacquelyn 16 Jun 2004 (5:41 PM)

Caitlin boys do like to be playing in the dirt and rougher surfaces.

Nancy 16 Jun 2004 (6:17 PM)

Caitlin, boys are immature sometimes but so are girls.

Neill 20 *lun* 2004 (4:55 PM)

I think that we are all immature at times
but don't realise it and critasise eachother
unfairly.
P.S, We are all good at different things.

Neill 20 *lun* 2004 (5:13 PM)

Boys are not immature because we do more phisical activity than the average girl- therefore improving our performance record instead of lying around all day playing with dolls and getting fat, Girls that play with dolls have a better chance of suffering haert attacks when they get older because of being lazy!

Neill *20lun2004* (5:16 PM)

Playing with dolls also is bad because girls make immaginary friends with dolls. they do not make better real friends.

Jacob 23 lun 2004 (12:11 PM)

jacquelin do you have a problem with us playing on rouhg dirt does this make us immature? if it does how??????????????
ps. i am crazy

Neill 23 *lun* 2004 (12:12 PM)

Besides boys are imature because they wear ties and don't mature that quickly.

Jordan 23 *lun* 2004 (12:13 PM)

Is this a truce Caitlin?

Kevin 23 *lun* 2004 (12:14 PM)

hey luke
where did catlin say she gave up to you in the arrgument

Shayna 23 *lun* 2004 (12:14 PM)

WELL just to let you know, You guys are a bit immature when the teacher says something. YOu guys aways act like babbies. You know when Mrs T said he wll give you baby stuff? Hi baby luke

Kevin 23 lun 2004 (12:16 PM)

This Is luke

Catlin, boys are mainly only immature when they drink to many things with drugs such as coke, which has caffene in it.

Jacob 23 *lun 2004* (12:16 PM)

jacquelin how does this tell us that we are immature because we play in dirt??
ps.why???

Sarah 23 *lun 2004* (12:17 PM)

From Emily: well girls are immature. A 13 year old girls thoughts is BOYS BOYSBOYSBOYSBOYSBOYSBOYSBOYSBOYSBOYS.

Neill 23 lun 2004 (12:17 PM)

Well, thanks for helping the boys have victory, because youjust typed doen something IMATURE, Shayna!

Neill 23 lun 2004 (12:18 PM)

Sorry I made a mistake I meant down.

Jordan 23 *lun* 2004 (12:18 PM)

SHAYNA YOUR WRONG! BESIDES I DON'T SEE YOU CONSENTRATING ON YOUR WORK TOO HARD EITHER!

Kevin 23 *lun* 2004 (12:19 PM)

i disagree with you shayna you sometimes act like babies yourself you know

Shayna 23 *lun2004* (12:19 PM)

Well DERRR, ofcourse you are immature but so am I can't do all the boy stuff but i sure can gross out girls if you ask me too JUST TRY GROSS ME OUT you will defiently fail so boys am't immature all the time but just because girls use their imagination more doesn't meen BOYS ARE SOOOOO IMMATURE AND SILLY WE GIRLS KNOW IT MORE THAN ANYBODY ELSE but just remember boys am't the only ones that are SOOOOOOOOOOO IMATURE AND SILLY ESPECIALLY IN CLASS!!!!!!!!!!!!!

Sarah 23 *lun* 2004 (12:20 PM)

girls are immature

Neill 23 *lun* 2004 (12:21 PM)

M sister is immature because when my cousin came to my house from overseas, she went BERSERK, PSYCHO, CRAZY, AND MAD!

Mark 23 lun 2004 (12:22 PM)

boys and girls can like the game chess

Neill 23 lun 2004 (12:23 PM)

Girls ae immature because they mature faster and to reinforce my statement take a look at Britney Spears!!!!! l! I!!!!!! 11

Sarah \23 lun 2004 (12:23 PM)

This was Emily's thought.
Boys r immature cos girls mature faster.

Neill 23 lun 2004 (12:25 PM)

But boys ARe Not Imature!

Jacob 23 lun 2004 (12:26 PM)

only geeky boys like chess
ps were did you get chess from mark its never been menchoned

Shayna 23 lun 2004 (12:26 PM)

You boys are immature because you are more noisier and immature when you guys play and you get into more fights than we do and if someone locked a boy and a girl in one room i think that the girl will think of ways to survive so that means you boys are just immature. You boys are annoying to lots of peopl e including teachers when you mess up! Respond more to tell me you are immature!

Kevin 23 lun 2004 (12:27 PM)

i don't think so shayna

Mark 23 lun 2004 (12:27 PM)

Yes i ment the geeky boys

Jordan 23 lun 2004 (12:27 PM)

BY SAYING THAT YOU JUST MADE YOURSELF IMATURE SHAYNA

Neill 23 lun 2004 (12:27 PM)

I'm not noisy!

Jacob 23 lun 2004 (12:28 PM)

shayna your messages are to long

Mark 23 *lun* 2004 (12:29 PM)

give up shayna girls are immature

Jordan 23 *lun* 2004 (12:30 PM)

WHO AGREES WITH ME!

Neill 23 lun2004 (12:30 PM)

Thats true because a few weeks ago, Becky, Sarah and Emily started slapping my back.

Neill 23 lUll 2004 (12:30 PM)

I do!

Shayna 23 *lun* 2004 (12:31 PM)

Hi i'mjacquelyn and i wrote some ofshayna's messages to say you're immature

Katarina 28 *lun* 2004 (6:23 PM)

boys are definetly not immature! but i do agree that some boys go crazy or they can getout of control. and girls are DEFINETLY NOT emiture, though I mish admit, my dad, and take note that he is a male says that girls are more smamarted than boys. though some girls get realy iffy, they get in gruops or "gangs" if you can call it that and anyone that is not in there group is there enamy

Katarina 28 *lun* 2004 (6:45 PM)

Whoops, I sent this before I had a chance to check my spelling. I was being bothered by someone. You guessed it, a boy. So here it goes again !!
Boys are definitely not immature! but i do agree that some boys go crazy or they can get out of control. and girls are DEFINETLY NOT immature, though I must admit, my dad, and take note that he is a male says that girls are often smarter than boys. Though some girls get realy iffy, they get in groups or "gangs" if you can call it that and anyone that is not in there group is there enemy.

Jacob 22 lui 2004 (10:25 AM)

whoops whooops whoops thats all u can ever say

Kevin 22 Jul 2004 (10:27 AM)

Katarina your messages are to long
This is from Luke and kevin

Mark 29 Jul 2004 (10:31 AM)

if boys are imature then girls are more imature

Katarina 29 Jul 2004 (10:34 AM)

so, who cares, I can tell my point, cant 1. the thing is that boys are imature to the girls eyy inles a girl putes her mind into the boys, and trust me, I have had lots of practis. boys do things diferent ways, and that makes them do different things. yet, I must admit, some boys are imature, but they are not born with it, same withe girls.

Katarina 29 Jul2004 (10:37 AM)

ps, keven, they are not to long and whoops is not all i can say!

Katarina 30 Jul2004 (6:40 PM)

sometimes I play boy things like warhammer, yu gi oh cards, camputer games and loads more and do they make me imature and the reson boys ado the things they do in because that is what boys like and probably they dont think it's immature.

Katarina 30 Ju12004 (7:04 PM)

ps. sorry about the mastak I made earlyer, it was ment to me eye.

Katarina 31 Jul2004 (7:21 AM)

p.s.s I'm not good at speeling, ignor mastakes.

Katarina 5 Aug 2004 (10:16 AM)

Please forgive me for my mistakes

Joshua 5 Aug 2004 (10:27 AM)

WHY ARE YOU MAKEING MISTAKES SHANYA

Katarina 5 Aug 2004 (4:52 PM)

are you talking to me or shayna?

Navroz 11 *May 2004* (11:54 *AM)*

Well,boys like rough and tough things and girls like hairstyles and other fashion!

Responses:

Autumn 8 Jun 2004 (11:47 AM)

Boys are more active than girls sometimes. Girls are usually more indoor people.

Ingrid 15 Jun 2004 (11:59 AM)

i agree with the comments you both have said

Leanne 11 *May 2004* (11:58 *AM)*

i disagree both girl and boys can play with cars. why my little cousin plays with cars not because they are for boys but because to her she sees them as rolling coloured things.

Responses:

Jacob 26 May 2004 (12:15 PM)

Leanne you are absoloutly right I sometimes play with dolls.

Joshua 9 *Jun 2004* (11:49 *AM)*

Little girls like dolls and older girls like other things but boys of all ages like th same things

Responses:

Mark 9 Jun 2004 (12:17 PM)

What things Josh? are yooou talking about Rcx's and Lego technic and those things?

Alysha 15 Jun 2004 (11:42 AM)

I would have to disagree. Most people think that little girls like playing with dolls but the majority of girls I know don't!

Hailey> 16 Jun 2004 (5:34 PM)

1 think boys like car because they are sort of boys stuff

Nancy 16 Jun 2004 (6:32 PM)

Some girls might like dolls but not all, for example as you know Josh, i am horse crazy and play with toy horses sometimes.

Hailey 16 Jun 2004 (6:43 PM)

I think so too because everybody has different personalities.

Mark 29 Jul2004 (10:29 AM)

It might be wat our parents get for us
c
h
1
l
d
r
e
n

Ingrid on 15 Jun 2004 (11:47 AM)

I THINK BOYS BRAIN IS DIFFERENT TOL US

Responses:

Stephanie 15 Jun 2004 (11:55 AM)

Why? They like playing like girls and even go to school with us.

Autumn 15 Jun 2004 (12:15 PM)

Girls and boys are a different gender so they like different things. Some things are just made for the likes of girls and boys so they start to adapt to them.
Somethimes children who play with their older/younger brother or sister they like the toys their siblings are playing with.

Nancy 16 Jun 2004 (6:44 PM)

One game that bothe girls and boys might like is chess. Even though most boys like are different we might still like the same thing SOMETIMES.

Responses:

Hailey 16 Jun 2004 (6:47 PM)

I agree because chess is actually unisex

Sarah 23 Jun 2004 (12:18 PM)

I hate chess and im a girl

Shayna 22 Jul2004 (10:20 AM)

Another good game is cludo

Hilaire 23 *Jun 2004* (12:21 *PM)*

People won't really laugh if a boy got to play with a doll. Cause action figures are dolls as well.
Girls play with cars as well like barbie cars. Sometimes girls can be tomboys so they play with something boyish.
Different people like different things. Especially when they have different genders.

Katarina 31 *Jul2004* (7:24 *AM)*

I think that it is just in there nature, but I notice that some girls like boy stuff and some boys girl stuff or at least used to.

Marie-claire on 6 *Aug 2004* (11:52 *AM)*

I think boys are influenced by each other to like cars but somtimes I hear of girls who are obsessed with cars.

Responses:

Marie-claire 6 Aug 2004 (11:56 AM)

Boys are immature most of the time but girls have proven to be mature because that the way we are

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Obstacle Course 1

Wondering One
If there are differences between girls' and boys' choices, why do you think this might be? Do you think it has any implications for school, for life? What advanta es/disadvanta es are there in bo s thinkin different! from irls?

Leanne on 11 *May 2004* (11:33 *AM)*

Boys must have a different things in there brains to girls that make boys more rough and tough and girls more quite and beautiful and concerntrate more on school and studing than playing around

---

Namratha on 11 *May 2004* (11:36 *AM)*

There are different choices between girls and boys both phiscally and mentally for boys and girls are exposed to different things and therefore think differently.

Leanne on 11 *May 2004* (11:37 *AM)*

Boys must have a different things in there brains to girls that make boys more rough and tough and girls more quite and beautiful and concemtrate more on school and studing than playing around

---

Navroz on 11 *May 2004* (11:46 *AM)*

i think it is becauseofschool life, how friends treat eachother, what they like and how they behave. It also matters about the veiws of your parents, aunties and auncles.

Becky on 19 *May 2004* (12:12 *PM)*

I think that girls and boys think differently beacuse they have some differnces in some way such as being brought up in different ways. Some parents might buy some different toys for them. Or take them to different places. causing them to like different things.

Responses:
Hilaire 26 May 2004 (11:47 AM)

i agree with you but some girls might be tomboys and some boys might hope that they were born as girls.

Sarah 26 May 2004 (12:03 PM)

Yes, thatis true Hilaire but that would be beacuse of the way that they have been brought up. Like Becky said.

Caitlin 22 Jun 2004 (10:55 AM)

In some cases where the boy would want to be a girl, the parents would have brought them up like that. Maybe the father wanted to be a girl, then the boy would take that opinion and call it his own. Maybe the mother would have done well and been happy, and always said how great it is to be a girl. In other cases they mghtjust be like that out of their own free will. That is a bit weird, but there are Drag Queens, and there is nothing wrong with them. It is perfectly respectable to be one.

Cassandra 1 Jul 2004 (4:30 PM)

It might have something to do with how they are brought up but Miriam wanted be a girl but her parents wanted her to be a boy! Caitlin, I agree with you.

Jessica 26 *May 2004 (J*1:56 *AM)*

Due to hormones mostly boy's have different things in their brains then girls. for example boys are more rough than girls. It is also due to the way they are brought up.

Responses:
Julianna 1 Jun 2004 (2:12 PM)

I agree with Jessica that boys and girls have different hormones and also the way that they were brought up causing them to be different.

Julianna 1 *Jun 2004 (2:05 PM)*

I have heard that boys' and girls' brains differ a bit. there are two parts to your brain and there is on cord connecting both of them.
with the girls' brain the cord is very thick and the two sides of the brain communicate clearly but with a boys' brain the cord is quite thin and dosen't communicate well.

So here we have the consept that girls are smarter than boys what do you think?

Responses:
Alana 1 Jun 2004 (2:24 PM)

IT'S TRUE.
Girls are smarter than boys

Grace 3 *Jun 2004* (2:38 *PM)*

a advantage is that then in the classroom everyone will have different opinions.
but a disadvantage is that then you might be fighting that the boy's answer is write and the girl's answer is wrong or the other way around.

Obstacle Course 2

Wondering Two
Should schools encourage different ways of thinking? If so, why should they and how might they do that? If not, why not and what should schools do to encourage people to think in ways that are more alike?

Natalie on 4 May 2004 (8:22 PM)

I think that schools should encourage different ways of thinking. It would be much better for a child to learn to think in different ways rather than similar ways so that they will not be limited in their ideas. They should also learn to think differently in different situations, so that they would not get stuck because the way of thinking in which they're used to does not work or help them in a particular situation.

Leanne 11 May 2004 (11:36 AM)

No everybody enjoys learning in there own way like. some people like repeating things to lock it in there brain or some people like to write things down over and over agian to remember it.

Jacqueline 26 May 2004 (11:54 AM)

if children are having difficulty with the way that they are thinking then yes. schools should change the way that the child thinks

Responses:

Jessica 26 May 2004 (11:58 AM)

If children are having difficulty with the way they are being tought then yes

---

Julianna 1 Jun 2004 (2:17 PM)

I think schools should encourage different ways of thinking because it could be simpler for the student to under stand not just thinking how the teacher did it.

Recall and Recognition 1

Wondering One
Have you wondered about how we actually remember things? Why do we remember some things but not others? Why do we often recall people's faces but not remember their names?

Thomas 19 *May 2004* (12:16 *PM)*

To me it is the other person who forgets

Namratha on 25 *May 2004* (9:54 *AM)*

People have a long term and short term memory. And people remember things which highly interest them, but other things which they don't find very interesting forget about them. Some people remember things by pictures and when they see a person they recall them

Responses:

Alana 25 May 2004 (I :45 PM)

Cool

Jessica 16 Jun 2004 (II :47 AM)

I only remember things that are important to me. So whilst I remember that I have a project to hand in, I may not remember what the new kid's name is. Though, sometimes new important information reaches your brain the old important information is pushed aside.

Nancy 1 *Jun 2004* (2:12 *PM)*

About the names comment.
I think it's because we see their faces cmore than we use people's names.

Recall and Recognition 2

Wondering Two
The experiment the girls in Year 5 did showed that people are very good at recognising words that they have been shown. Do you think the results would be different if *unknown* words - in different languages - were on the list?

Thomas 19 *May 2004* (12:21 *PM)*

I don't even Know what they mean

Responses:

Sarah 9 lun 2004 (12: 11 PM)

I don not think that it would matter if you did not know what they meant but if you could remember them
(By the way they are french)

Chatterbox 1

Wondering One
What happens when a person listens to instructions? Do you think this is somehow different from what happens when a person listens to and *watches* instructions at the same time? How?

Angela 4 *May 2004* (11:51 *AM)*

YES, IT IS BECAUSE IF YOU WATCH, IT IS LIKE EXPERIENCING BUT WHEN YOU LISTEN, YOUR BRAIN MIGHT NOT WORK SO *FAST AND NOT BE ABLE TO UNDERSTAND QUIKLY.*

Responses:

Chrissy 11 May 2004 (10:56 AM)

yes it would

Maggie 11 May 2004 (11:54 AM)

As Angela said, people don't react as quickly as they hoped to.
For example, when a mother tells them to clean up their room, but later, it always ends up that the mother cleans up the room.

Angela 25 May 2004 (11 :27 AM)

ha, ha thats funny what maggies said, but its is true but i dont think cleaning up is really got to do with reacting quickly it is just that children like you and i dont want to do clean up but just live their life freely and happily

Marie-claire 25 May 2004 (2:56 PM)

Yes i agree angela

Ciao 1 *lun* 2004 (11:23 AM)

yes but sometimes it does relate to the topic if after a long time your brain might forget that your mum told you to clean your room but if you remembers then it still relates to the topic!!!

Maggie 15 *lun* 2004 (11:09 AM)

Ha Ha Angela, ur even FUNNIER, i thingk that cleaning has got something to do with reacting quickly becuase if u don't know what to do about clening. i mean realy, people like me have NEVER cleaned or wahsed to dishes before, well i have washed the dishes a feew time but not allwayus. i think that if u don't know how to wahs the disshed, you wouldn't ne able to do anything and . REACT!!!!!!!!!!!!

Angela 15 *lun* 2004 (11:23 AM)

my mum doesnt let me clean the kitchen.. she thinks i make it even messier.. coz i alwayz break at least 1 dish when im cleaning the kitchen.,... so she thinks i hav one part of my concentration thing thats in my brain is missing...

Jialin on 4 May 2004 (12:10 PM)

hi
think the message sends to the brain and the person then reconises the message and acts it

Responses:
Elisa 1 *lun* 2004 (11:27 AM)

I agree with JiaLin, i think the ears send a message to the brain of what they have heard and then the brain works out how to work out the instructions and send a message to the appropriate part of the body that needs to do the working.
Lisie

Jialin 1 *lun* 2004 (11:43 AM)

New challenge,

why do we feel as if we are in a dream like when i have a nightmare about falling into a hole i feel the air rushing against my head and the tingling sensation.

Janet 4 May 2004 (12:40 PM)

think that a person sometimes listens to someone their brain sort of dunno

Responses:

Ciao 4 2004 (12:41 PM)

that cool reading someones brain

Yun 4 May 2004 (3:00 PM)

I think that there is a big difference when you are listening or watching and listening at the same time. Watching and listenings is better because there might be a picture of what they are saying. Just listening to intructions can get confusing.

Angela 11 May 2004 (10:58 AM)

yeh shes rite C02 i can (honestly learn betta wen i look and lisen.

Alysha 11 May 2004 (11:08 AM)

What about if you were trying to memorise something (lines for a play). Would listening only or both visual and listening help you remember it?

Angela 11 May 2004 (11:58 AM)

i think what Alysha asked was a real Question. i think visualing and listening will be better that listening because you'll be able to remember better if someone acted and said it to you.

Maggie 25 May 2004 (10:03 AM)

me not sure angela. i do better when me listen then visualising. but to tell u da truth, i sometimes actually do better when people act it out then rather telling me to do someting.

Ciao on 4 May 2004 (12:41 PM)

hi

i was in the experiment last year and it was very fun, but i want to know why do you sometimes know something such as know hoew to spell so but then you just suddenly forget it i just don't understand

Responses:

Janet 11 May 2004 (10:38 AM)

i think that when u haf 2 learn a spelling word i thing that teachers tell u 2 write it again and again 2 get it in you brain:D

Stephanie 11 May 2004 (10:57 AM)

hi aint this fun??/ Very interesting website!

Maggie 25 May 2004 (9:57 AM)

we know this is an education and fun website. it is not only colourful, the website is also a place where u could say whateva u want withouht feeling embarassed.

Maggie 25 May 2004 (9:57 AM)

sorry about the spellings people.

Janet 11 May 2004 (10:48 AM)

if it is a particularly hard word then u SOMETIMES forget it but then u can remember partofit:D

Responses:
Alysha 11 May 2004 (11:lOAM)

What do you think you remember that particular part of the word?

Marissa 11 May 2004 (11:11 AM)

why do we only use about 50% of our brain
did the other half go for a nap or something
does any animal use there whole brain

Janet 11 May 2004 (11:16 AM)

Identical twins have similar hand prints and foot prints but different finger prints and teeth marks!

Janet 11 May 2004 (11:16 AM)

Identical twins have similar hand prints and foot prints but different finger prints and teeth marks!

Katrina 25 May 2004 (10:57 AM)

does anyone no if blind people see there dreams

Ciao 1 Jun 2004 (11:28 AM)

katrina talk about the dreams in the dreams postbox!!!

Ciao 1 Joo 2004 (11:48 AM)

but still i think that dreams works like this because it is just some pictures in our brain??? iduno!!!

Jialin 1 Joo 2004 (11:58 AM)

interesting information! it's probably not just pictures but maybe also some information

---

Marissa 11 May 2004 (11:02 AM)

do identical twins have the same finger print

Responses:
Janet 11 May 2004 (11:06 AM)

good question but i dunno!?

Janet 11 May 2004 (11:07 AM)

i asked mrs h and she said NO

Marissa 11 May 2004 (11:08 AM)

I think this website is fun but it is so big and has alot of information but it is hard to get around it all in a short amout of time.
This site was helpful to me with because it gave me information that i had never know about.
Great website
From Marissa and Hannah

Ciao 11 May 2004 (11:22 AM)

about the fingerprintt it said in the twins house that they have similar hand and foot print but different toothmarrks and fingerprints.

Marissa 11 May 2004 (11:26 AM)

like a police man is going to check there teeth mark when they get booked

Marissa 11 May 2004 (11:27 AM)

have there been any people that have had exactly the same finger prints as another person

Maggie 25 May 2004 (9:52 AM)

i don't think so Merissa. i'm not even quite sure for myself!

Ciao 1 Jun 2004 (11:30 AM)

no marissa maggie is right no one in the world has the same finger prints
plus the topic u r talkin about is nothin relatin 2 topic if u wanna know about da twins our fingerprints maybe u would lik 2 go 2 da twins postbox

Jialin 1 Jun 2004 (11:37 AM)

i dont' think so because everyone is born with different fingers and that is why they use fingerprints to stop crime

---

Marina 11 *May 2004* (11:11 *AM)*

I like the chatterbox it is fun and is egicational

Responses:

Janet 11 May 2004 (11:12 AM)

educational

Marissa 11 May 2004 (11:13 AM)

educational

Janet 11 May 2004 (11:13 AM)

educational

Marissa 11 May 2004 (11:13 AM)

u spell it like that
educational

Ciao 1 Jun 2004 (11:31 AM)

HELLo u guyz arent talkin about the memory topic so stick to da topic

---

Marissa 11 *May 2004* (11:12 *AM)*

does our brain keep us alive or does our heart keep us alive or does both of them keep us alive

Responses:

Janet 11 May 2004 (11:14 AM)

both of them because you brain sends a message to your heart and tells it to beat!:D

Marissa 11 May 2004 (11: 17 AM)

could we live with half a brain

Alysha 11 May 2004 (11 :21 AM)

There are some mental illnesses where your brain doesn't function properly. You can sti11live, but organs such as your arms and legs don't work. Most people usually have to live in specail home or have wheelchairs.

Marissa 11 May 2004 (11:24 AM)

. i think i will stick with a whole brain then

Maggie 11 May 2004 (11 :57 AM)

I think you should Marissa! ‼ !!!!!!!

Jialin 8 *lun* 2004 (11:58 AM)

duh! But why would it be worthwhile to live if you can't move?

Maggie 15 lun 2004 (10:54 AM)

u could sti11listne and wpeak even though u can't move. so there is no difference

---

Marissa 11 *May 2004* (11:22 *AM)*

if we only use half our brain then why do we have a whole brain
could we live with only a half brain
that would be kool
if we only had a half brain would we be dumb
if so what makes a person dumb in the fist place

Responses:

Maggie 11 May 2004 (12:01 PM)

Hmmm Marissa, i think that people might be dumb in the first place is because they don't use their brains as they have should been.

Joshua 19 May 2004 (12:17 PM)

true we could live with one half

Leanne on 11 May 2004 (12:01 PM)

when you see instructions you know exactly what to do but when you are only told instructions you have a little exploring and experamenting to do

Responses:

Eleni 15 Jun 2004 (11:13 AM)

I saw the other conversation and they asked each other about if they could live with a half brain

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Melissa 25 May 2004 (2:13 PM)

Yeah i think it is differnt because when a person watches they know exactly what to do but when sombody listens to some instructions
Seya

Responses:

Maggie 25 May 2004 (2:15 PM)

hi mel,
i kind of agree with u. wen a person is actually watching someone do someting, i'm not qute sure they would understand what the r suppose to do.

Marie-claire 25 May 2004 (2:55 PM)

Hannah, Alysha and I (marie-claire) were incharge of the experiment for the chatterbox and we REALLY enjoyed it;)

Responses:

Ciao 1 Jun 2004 (11:35 AM)

yes it was fun i was in da experiment last year

Maggie 15 *lun* 2004 (10:52 AM)

i wasn't in da expirement but i stiiil think it is great

Jialin 1 *Jun 2004* (11:19 *AM)*

hi, why do we *think differently and why do* we *sometimes dream about things that actually haapened to us?*

Responses:

Janet 1 lun 2004 (11:32 AM)

i know,
one night i was dreaming that we would have this english sheet and then the next day we actually happened! !
IT'S REALLY SCARY!!

Jialin 1 *lun* 2004 (11:35 AM)

Yeah, sometimes i have one dream then the next day i walk into this restaurant and ask my mum if i have been to the restaurant before and she said no.then i get this feeling that everything is so weird

Ciao 1 *lun* 2004 (11:35 AM)

OMG

Janet 1 *lun* 2004 (11 :39 AM)

OMG
it's like we can tell the future but never know when it happens or how!
scary!!

Jialin 1 Jun 2004 (11:41 AM)

hmmm, maybe it's just that we've seen this restaurant or place and remembers it like WHOOSH! Then we have a dream about it and forgets we had seen it in a mag or something

---

Jialin 1 *Jun 2004* (11:49 *AM)*

Why do we sometimes speak in our dreams?
Responses:
Janet 1 lun 2004 (12:03 PM)

What happens when a person listens to instructions? Do you think this is somehow different from what happens when a person listens to and watches instructions at the same time? How?
thats wat the topic is!!!
so write about it!

Maggie 1 lun 2004 (1:46 PM)

talking in dreams is scary especially if u said someting your not suppose to say in realistic.

Jialin 8 *lun* 2004 (11:25 AM)

But anyway how come sometimes you feel your brain move and sometimes you feel real dizzy when you wake up?

Ciao on 1 *Jun 2004* (11:58 *AM)*

i dont know ***if*** *they r combined it will improve or not but i still rather a physically example and i must be taken through the steps one byone!!*

Responses:
Maggie 1 *lun* 2004 (1:47 PM)

i king of rather like listening then seeing someone act it out PHYSICALLY
Ciao!!!!!!!!!!!!

Chatterbox 2

Wondering Two
Are there really such things as learning styles? Could it just be that some things are best learned by seeing and other things are best learned by listening and still other things by moving? For example, could you learn to ride a bike by listening? What do you think?

Keewa on 11 *May 2004 (10:54 AM)*

HEY who ever gets this
I think this program is really cool and exiting. It has all these cool informative places and it is also fun.

Responses:

Chrissy 11 May 2004 (11:00 AM)

I agree with you keewa this is a mad website and fun i especially love the genesis cinemas

Marissa 11 May 2004 (11 :27 AM)

i want to go to the candy bar in the cinimas

Mary 25 May 2004 (9:51 AM)

this site is so cool, you can chat and ask questrions and people can answer u and it could be a debate

Maggie 25 May 2004 (10:06 AM)

watch the spellign Mary, even though u have a point there. this website is fun and u would no what other people think.

Angela 25 May 2004 (11 :31 AM)

this Questian is hard.... but i think, wen wen we're watching and hearing it is like experiencing, and i heard from adults that experience is the best Fact Book

Eleni 25 May 2004 (11 :32 AM)

Can I ask you a question?

Eleni 25 May 2004 (11:34 AM)

Ok. Does anyone know anything about the nervous system?

Maggie 25 May 2004 (2: 13 PM)

i don't think taht i know anything about the nervous sytem eleni.

Jessica *on* 25 *May 2004* (9:57 *AM)*
I think that there are surley learning styles, for some people like to learn by whatching or by visual learning, but i don't think that you can learn by listening to a bike, but there are surely ways to learn in another way!

Responses:

Eleni 25 May 2004 (11 :29 AM)

Jessica?

Eleni 25 May 2004 (11 :30 AM)

Can I ask you a question?

Joshua 16 *lun* 2004 (5:11 PM)

YOU ARE right jessica

Maggie 25 *May 2004 (2:09 PM)*

hello, i *don't think that i could ride a bike by listening.* i *could only ride a bike if i could see someone ride it too.*

Responses:

Ciao 1 *lun* 2004 (11:17 AM)

i usually only can learn. by a example instead of someone talking!!!

Ciao 1 *lun* 2004 (11:20 AM)

people talking is sometimes boring really depending on who is talking!!!! but i still rather a example physically even if the person is not really boring! !

Maggie 8 *lun* 2004 (10:52 AM)

i don't think talking is really boring. i rather thinka that physically is even more boring.

Ciao 8 *lun* 2004 (11:22 AM)

well i dun think so coz sometimes talking is boring to me!! !!! anyway every1 in the world is different anyway!!!!!

Maggie 15 *lun* 2004 (11:11 AM)

why is talking so boring, i know that everyone is unique and every thing but every1 should have something in common

Jialin 15 *lun* 2004 (11:23 AM)

Talking is so not boring it's the mind that makes you think that it is boring! You learn. some things by talking and anyway it would be pretty hard to communicate with somebody if you didn't how to speak

---

Riana 8 *Jun 2004* (11:24 *AM)*

This site is really cool. I learnt alot of stuff about our brains and how they work. Thanks everyone!

Responses:

Kathryn 15 lun 2004 (11: 17 AM)

YEA YOU COULD LEARN TO RIDE A BIKE BY LISTENING

Cassandra 1 *Jul 2004* (3:59 *PM)*

If you learn to ride a bike by listening, then you're pretty special!

Dreams 1

Wondering One
Have you the different theories about dreams on the Ideas Wall? What are your ideas? Which explanations do you think make the best sense - and why?

Kathryn Bailey's 4 *May 2004* (12:18 *PM)*

When you are in a deep sleep you don't dream but when you sleep lightly you dream

Responses:

Kathleen 11 May 2004 (10:48 AM)

Yeah, but why's that?

Rebecca 17 *lun* 2004 (12:26 PM)

I ACTUALLY FIND I DREAM MORE IN A DEEP SLEEP SOMETIMES.

Caitlin on 11 *May 2004 (10:55 AM)*

I think you dream night, but you just don't remember it.

Responses:

Caitlin 11 May 2004 (10:56 AM)

What does everyone else think?

Nancy 11 May 2004 (11:02 AM)

My thoughts are similar to Caitlin and that everyone dreams at least once every week.

Maggie 11 May 2004 (11: 14 AM)

Sometimes, i dream and remember but most of the time, i never remember what i dreamed! I don't quite agree with Nancy, i dream most of the time, slepping and daydreaming.

Joshua 20 May 2004 (4:12 PM)

i always remember bad dreams

Maggie 25 May 2004 (10:08 AM)

i sometimes remember bad and good dreams even though i don't want to remember it.

Kathleen 25 May 2004 (11:18 AM)

I always remember things that are important to me. That's the same with dreams as well.

Angela 25 May 2004 (11:41 AM)

ummm... did you know i sometimes dream into my dream? like... im sleeping IN the dream and then i dream IN the dream and then again and again

Justin 26 May 2004 (11:50 AM)

I always remember my dreams!

Angela 1 lun 2004 (11:24 AM)

Why do people who experienced terrible stuffs like war, why do they dream about it and actually live the war-life IN the dream while every other people lives so normally?

Stephanie 1 lun 2004 (11:32 AM)

Its always funny how you can't remember the nice and happy dreams you have and but you always remember the nightmares you have.
Why is that so?

Angela Chung 1 lun 2004 (11:39 AM)

you know what? my mum once left the kitchen all dirty, and then fell asleep, and she dreamed of cockroaches crawling all over the Kitchen

Elisa 1 lun 2004 (11:42 AM)

I'm not sure why you only remember bad dreams but it's the same with me. Going back to the beggining of the disscusion i think you dream every night but you hardly ever remember them.
Why do people have repetative dreams and why are they usualy bad dreams?

Lisie

Maggie 8 Jun 2004 (11:03 AM)

hey guest what angela, i don't really get what u say about dreaming IN your dream.

Ciao 8 Jun 2004 (11:30 AM)

i do understand angela i just think dat maybe it is also because of the environment

Angela 15 Jun 2004 (11:18 AM)

maggie, well i'l help u... well like ur sleeping.. right? and u dream....
u dream IN ur dream.. so when ur dreaming, ur actually sleeping in the dream. so u dream in THat dream.. get it>?

Maggie 15 Jun 2004 (11:27 AM)

i still don't get u ANGELA, could u please explain it more properly and Clearly??
i don't get u da par where u typed, u dream in ur dream

Constance 11 *May 2004* (11:36 *AM)*

i love dreams but not scary ones

Responses:

Mary 11 May 2004 (11:38 AM)

i hate have nightmares because they freak me out when i'm asleep and when i wakeup

Joshua 20 May 2004 (4:11 PM)

Often when you've watched a scary movie you hyave nightmares

Maggie 25 May 2004 (10:10 AM)

even when i watch funny movies, my dreams turn it into a horrible dreams. as mary said they FREAK ME OUT!!!!!!!!!!!!

Katrina 25 May 2004 (11:01 AM)

hey conatance
does anyone no if blind people see the dreams or they dont

Chrissy 25 May 2004 (11:14 AM)

i hate scary dreams every time i have one i am stressed out all day long

Kathleen 25 May 2004 (11:21 AM)

Sometimes, I dream, except when I wake up, i can't really remember if the dream was real, and that it occurred yesterday, or the week before. It's so confusing then! Why are dream sometimes so realistic?

Daniel 1 lun 2004 (9:30 AM)

yeah
i also wonder ifblind people can 'see'dreams??

Chrissy 1 *lun* 2004 (11:17 AM)

Why do dreams feel so real

Katrina 1 lun 2004 (11:19 AM)

does anyone no if blind people see dreams no said llast week when i asked1 would anyone know

Katrina 1 *lun* 2004 (11:22 AM)

myabey blind people dont see there dreems because they have seen objets or colours but thet have probley felt some objects

Stephanie 1 *lun* 2004 (11:29 AM)

People who were blind since they were born don't know what the colour red or and I think that they don't know what are dream is because since they were born they have never been able to see.
Is that true?

Katrina 1 lun 2004 (11:31 AM)

i dont no if its true but it can be ture

Autumn 1 *lun* 2004 (11:35 AM)

Do you dream every night or just sometimes?

Katrina 1 Jun 2004 (11:37 AM)

but when blind people feel objets, say like a cube they no what it looks like so they can mabey dream about a cube

Katrina 1 Jun 2004 (11:39 AM)

Autumn, i think we have dream every night but we dont remeber it because of our short tearm memeory

Katrina 1 Jun 2004 (11:41 AM)

Autumn, i think we have dream every night but we dont remeber it because of our short tearm memeory

Riana 8 Jun 2004 (10:54 AM)

I dont usually have scary dreams, but when i do they totally freak me out, and i cant sleep for the rest of the night.

Katrina 8 Jun 2004 (11 :26 AM)

do blind people see ther dreams and if they do what do they see?

Ciao 8 Jun 2004 (11 :32 AM)

i think that dreams r rely real too C02 once wen i was sleeping i was dreaming i fell down the stairs and wen i woke i was on the floor!!! !!

Jialin 8 Jun 2004 (11 :40 AM)

poor you must of had a rough time but anyway(responding to autumn) we probably have dreams every night but we just forget it

Keewa 8 Jun 2004 (11:44 AM)

Katrina
My aunty is blind I will ask her if she can see in her dreams.

Katrina 8 Jun 2004 (11 :46 AM)

ciao, i think we move when we have dreams.

Katrina 8 Jun 2004 (11 :49 AM)

i think it depends what we dream of.

Elisa 8 Jun 2004 (11 :59 AM)

Katrina, we don't have short term memory cause we can remember everything! for example...u can remember what u did on 5 June 2000!!! it's just at the back of your memory.
Lisie

Keewa 15 Jun 2004 (11:06 AM)

Katrina, blind people for exaple my aunty they do see in their dreams its just they may not see what we see because we know what things really look like but for blind people its different because they have to get an object or apicture in their mind. Like if i said to my aunty do you like the coour red she would not know. Just emagine that you can not see and you will see what it feels like just say you did not know what a tree looked like and try to emagine and see if it is easy.

Keewa 15 Jun 2004 (11:26 AM)

Katrina, blind people for exaple my aunty they do see in their dreams its just they may not see what we see because we know what things really look like but for blind people its different because they have to get an object or a picture in their mind. Like if i said to my aunty do you like the coour red she would not know. Just imagine that you can not see and you will see what it feels like just say you did not know what a tree looked like and try to imagine and see if it is easy.

Keewa 15 Jun 2004 (11:57 AM)

Katrina, blind people for exaple my aunty they do see in their dreams its just they may not see what we see because we know what things really look like but for blind people its different because they have to get an object or a picture in their mind. Like if i said to my aunty do you like the coour red she would not know. Just imagine that you can not see and you will see what it feels like just say you did not know what a tree looked like and try to imagine and see if it is easy.

Lara 19 *May 2004 (12:20 PM)*

my dreams sometimes gives me nightmare and the only way i can stop that is bye

Responses:

Jialin 8 Jun 2004 (11:30 AM)

what? well everybody has nightmares probably because something had happened to them and they remember it.

Brianna 15 Jun 2004 (12:32 PM)

Hi my name is Brianna Elton, when i have nightmares about something, the next night i am absoulutIy fine. I think having nightmares clears out that fear in your mind.

Hailey 23 Jun 2004 (12:11 PM)

this is really katarina
nightmares are not scary if you don't tell yourself that it is and each dream has a meaning, like, if you had a dream of your little brother diying the dream would mean new life, so that dream might mean that you will get another sister or

brother or it might mean that you will get realy ill and almost die but you don't die, it would be like you had an extra life.

Hilaire 23 Jun 2004 (12: 14 PM)

It doesn't happen all the time. Once i had a nightmare and it didn't take away my fear in my mind.
You still remember your nightmares most of the time. i think that the only way you can make your nightmares go away is by not do anything wrong. cause i recon that you get your nightmares by doing something that is not right.

Hailey 22 Jul 2004 (10: 15 AM)

i think that nightmares are just storys .

Katarina 29 Jul2004 (10:42 AM)

they are images of the future

Katarina 29 Jul2004 (10:52 AM)

lastnight I dreemed that there was a psycho giy going round town doing bad things and he was to be killed and I was convicted and that day I did not do any thing wrong.

Justin *on* 26 *May 2004* (11:47 *AM)*

I hate dreaming. Do you?

Responses:

Justin Foo 26 May 2004 (11:48 AM)

I hate nightmares and I hate being woken up.

Justin 26 May 2004 (11:49 AM)

I only like being woken up by my alarm clock.

Jordan 26 May 2004 (12:10 PM)

me too Justin

Justin 26 May 2004 (12:13 PM)

Your like me, not a good runner and very talkative, do you feel in your dreams sometimes I do sometimes I don't I prefer when I can't feel cause if you fall you would start hurting.(From Neill and Justin)

Stephanie 1 *Iun* 2004 (11 :34 AM)

I hate dreaming too because you never know if it is going to be good or bad. Why?

Chrissy 1 *Iun* 2004 (11 :42 AM)

why do we forget our dreams a few days or hours later

Elisa 1 Jùn 2004 (11 :53 AM)

i think that u sometimes can work out wether u are going 2 get a bad or a good dream that night. for instance if before u went to bed u watched a scary movie u are most likely 2 get a bad dream, or say u watched a movie for little kids because your lil sis wants to watch it with u you will probably get a good dream.
What does everyone else think?
Lisie

Jialin 8 *Iun* 2004 (11 :33 AM)

well i think and agree with you elisa but you would eventually get over it and plus sometimes you don't even have dreams when you sleep

Jialin 8 *Iun* 2004 (11:55 AM)

why do we feel some things in our dreams ego when i imagine i am falling i can often feel myself drop but when i wake up i am still on my bed.

Jialin 15 *Iun* 2004 (11: 13 AM)

Yes, but it changes into something like a jumping castle sometimes. it is really weird! I hate dreaming sometimes

Maggie 15 *lun* 2Q04 (11 :29 AM)

i think people forget dreams becuase they want to forget it especially if it is a really bad nighmare that is truly like a realistic vision

Stephanie 15 *lun* 2004 (11 :48 AM)

We foget our dreams sometimes because we are thinking of different thinks all the time.

Jialin 15 lun 2004 (11 :48 AM)

well according to me i don't ever forget some

Stephanie 15 *lun* 2004 (11 :54 AM)

sometimes i have a reallyreally good dream and all of a sudden i wake up in da middle of the night..... then i try 2 go back 2 sleep, thinking about my "reallyreally " good dream but i forget :(

Stephanie 15 Jun 2004 (11:58 AM)

sometimes i have a reallyreally good dream and all of a sudden i wake up in da middle of the night..... then i try 2 go back 2 sleep, thinking about my "reallyreally " good dream but i forget :(

Stephanie 1 *Jun 2004* (11:41 *AM)*

Why do we sometimes repeat our dreams a few years later and only remember a small percent of it?

Responses:

Elisa 1 Jun 2004 (11:54 AM)

i have a perticular bad dream that keeps on repeating it's self and getting really anoymg.
Does anyone know how i can make it go away or why it's doing this?
Lisie

Maggie 8 Jun 2004 (10:55 AM)

thatscary Elisa

Jialin 8 Jun 2004 (11:36 AM)

sometimes it is posible when you see something relating to the dream you had before and you try to remember it but it doesn't come up

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Elisa 1 *Jun 2004* (11:45 *AM)*

Do blind people have dreams?
Lisie

Responses:

Elisa 1 Jun 2004 (11:56 AM)

I've posted this question cause a girl in my class really wants 2 know the answer so does anyone know? i think it's a really good question.
Lisie

Stephanie 1 Jun 2004 (11:58 AM)

I think blind people still have dreams just in a different way.
Is that right?

Elisa 1 Jun 2004 (12:04 PM)

I'rnnot quite sure..j think it's a possibility. what does everyone else think?
Lisie

Leanne 1 Jun 2004 (1 :54 PM)

Some dreams you can imagen and you dont really see pictures
you can just think up a story line Elisa

Jialin 8 Jun 2004 (11 :28 AM)

I think blind people have dreams because maybe when they were little they had sight even if they were born without eye sight they would gradually build up pictures in their minds.

Elisa 8 Jun 2004 (11 :35 AM)

I think that Leanne is probably right. does anyone have anymore ideas?
Lisie

Ciao 8 Jun 2004 (11 :35 AM)

i think blind ppl do c their dreams coz dreams r just a pic in ur mind just say that u dont open ur eyes to c dreams do u ??????

Elisa 8 Jun 2004 (11:37 AM)

JiaLin i gess your quite right.
Lisie

Jialin 8 Jun 2004 (11:46 AM)

great! blind people r quite interesting they can sometimes be very smart

Elisa 8 Jun 2004 (11 :52 AM)

Ciao but it would be so long since they had seen anything (if they ever did) that they wouldn't remember any picture!
Lisie

Elisa 8 Jun2004 (11:54 AM)

JiaLin of course they have 2 be smart cause they read by feeling dots!!!
Lisie

Alice 15 *lun* 2004 (11 :23 AM)

If someone who was blind saw somthing they would probarly remember it really well because it is the only thing they have ever seen.

Autumn 15 *lun* 2004 (11 :32 AM)

this is actually me (Elisa) but my internet dosn't work so i'm using Autumns. Alice, but if they were born blind they wouldn't have seen anything.
Lisie

Cassandra 15 *lun* 2004 (11:46 AM)

a girl in my class said that babies have dreams in the womb even when there blind. Thats wired!

Autumn 15 *lun* 2004 (11:47 AM)

I think blind people do have dreams because they also have a mental vision; imagination. They just only cant see things.

Jialin 15 *lun* 2004 (11:52 AM)

i agree Autumn! Some blind people can actually see but not that clearly ego one time i waved at them to test if they could still see and they waved back!

Maggie 8 *Jun 2004* (11 :24 *AM)*

this website is fun and educaitonal

Responses:

Jialin 8 *lun* 2004 (11:37 AM)

i know but hey do you know why we can't remember some dreams?

Elisa 8 *lun* 2004 (11:37 AM)

You said it! !! it's education made fun! !!!
Lisie

Angela 15 *lun* 2004 (11:09 AM)

if its been PROVED that babies dream in the womb, what do they dream about, because they havn't seen anything outside, what do they dream about?

Jialin 15 *lun* 2004 (11:14 AM)

Maybe they don't see pictures at all but they hear and see nothing

Angela 15 *lun* 2004 (11: 15 AM)

so actually, there isnt ANY pictures in they're dream? this is so Wierd...

Stephanie 15 *lun* 2004 (11 :59 AM)

hi, does ANYONE no y we FORGET our DREEEMS???? (i meant dreams??)

Maggie 22 *lun* 2004 (10:54 AM)

how do u know that there isn't pictures in a babues dream. nobod could prove it!!!!!!!!!

Jialin 8 *Jun 2004* (11 :34 *AM)*

Why do we *sometimes have a mixture ofdreams i mean ego if you were in a room you might transport yourselfhalfa secound later to a library?*

Responses:

Elisa 8 Jun 2004 (11 :42 AM)

i'm not sure! i have that 2!!! 1 second i'm in Jurassic park and a second later i'm in the city in my dreams!!!!
Lisie

Jialin 8 lun 2004 (11 :45 AM)

coooool! it is probably because your brain is overloaded with dreams so you dream it at the same time

Elisa 8 Jun 2004 :50 AM)

but i don't dream it at the same time! there's just a split second imbetween each dream. it doesn't even countinue on from each dream!
Lisie

Jialin 8 *lun* 2004 (11:51 AM)

why do we remember mostly scary dreams and few happy ones?

Winnie 15 *lun* 2004 (11 :26 AM)

u probaly remember scary dreams cause its so scary that u just remember them

Winnie 15 Jun 2004 (11 :29 AM)

sometimes in scary dreams it fells really real and sometimes i scream

Jialin 15 *lun* 2004 (11:42 AM)

sometimes i sleeptalk then i sweat and wake and freakout.

Stephanie 8 *Jun 2004* (11:38 *AM)*

Why do people dream when they are asleep? Why can't they always dream in the day too? Why do we dream?

Responses:

Elisa 8 *lun* 2004 (11 :45 AM)

u can also daydream in the day but just not as vividly. sometimes it can be a vision that God wnats us 2 know.
Lisie

Jialin 8 *lun* 2004 (11 :47 AM)

wow! But for ego when i daydream one time i saw a butterfly that was all

Autumn *8lun* 2004 (11:50 AM)

I think we dream at night because our brain is not concetrating, its just roaming around so we just think automaticly.

Stephanie 8 *lun* 2004 (11 :54 AM)

Why does our dream stay longer even if the night is longer?

Angela 15lun 2004 (11:20 AM)

but.. daydreaming is just like.. thinking.. but think a little HARD>...<
>0<

Alice *15lun* 2004 (11:26 AM)

I think when you dream your mind is sorting out what you have done and thought during the day.
When you day dream i think it may because you are not concentrating on what you are doing. e.g. MATHS!!
Also when you said you saw a butterfly it may have been because there was one out the window!!!
Alice

Autumn 15lun 2004 (11:50 AM)

I think we dream at night becuase we are reflecting on our day.

Angela 8 *Jun 2004* (11:59 *AM)*

ifits been shown that babies dream in the womb, what do they dream about, because they havn't seen anything outside, what do they dream about?

Responses:

Maggie 22 *lun* 2004 (10:53 AM)

no bod actually knows what a baby is dreaming about. it is like a normal perosn. you don't know what they r dreming about unless they tell u themselves.

Jialin 15 *Jun 2004* (11:17 *AM)*

Do you know why we have the ability to dream and why we dream?anyone?

Responses:

Winnie 15 *lun* 2004 (11:32 AM)

i think we dream cause we have experienced things and we just think about it and we just see our dream.

Autumn 15 lun 2004 (11 :34 AM)

i think Winnie is probably right. just 2 add though i think that we might dream for pleasure. (this is Elisa posting this)
Lisie

Jialin 15 *lun* 2004 (II :40 AM)

Are you using Autumn's? Anyway i agree but i disagree also because if you really do dream for pleasure why do we have nightmares?

Autumn 15 lun 2004 (11:45 AM)

yes, but thats not important. u are right i guess but still thats only when u have nightmares and sometimes thats your own fault cause u might have watched a scary movie so you are probably going 2 get a nightmare.
Lisie

Jialin 15 *lun* 2004 (11:47 AM)

yeah but sometimes i repeat dreams and also i never watched a scary movie ever since i was 7

Cassandra 15 *Jun 2004* (11:31 *AM)*

Why do we sleep talk and sleep walk?

Responses:

Winnie 15 *lun* 2004 (11:45 AM)

i dont but my brother played with his digimon and he was shaking it but also at night i saw my brother shaking his hand

Stephanie 15 *lun* 2004 (11:49 AM)

i think is is because when someone is sleeping a deep sleep, they have a dream. (well everyone dreams during their sleep and usally we forget them) in peoples dreams anything could happan sooo people could talk. ...
SMEF

Autumn 15 lun 2004 (11:49 AM)

Weare imaginating things so we do them.

Stephanie 15 *lun* 2004 (11:51 AM)

once my neice slept talked she said, i'm a barbie girl concert u see, my neice has a weird mind. for the same reason da brain makes your mouth move and sometmes u oculd talking when u sleep :)

Rebecca 17 *Jun 2004* (12:24 *PM)*

I THINK DREAMS ARE MADE UP ENTIRELY OF SMALL THINGS IN THE BACK OF OUR MINDS, MIXED UP TO MAKE A GROUP OF IMAGES RATHER LIKE A MOVIE THAT WE CAN'T MAKE MUCH SENSE OF.

David 23 *Jul 2004* (11:48 *AM)*

i havent read the ideas wall, but i think that some dreams do have meanings for example if you are falling of a cliff in your dream you may be soon faced with a negative event in your life or something like that. I believe it because it does make sense and that event might not happen tomorrow but probably will happen some time later. I do believe that you dreams to convey a message of some sort.

Responses:

Courtney 23 Jul2004 (11:51 AM)

i think that dejavu can be a result of something you have dreamed

---

Katarina 31 *Jul 2004* (7:18 *AM)*

I think that a dream tells you what your future in or a dream reminds you of the past, for instance, my mums friend had a dream that all her teeth feel out and when she looked it up in a dreams book it said that soon people die or a few people have already died. It was true because in that week 3 *members of her family died. but my question is how and why do you have dreams.*

Ruth 13 *Aug 2004* (1:21 *PM)*

Yes I read the Ideas. Sometimes when I have a big event coming up, I dream about it and everything goes wrong in the dream. Then I wake up, realise it hasn't happened yet, and feel like I have a second chance!

Dreams 2

Wondering Two
At the end of his investigation, Matt commented that the more knowledgeable he became about this subject, the more he felt he did not know. What more do we need to know about dreams?

Kathleen 11 *May 2004 (10:48 AM)*

Perhaps what causes dreams.

Responses:

Joshua 20 May 2004 (4:13 PM)

i agree does anyone,Know

Kathleen 25 May 2004 (11:23 AM)

Just guessing, but maybe how to prevent dreams? That could lead to all sorts of discoveries!

Justin 26 May 2004 (12:17 PM)

I do!, You dream when your sleeping because your brain is still thinking when your asleep.

Elisa 1 lun 2004 (12:01 PM)

Really?! i never thought of that but it is true now i think of it cause your brain has 2 tell u 2 keep breathing.
u know if we didn't breathe there would be no human race because u have 2 think 21ive!
what does everyone else think?
Lisie

Kelly 1 lun 2004 (2:08 PM)

Theories are that we dream everytime we sleep, although even though when we wake up, we don't recall it.

Jialin 8 lun 2004 (11:42 AM)

I agree! i researched and they said that when you sleep your brain is actually very active!

Vanessa 8 lun 2004 (11:46 AM)

Do you think that dreams are linked with sleepwalking? Do you sleepwalk because you are dreaming about moving around? You're brain is partly active while you're sleeping, so maybe that's why my sister sleepwalks.

Winnie 15 lun 2004 (11 :34 AM)

but i think you need to think to go to sleep so that your brain knows that u want to go to sleep.

Stephanie J Jun_2004 (IJ: 25 *AM)*

why do we forget our dreams

Responses:
Stephanie 1 lun 2004 (11 :36 AM)

We foget most of our dreams because our brain is working so fast that when we wake up suddenly our brain wakes up.
Is that right?

Elisa 1 lun 2004 (12:02 PM)

I'm not sure.
Lisie

Ciao 8 *lun* 2004 (11:27 AM)

i think it depends on what the dream was aboutl !!! if it was excitinj g and u rely liked it then i think u may remeber it!!!!! but if it was boring and very dull then i think u will rather forget it quicker!! !!!

Stephanie 8 *lun* 2004 (11:39 AM)

I now agree with Ciao. I think she is right.

Angela 15 lun 2004 (11: 13 AM)

this is the REAL~ question....
Why DO we dream, and how do we dream...
and how does our brain circulate while we're closing our eyes.....
and how do we make the movements that are actually made in the dreams.. its not like we've seen every move of the person in the drea.. so how do we make the movements in the dream.... its sooo hard to think... help! some one answer please

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Keewa 15Jun2004 (11:31 *AM)*

i wonder why we forget dreams!!!!! *anyone know the answer??? But then sometimes i remember dreams and sometimes i don't why is this happening!!! Someone tell me!!!!!*

Responses:

Keewa 15 *lun* 2004 (11:53 AM)

sorry about the one above my computer is playing up but anyway, how is it we only remember some dreams and not others and i also wonder how is it the mind chooses which one to remember and which one to forget.

Hilaire 23 *Jun 2004* (12:25 *PM)*

We need to know what causes dreams and why are dreams involving in your mind.
We should also try to find out why we even have dreams and nightmares.

Responses:

Cassandra 1 Jul2004 (4:18 PM)

I agree Hilaire.

Hailey 29 Jul2004 (10:24 AM)

I also think that we should find out why we have dreams as well.

Hailey 22 *Jul2004 (10:18 AM)*

i think that he has been investagated too much. therefore he ask himself to many questions wich makes him unsure of the subject,

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Daniel 23 *Jul2004 (11:50 AM)*

Why vary? what causes a nightmare and a good dream? and do dreams have attachments to real life events?
pretty flowers

David 23 *Jul2004* (11:52 *AM)*

*hi every*1!!!! *i have no idea what im doing, lol. Once you know heaps about dreams you tend to think more 'outside the square' and ask yourself questions that you will have no idea of knOWing the correct answer of bells gone!!!*

Drawing Test House

Wondering One Elizabeth and Fiona wondered what is it about you that makes you unique? Is it to do with who you are, what you do or how you look - or something else altogether?

Mark 13 *Apr 2004 (10:29 AM)*

I suppose it's a combination of all those things. Or maybe just it's the absence of being the same as anyone else. nothing we *do on purpose, just the way things are,*

Responses:

Nicola 11 May 2004 (11:05 AM)

Choices afffect what makes you unique, you have mnay choices in life and your choices affect how you act, look and feel inside.

Ajeet 23 Sep 2004 (5:45 PM)

Go 2 dna, then u will find the answer

Navroz 25 *May 2004* (9:59 *AM)*

It could be anything that makes you unique!

Responses:

Kathleen 25 May 2004 (10:48 AM)

That's true. Almost everything about you is unique, except for maybe the things that you like, and the type of clothes that you wear.

Riana 8 **Jun** 2004 (11:04 AM)

I think that you are justs unique. I dont think there is another person in the whole wide world that would look EXACTLY like me or have my WHOLE name (Riana Kulkarni). I think that you can also be unique by the things you can do like i am pretty good at hockey and tennis.

Ajeet 23 Sep 2004 (5:46 PM)

Go 2 dna, then u will find the answer

Namratha 25 *May 2004 (10:03 AM)*

What makes me unique is my name for it isn't very common and I thinks my name reflects on my personality, because my name means 'Great wisdom and very humble'. Also I have a birth mark on my finger which not many people have.

Responses:

Kathleen 25 May 2004 (10:53 AM)

True, Namratha. Birthmarks are just some of the things that make people unique, because it's highly unlikely that people will have a birthmark the same shade as you, or on the same place. Even more unlikely is the chance that they would have a birthmark the same shape as you.

Ajeet 23 Sep 2004 (5:46 PM)

Go 2 dna, then u will find the answer

Alana 25 *May 2004 (10:05 AM)*

I think that god made us all unique in our different ways.

Responses:

Melissa 25 May 2004 (10:07 AM)

Hi Alana
I think too but some people have lessons to practise and make themselves better
Se Ya tell me some more about what u think

Alana 25 May 2004 (10:09 AM)

Yeah Mel,
That is true as well as my idea thanks for responding to 'my' idea.

Melissa 25 May 2004 (10:10 AM)

It is not just "Your" Idea You know
SeYa
I am gonna check out the Dreams part now
SeYa

Emily 26 *May 2004* (12:18 *PM)*

I think its how they think

Responses:

Kirsten 14 Sep 2004 (5:41 PM)

SO DO I BUT IT CAN ALSO HAVE SOMETHING TO DO WITH WHAT WE HAVE SEEN IN OUR PAST THAT MAKES US THINK THOSE THOUGHTS

Jennifer 22 *Jun 2004 (11:00 AM)*

I think, in everyones brain, there is a part which is different to any other person's part. It makes you think differently, do different activities, move differently and eat differently and so on. This varies the type of person we are. By doing these

activities differently, we *develop different habits. They can be good or bad but they are different in some way.*

Everyone has been through different times, good or bad.

Responses:

Kirsten 14 Sep 2004 (5:44 PM)

YES THERE IS A DIFFERENT PART IN EVERYONE, THOUGH WOULD YOU SAY THAT MANY PEOPLES THOUGHTS ARE SIMILAR OR COMPLETELY UNIQUE

Jacquelyn 23 *Aug 2004* (7:24 *PM)*

It is everything ofyou! All ofyour body is unique. Everyone is different but we *might not cope with each other/*

Responses:

Kirsten 14 Sep 2004 (5:47 PM)

I STRONGLY AGREE AND I THINK ONE OF THE REASONS WHY WE DON'T ALWAYS COPE WITH EACH OTHER IS BECAUSE WE ALL HAVE DIFFERENT IDEAS

Ruth 13 *Aug 2004* (1:13 *PM)*

Yes, I think different responses can be right. It depends on the listener's experiences, understandings and beliefs. I remember being asked at school to draw a Martian - but I'd really been asked to draw a margin! Problem was, I didn't know what a margin was!

Responses:

Nat 14 Sep 2004 (5:46 PM)

this is nat

I totally agree with ruth and i think that it would esspecally depend on the listeners life experiences.

Kirsten 15 Sep 2004 (12:41 PM)

i think that because ruth had never heard the word margin before her brain went to what the closest word which she new, which was ofcaurse a martian.

Kirsten **15** ***Sep 2004*** **(12:48** ***PM)***

when we were born we all learnt how to talk, walk and eat from what we have seen being done by others around us. and because of how different every person is we all learn 'different ways and different techniques.
DO YOU THINK THAT IF WE GOT A PAIR OF TWINS AND DID THE DRAWING TEST ON THEM, THEIR DRAWINGS WOULD BE VERY SIMILAR?
