Exploring literacy in a Waldorf and brain-based Grade 1 environment

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by

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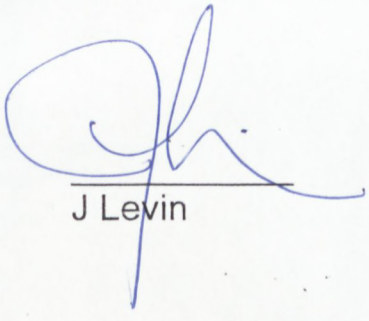
DECLARATION

I, Joy Levin, declare that the contents of this thesis represent my own unaided word, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.



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ABSTRACT

This is an ethnographic study comparing two Grade 1 classrooms in different schooling systems in terms of literacy. The first is in a 'brain-based' school, in the public schooling system. Factors such as proper nutrition, hydration, the role of movement, and emotional interest are featured. The second is in a Waldorf school, representing the largest independent schooling system worldwide. Waldorf takes a slower approach to teaching literacy through using aesthetic, storytelling, creative expression, and movement in the learning of letters. Both schooling systems have been analyzed in terms of their placing of importance on the psycho-motor, affective and cognitive faculties of the child.

The study involved spending time in each classroom to observe the physical qualities of the school environment, the rhythms of the day and the content taught. The purpose was to see if certain techniques or insights into the teaching of literacy could be obtained from the two systems which would have relevance in other schooling systems.

Brain-based and Waldorf schooling come from two very different backgrounds. Brain-based schooling is a contemporary attempt at bridging studies of the impact of neuroscience on education and classroom practice. It considers the role of three levels of the brain - the reptilian, the limbic and the cognitive - in working together towards healthy education. It relies on theories such as Howard Gardner's multiple intelligences, learning types, and the need for proper nutrition and movement within the education day. Waldorf education is based on the work of Rudolf Steiner in the early 1900s and is based on a developmental perspective of the child as a spiritual being. It considers the child within a larger world, and needing the creative aspect of storytelling and artistic expression in the integration of intellectual material. The two have been compared for their similarities and differences, in relation to the teaching of literacy.

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Firstly, to my parents, Jeff and Merle, for your constant belief and support in making the best in our life,

I dedicate this thesis to my dear friend, Gary, who through the years has inspired me to think, and through our fireside chats I put my own thoughts together on my thesis. Although we may not always agree, you are a true scholar to me, as without needing any paper to prove it, you continue to regard knowledge in its highest form.

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CHAPTER ONE

INTRODUCTION

1.1 Origin of the study

When I read the results of the International Progress in Reading Literacy (PIRLS) 2006 (2007: Howie, Venter, Van Staden, Zimmerman, Long, Scherman and Archer) study, and learned that South Africans had fared worst in the results of all participating countries in Grade four and five literacy comprehension, I decided to follow a path of study involving literacy practices. My thinking was that there must be some way that reading and writing can be taught which addresses the special needs of South African children; including the lack of emergent literacy opportunities, children coping with second language schooling, nutritional needs not being met, and the effects on the child's body and mind from the general stresses that come into life. I recognized that although as a country we are striving to meet standards of literacy skills in comparison to other regions of the world, we also work with many hindering conditions here, and wondered whether there was a way to engage and inspire children so that their love for literacy, as well as test scores, are increased.

At the time of the PIRLS data collection in 2006, Pretorius and Ribbens reported a lack of national assessment procedures which monitor reading and determine if readers are functioning at appropriate motivational levels for their ages (Pretorius and Ribbens, 2005, in Howie et al., 2007:11). On this basis, they recognized a difficulty in determining whether students have reading problems themselves, or if the cause could be that the educational system is not delivering its mandate to produce literate learners.

In March 1997, the former Minister of Education, Sibusisu Bengu, launched Curriculum 2005, leaving behind content-based teaching and rather incorporating Outcomes Based Education (OBE). This is a system which incorporates a learner-centred approach, giving less emphasis on what the teacher wants to achieve, but rather on what the learner should know and demonstrate (Botha, 2002 in Howie et al., 2007: 14).

Bengu asserted that this new educational system would help to transform South Africa, and producing thinking, caring learners (1997, in Russel,1998: 5). Jonathan Jansen, a prominent critic of OBE, in his famous critique (1997, in Russel, 1998:5) states:

> My thesis is that OBE will fail, not because politicians and bureaucrats are malintended, but because this policy is being implemented in isolation and ignorance of almost 50 years of accumulated experience with respect to curriculum change.

Sadly, many of his predications came true. Policies of the Outcomes-based education system showed very high ideals, but were challenging in the South context (Howie, et al., 2007:14).

Curriculum 2005 came under review from the Policy Review Committee, set out by the Department of Education. This set in motion a process where the Curriculum 2005 was phased out and replaced by the Revised National Curriculum Statement (RNCS). This statement outlined nine learning areas, three of which would be incorporated into the foundation phase: literacy, numeracy and life skills (DOE, 2002:15). Time percentages were allocated to each learning area, with literacy taking 40% of curriculum time, numeracy 35% and life skills 25% (DOE, 2002: 17).

Literacy falls under the larger umbrella of the language learning area, which states the following outcomes (DOE, 2002:20-21):

1. **Listening**: The learner is able to listen for information and enjoyment, and respond appropriately and critically in a wide range of situations.
2. **Speaking**: The learner is able to communicate confidently and effectively in a spoken language in a wide range of situations.
3. **Reading and Viewing:** The learner is able to read and view for information and enjoyment, and respond critically to the aesthetic, cultural and emotional values in texts.
4. **Writing:** The learner is able to write different kinds of factual and imaginative texts for a wide range of purposes.
5. **Thinking and Reasoning:** The learner is able to use language to think and reason, and access, process and use information for learning.
6. **Language Structure and Use:** The learner knows and is able to use the sounds, words and the grammar of a language to create and interpret texts.

The most important task of the foundation phase teacher, according the Revised National Curriculum Statement (RNCS), was to ensure that all learners could read, and forty per cent teaching time was allocated to literacy. It recognized that all learners needed to learn strategies which helped them to read with understanding and unlock codes of the written texts (Howie et. al., 2007: 15). This required a balanced approach to literacy development, beginning with a child's emergent literacy skills, and then involving them in reading books, writing for genuine purpose and giving attention to phonics.

Two systems of education are studied in this research. The first, the Waldorf school, falls in the category of an independent school system, and does not adhere to the specifics of the RNCS. The second is a South African public school

followiong the National curriculum, but adding features more relevant to brain-based principles. The hope of this comparison of techniques is that both systems studied may offer workable options of educational techniques for the learning of literacy both within and beyond the outlines of the present curriculum.

Literacy has come to imply teaching children to read and write, as a technical and neutral skill. Yet, as Street (2003: 78) asserts, reading and writing are also embedded in social and cultural conceptions of knowledge: "It is about knowledge: the ways in which people address reading and writing are themselves rooted in conceptions of knowledge, identity and being (Street, 2003: 77-78)." The ways in which literacy is perceived is always enclosed within a worldview, and therefore even the ways that literacy is taught are influenced by those teaching it, and the position with the learners in relation to power. "It is not valid to suggest that 'literacy' can be 'given' neutrally and then its 'social' effects only experienced later (Street, 2003: 78).

Street (2003: 78) asserts that there are rather multiple literacies, and outlines two models of literacy: autonomous and ideological. The autonomous model is the standard viewpoint of educators who see literacy skills offering skills, which autonomously will have effects on other factors such as cognitive and social practices. Therefore it is seen that helping to tackle 'illiteracy' in a nation such as South Africa, will in itself help create socially constructive and critically thinking individuals, regardless of the factors which caused the high levels of illiteracy in the first place (Street, 2003: 78).

The ideological model of literacy is more culturally sensitive to the varying perceptions of literacy, and sees it as a social practice rather than simply a technical skill. Therefore engaging with literacy is a social act from the start,

loaded with social practice and conceptions of reading and writing, which affect different cultural groups in varying ways.

Emergent literacy is a valuable tool as an indicator of potential, with its stages beginning with the exposure to literacy practices in daily life: listening to stories, imitating writing and reading, having literature available and recognizing the value of it in daily life. The reality of many South African children is that this exposure is not extensive, and they arrive in a reception year or Grade 1 classroom unprepared with the foundation that will lead them to become good readers and writers. All of the stresses in their lives have potential to affect the literacy abilities of the students.

While both brain-based and Waldorf schools exist internationally, the techniques discussed could be applied in any country. With the challenges the South African students' experience, it is my goal that the study can offer insights that can be applied here, whether within a public or private curriculum.

Waldorf pedagogy can be difficult to understand for some, as the concepts are rich in both language and philosophy. Unless one is exposed to the system in its entirety, it can be complex to understand the parts. In addition, many of the theories do not reach into the academic field, and the original writings are nearly a century old. The main principle is about linking transitions in child development outlined by its initiator, Rudolf Steiner, to curriculum. My interest was in whether this pedagogical system could connect to current research, and therefore I looked to neuroscience to bridge the communication gap. Waldorf has a very specific program of teaching writing and reading, which correlates with their child developmental model.

Brain-based schooling, based on theories of the brain in learning, is also linked to the constructivist classroom and believes in the brain's need to link concepts to daily experience. Many neurological findings actually make sense from a humanistic, child-centred perspective, but can be validated by brain studies. Brain-based schooling has no specific pedagogy towards literacy but does add exercises and theories towards relaxing the brain and accessing skills of the learner.

Grade 1 is the first formal year for teaching literacy, and as a result I decided it was the year to focus on. My desire was that in comparing the two environments, their differences and similarities, I would attain a set of insights into the teaching of literacy that could be utilized by any system of education. The hope was that techniques and theories might emerge to supplement literacy practices in schools today, with relevance to the individual and developmental needs of the child.

Literacy, involving oral language, as well as reading and writing, is imperative in the learning environment. South African provincial and national systemic evaluation results (2003, 2005) showed that at least 40% Grade 3 and 7 readers were reading below grade level, and many prospective readers are so discouraged that they cannot master the reading tasks assigned to them (Kohler, 2008:ii). Boyer (1995, in Kohler, 2008: 4) suggests that although speaking and learning come first, learning to read is the top priority in primary school education. This study is an investigation into techniques of understanding and learning literacy through the perspective of the needs of the brain as well as the developing child.

1.2 Structure of the report

Chapter 1 contextualizes the research project.

Chapter 2 conducts a literature review that includes descriptions of both brain-based and Waldorf education. It positions them in terms of other educational frameworks. Brain-based education is investigated, with regard to its assumptions, critiques, and views of the brain in reading. Waldorf schools are discussed with regard to their foundations and views on teaching literacy. Then the connecting themes are discussed and analysed according to the literature.

Chapter 3 outlines the ethnographic methodology in education that informed the design of the study, how I attempted to attain validity and reliability, and which tools were utilized in the data collection.

Chapter 4 presents and discusses the findings from the data collection. It looks at the learning environments of both the brain-based and Waldorf schools, how they corresponded to a set of environmental factors determined by the two approaches, and what came up during the observation, interviews and document analysis. It discusses the results of the studies under the framework of psycho-motor, affective and cognitive realms in order to answer the research questions.

Chapter 5 gives recommendations for further study and how we can take these principles into the larger fields of practice, including ourselves as the educators.

CHAPTER TWO

LITERATURE REVIEW

This literature review outlines the central themes in both brain-based and Waldorf education, with a focus on their perspectives on literacy. It opens with a look at education in South Africa. It investigates the roots of both schooling systems, and then outlines connecting themes of utilizing the psycho-motor, affective and cognitive domains in learning. Brain-based education draws on neuro-scientific findings of brain function, and how these findings can be applied to education. This considers how the brain learns, and the effects of the classroom environment on the learning brain. It does not have specific pedagogy with regards to literacy but rather techniques to support learning as a whole. Waldorf schooling involves the three domains of thinking, feeling and willing or doing in learning, which involves, but is not limited to brain functionality. Waldorf education looks at the stages of child development, and finds appropriate curriculum to meet the growth of the child: physically, emotionally and mentally. Both systems are compared in order to gain insight into the acquisition of literacy skills.

2.1 Literacy in a South African context

Literacy seems to be the inexorable combination of writing, reading and thinking (Eitelgeorge and Barrett: 2004:17). The early skills that are considered crucial to later academic success are generally referred to as emergent literacy (Spira, Bracken, and Fischel, 2005: 225). These are the skills, knowledge and attitudes that are presumed to become the developmental precursors to formal literacy acts of reading and writing. This term was first coined in 1966 by Marie Clay, calling attention to these pre-writing skills of oral language, drawing, pretending

writing and reading, as building blocks towards attaining literacy skills (Eitelgeorge and Barrett, 2004:17).

According to linguistic theories, human language utilizes three modalities- speech, gesture and writing. Speech uses the acoustic channels and gesture and writing utilizes the visual channels. From a historical perspective, gesture may have arisen first, and only afterwards speech and writing (Bright, 2000:3). This highlights the role of movement and gesture within learning of language. From the earliest ages children are reading the gestures of the mother and caregivers to gain understanding and offering gestures in order to demand their needs. Therefore it is my opinion that the very young child's reading of the mother's face, is actually the first stage of literacy. In South Africa many children are forced to go to early childcare in their first days or weeks, due to the demands of work and cicumstances of poverty. This, in my opinion, is already undermining a country's value of literacy.

According to McAllen (1977:13) a child's first literacy is the wandering of the one arm and hand, feeling the mother as the child breast feeds. This allows the child to feel their way through the line and the curve, the basic shapes of writing. When bottle feeding there is not that movement or exploration of shapes, and the very early basis for spatial development is not occurring. Crawling in the later months is also imperitive to the balancing of the brain hemispheres, and many children do not have adequate space to explore their crawling potential. I believe these early childhood factors can be acknowledged in the full picture of literacy success.

This statement made by Valerie Kohler (2008, i) commenting on the state of literacy in South African schools, points out many of the issues discussed in this thesis.

> The provincial and national systemic evaluation results (2003, 2005) for reading showed that at least 40% of Grade 3 and 6 learners were reading below grade level. In January 2005, in the present study, 50 % of the Grade 7 learners were reading below Grade 7 level. Many learners were discouraged because they could not master the reading tasks set to them. Others responded to the task with boredom and disdain. The learners who could read seem to be the only ones who were enthusiastic about starting and completing the reading tasks.

The issues of students' ability to read are also influenced by their desire and excitement around reading. While the psychomotor aspect of literacy can be influenced by the ability of the young child to have freedom in movement, the affective domain is influenced by a person's interest in the material and desire to read more. This can be influenced by many factors such as stress, the inability to understand the content or the language of the material, or relate to the reading through one's life experience.

Street (2003:77) looks at the differences between the autonomous and ideological models of literacy. The autonomous model sees literacy as a neutral skill, separate from the context in which it is taught, that will give further skills such as cognitive abilities and life opportunities. The ideological model incorporates the social context in which the literacy is being taught, and sees literacy more as a social practice which incorporates literacy activities and gives meaning to them (Street, 2003: 78). When literacy is brought into cultures as a new practice, studies such as those by Kulick and Stroud (1993, in Street, 2003: 80) in New Guinea, show that local peoples can 'take hold' of these practices and adapt them to their own. The result is a new local-global hybrid rather than a single version of either. With the situation of multiple and mother-tongue languages in South Africa, this mixing can be important to investigate and observe in the emerging literacy paradigm. Assumptions in the autonomous model, such as the great divide between the oral and the literate (Street,

2003:81) have great implications in a culture such as South Africa, and in the study of the brain and human development.

Bloch (2006:11) emphasizes that many African-speaking children have orally oriented socio-cultural realities and often their first introduction to the elements of the written language is at school. She links 'print scarce' literacy environments preceding the child's entry to school as a contributing factor to a difficulty in learning to read and write. She states (Bloch, 2006:12):

> Faced with repetitive exercises that are not even meant to make any sense at all and with little chance of catching a glance at a storybook or any other sensible text, many children are not able to make the necessary associations to actually start reading and writing.

Bloch (2006) states she is unconvinced of emphasizing the value of indicators based on national standards in a South African climate. I agree. Learning in a second language, as well as constraints of poverty, nutrition and stress already take so much of the energy needed to attain literacy skills. In addition, there can be a lack of exposure to emergent literacy material before formal schooling, such as reading and writing as part of the daily activities at home.

2.1.1 A short history of the written word

According to linguistic theories, human language utilizes three modalities- speech, gesture and writing. Speech uses the acoustic channels and gesture and writing utilize the visual channels. From a historical perspective, gesture may have arisen first, and only afterwards speech and writing (Bright, 2000:3). Writing systems themselves work in two categories. The first is phonographic, where the written symbol corresponds to *the sounds* of speech, as in most European languages. There is also a type of phonographic where the writing is in syllables, and is called syllabry. When the consonants are written in full but the vowels just

partially or optionally, it is called consonantry, such as in Hebrew and Arabic (Bright, 2000: 4). The second main category is logographic, where the written symbols correspond to *the words*, such as in Chinese.

Writing began as logographic, where written symbols represented actual visual stimuli, or words. Writing as an abstract system of graphic symbols linked rather on the sounds words than the words themselves, seems to have evolved on three separate occasions in the history of writing (Bright, 2000: 5). Firstly writing by the Sumerians of Mesopotamia, became known as Cuneiform. Shortly afterwards it developed in China and a few centuries later in southern Mexico and Guatemala.

These early logographic written languages seem all to be based on single syllables, called morphemes, which are the most minimal meaningful elements of grammar. Modern Chinese has evolved from this monosyllabic language, although other languages such as Vietnamese have not (Bright, 200:5). Daniels (in Bright, 2000:5) recognized that the Sumerian, Ancient Chinese, and Mayan languages may have provided the linking from monosyllable logographs, making the bridge from visually-based symbols to abstract word-based symbols.

The original logographic symbols originally used by the Sumerians were adapted by their neighbours, the Akkadians, who spoke a Semitic language, which had a 'polysyllabic' structure which was very different from the Sumerian monosyllables. The Akkadians then revised the logographic cuneiform of the Sumerians into a syllabry, which was then borrowed by the Phoenicians. They evolved it even further to a consonantry, such as in Hebrew and Arabic systems, which still exists today. Later on the Phoenician system was borrowed by the Greeks, who then added vowel symbols, and produced the first alphabet. The Romans then adapted it, creating the Roman alphabet that we know today. In East Asia, the Chinese logographic system was taken by the Japanese and Koreans, who both spoke polysyllabic languages. Yet they went in differing directions - the Japanese created

a syllabry called kana. The Koreans created an alphabet called Hangul. Both exist today alongside Chinese characters in Japan and Korea. It seems that all the writing systems of the Eastern Hemisphere can trace their ancestry to languages which first emerged in Sumeria and China (Bright, 2000: 5).

It is likely that writing first originated as an adaptation of what is called pictographs, which are conventionalized graphic symbols based directly on visual stimuli (Bright, 2000:5). Interestingly, children in emergent literacy also start with pictures to represent meaning, and many of the images depicted in early rock engravings and cave paintings are reflected in the imagery of young children's drawings (McAllen, 1977:12).

From the pictures were monosyllabic writings which reflected the visual stimuli into the sound. Once the Semitic languages developed as writing with only consonants, they were read from right to left. Greek itself took 350 years to develop into a system of writing from left to right. According to Ornstein (1997:34) Greek was first read right to left, then as the ox ploughs, which is right to left and left to right, and only later as it is at present. This will be discussed later as a matter of understanding the role of the brain hemispheres in reading.
From my research I began to wonder if there was a picture of how humanity developed writing, and how a child develops their symbolic expression - first from the visual pictures, and then into abstract symbols. It is just that what took humanity thousands of years takes a child 6-9 years. And within that process a neurological wiring is occurring that may be reflective of humanity as well.

2.2.1 Waldorf schools

Waldorf schooling has its roots in the spiritual-scientific research of the Austrian scientist and philosopher Rudolf Steiner (1861-1925). The first school was

developed in 1919 in Germany, stimulated by the effects of the World War I, and as a request of Emil Molt, owner of a cigarette factory (Barnes, 1991: 52). Originally Molt asked Steiner to educate his factory workers, but he realized the potential rather of working with the children. His conditions were that:

- Schooling be a unified 12 year process
- Open to all children
- Independent of political or economic control
- Where the responsibility of the education was allocated to the teachers, rather than administrators (Barnes, 1991: 52).

He gave a set of spiritual- scientific lectures, now a book entitled *The Foundations of Human Experience* (1919 in Steiner, 1996) where he lectured the future teachers on the philosophy and practice of his educational system. This centred on the developmental picture of a childhood, in three phases of early childhood, middle childhood and adolescence. "Man is a threefold of spirit, soul and body, whose capacities unfold in three developmental stages on the path to adulthood" (Steiner, 1919 in Barnes, 1991: 52).

Waldorf schooling can be considered a humanistic education, because it prioritizes learners' growth and development in curriculum planning. This approach considers the whole child, not only the cognitive dimensions, offering music, art, literature, health and humanities as equal in curriculums to the sciences and mathematics. The humanistic approach has its roots in progressive philosophies and the child-centred movement of the early 1900s, proposed by John Dewey, Charles Judd and Francis Parker, who developed the progressive methods of teaching that promoted an understanding of learning as prompted by the natural development and curiosity of the student (Ornstein and Hunkins: 2004:8). The attempt within the curriculum is to form more meaningful relationships between students and teachers, foster student independence and

self-direction, and promote greater acceptance of the self and others. It is not stated that the Waldorf system developed out of the humanistic influence, but the philosophy does fall in line with some these principles.

Child-centred education looks at the value of the child interacting with their environment in an experiential way in order for learning to take place (Ornstein and Hunkins, 2004: 253-4). This is reflective of Rousseau's assertion in 1762 that children should interact with what has meaning in their lives, appropriate for the particular developmental stage of the child (Ornstein and Hunkins, 2004: 254). The value of learning through movement, through experience and the senses is very important in Waldorf education.

Rudolf Steiner expanded on the interactive space, where not only what is important in the outside world is valid, but also an internal developing world which includes that of the imagination. Waldorf education looks at the developmental stage of the child and brings stories which come from the history of humanity, to meet the needs of the child's growing emotional capacities. "The child must belong to the world" (Steiner, 1924: 12). Not only is the child growing into adulthood, but humanity also had its maturation, revealed through the progression of stories in which humans told and lived through. In this way, the oral world meets in the divide and supports the journey into literacy. For example, a Biblical story or Greek myth can meet a child in a particular stage of development of their own internal emotionally developing world.

Gidley (2007) makes a comparison between the concepts discussed by Rudolf Steiner with those of a modern spiritually oriented postmodernist, Ken Wilber. She compares both of their ideas of an evolving thought world, which human consciousness is developing with it. "In the human self-consciousness..thought contemplates itself. The essence of the world arrives at its own awareness."

(Steiner, 1973 (1914) in Gidley, 2007: 117). Gidley looks at the historical contemplations of evolution, even a century before Darwin, Johannan van Herder recognized and wrote that different cultures and historical periods had a varying consciousness, where people's awareness, sensations and beliefs differed from one period to another (Forester, 2001 in Gidley, 2007: 118). This was taken further by Goethe, Hegel and Shelling, towards a concept of conscious evolution. Although they were being inspired by the earlier, unitive worldviews, these philosophers took evolution further, "beyond the limitations of both pre-modern 'mythic' consciousness and 'formal' modernist rationality, towards a more conscious awakening of a 'post-formal', integral consciousness" (Gidley, 2007: 118).

Steiner did his degree in the study of Goethe's work. At the same time, the Industrial revolution was showing its technological and materialistic powers, "casting a shadow on idealist and spiritual notions of human consciousness and education" (Gidley, 2007: 118). Steiner in 1919, along with others such as Aurobindo in India, and the philosophies of Maria Montessori, developed the concept of consciously educating towards that evolution. Waldorf schooling today has become one of the largest independent schooling systems in the world (Blunt, 1995: 9) and its philosophies and practices have also contributed to many public school curriculums worldwide.

The concepts discussed under Waldorf education, of spiritual awareness and the evolution of consciousness as a process intended through education is also brought into the field by many modern educational theorists. Steiner education is being utilized in processes such as the United Kingdom, where old educational practices need a review, bringing spirituality from a non-denominational perspective into the educational forum (Gidley, 2007: 120).

Steiner education has been slow to reach the academic field, perhaps because of its independent nature, not formally linked to many other educational theorists. The language can be difficult to decipher and concepts must be built on in whole pictures before the parts can be comprehended. This can also result in a lack of criticism from the academic field.

My own child began Grade 1 at the onset of my thesis, and in completing it is in Grade 4. I have seen with my own eyes how the stories given to each emerging age of the child have met with their own emotional processing. In the Waldorf curriculum, the earlier years have fairy tales, animal fables, saint stories and meeting a great crisis time at 9 years old with the Biblical stories. As they pass through this crisis, they enter the Norse myths, then will go onto the Greek myths and into the history of the Romans and Babylonians. Here in Africa, stories which parallel these emotional stages are also being investigated as the curriculum has been critiqued as being too Eurocentric. It can be said that the stories of humanity as a whole can engage with and meet the needs of the child as they grow into the world.

2.2.2 Brain-based education

The brain-based learning system looks at the individual processes of the learner as important, and finds links in how the brain works. The neuroscientific domain has emerged after four decades of research on the brain, and its link in analysing educational practices. Many of these ideas have been conflicting, with "heated battles between well-intentioned parties who held drastically different views about the application of neuroscientific discoveries to educational practice" (Sousa, 2010: 9). According to Caine and Caine (1991: 8) brain-based education must include the design and orchestration of life-like, enriching and appropriate experiences for the learners, in a way that the student can find meaning within

the process. It utilizes theories of multiple intelligence, learning styles, and emotional intelligences to integrate the psychomotor, affective and mental realms into the learning process.

Brain-based education has been linked to principles of constructivist classrooms. According to Kahveki and Ay (2008: 124), although the two have appeared to be separate domains, there are close links in their principles. Constructivism is concerned with how individuals learn, and advocates that the learner be the active person in the process of thinking, learning and coming to know (Ornstein and Hunkins, 2004: 117). It questions the behaviourist approach, which asks "What can an external force, such as a teacher, do to enact or elicit a response from the learner?" (Ornstein and Hunkins, 2004: 117). Instead, the learner is a key player, participating in generating meaning or understanding, as opposed to passively accepting information through memorization or mimicking. The learner constructs understandings from the inside, not from an external source. These theories stem from works of Lev Vygosky, Jean Piaget and John Dewey. Caine and Caine (1991: 9) who were pioneers in brain-based approach, use constructivism to validate similar understandings about the brain, saying that the brain searches for connections and meaning in the information presented.

There is contention as to whether some of these theories attributed to neuroscience are not actually based in cognitive psychology and other social theory rather than pure science. Bruer (1988: 388) cautions that the neuroscience stated in policy arguments is not new, and depends on three well established neurological findings: 1) rapid, postnatal synapse formation, 2) critical periods in development, and 3) the effects of enriched rearing on brain connectivity in rats (Bruer, 1988: 388). He warns that often this neuroscience is misinterpreted and oversimplified, bringing principles far more attuned to fields of cognitive psychology.

Davis (2004:22) critiques the assumption of a neuroscientist, that by teaching in a certain manner, the student can learn to 'think for themselves'. Yet, he urges, this is much more of a political and moral question, to do with autonomy. How can one assume that because the brain functions in a certain way, definite educational precepts follow? In addition, concepts such as the brain being limitless, or that the brain is essentially curious, pose 'category mistakes' in assumptions of the role of neuroscience in education (Davis, 2004:23). Rather learning involves knowledge, memory, understanding, belief, motivation and attitude, which are features of a discourse of interconnected concepts described as 'folk psychology' (Davis, 2004: 24). This is the medium through which we make sense of our own behaviour, and that of others. Davis asserts that we never by-pass the language of belief, intention, reason and motive in the attempts of referring directly to brain functioning.

This is relevant when discussing the foundations of brain-based education, which are a mix of neurological findings with psychological intentions, such as seeking meaning, finding connections and limitless potential (Davis, 2004: 22). While much of folk psychology is now being validated by neurological research, it is difficult to point out that the brain is the cause of these intentions.

While the great claims of brain-based education, such as finding meaning through brain neurons may be discussed and even disproved, the role of the brain in learning has an ever greater expansion of information and studies that can contribute to a greater picture of the child in the learning environment.

2.3 Connecting themes in education

Three main connecting themes run through the two systems of education being studied, and can be classified using a threefold picture of the thinking person. All human beings consist of the psycho-motor (or physical), affective, and cognitive domains. These will be defined and then discussed in relation to similarities between brain-based and Waldorf education. They will then be applied to the greater theme of literacy education.

2.3.1. Psycho-motor domain

The pyscho-motor domain is involves the physical body and movement. The role of movement is an integral part of the curriculum in both education systems. In brain-based education it is not only movement in general, but specific movements which help integrate the co-ordination of left and right sides of the body, and therefore the brain. This use of both hemispheres of the brain is imperative in reading and writing. In Waldorf, the role of movement is also very important to learning. The physical domain includes the role of movement, senses, and the nutritional needs of the body, which ultimately influence the learning brain.

2.3.2. Affective domain

The affective domain focuses on the emotional needs in learning. Both Waldorf and brain-based schooling understand that the brain does not function in a state of high stress, and that the emotional or affective domain within learning has priority. This involves both a reduction of stress in the classroom environment, as well as the importance of making the lessons emotionally interesting in order for

higher learning to take place. Although teachers are aware that emotions have a valid role in learning, many are still unsure of how to incorporate them into their lessons (Sousa, 2010: 4). The affective domain in education involves the understanding of the limbic system of the brain, the role of stress, as well as the use of artistic or aesthetic expression for integrating information.

2.3.3. Cognitive domain

Cognition is the ultimate goal of education. Yet in order to achieve thinking, the other domains must be recognized and integrated. Cognition involves the actual work that is done, memory retention of information, and the thinking processes involved when working with the information given. Cognition also incorporates the comprehension of reading material and ability to use the skills of literacy and numeracy.

Both of these schooling systems acknowledge the holistic nature of education and the child, and that for successful literacy practices to occur, both the physical and affective domains need to be integrated into the cognitive processes. Each system has its own individual way of accessing the thinking capacities within the child, but for both of them there are techniques to involve the utilization of all three domains in order for higher functioning to take place.

A review of each education system and then a comparison of the similarities and differences between them for accessing the three domains of physical, affective, and cognitive, in relationship to literacy practices, will be conducted.

2.4 Defining brain-based education

According to Caine and Caine (1991), the brain-based system of education is actually an amalgamation of research that borrows from cognitive psychology, philosophy, sociology, science, technology, new physics, physiology and neuroscience (Caine and Caine, 1991: 9). The bridging of the gap between cognitive psychology and neurology is now termed cognitive neuroscience; it examines the connections relating neural processes and environmental input, as the students develop in their socio-cultural learning environments (Ansari, 2008:6). According to Sousa (2010:1) the birth of this body of knowledge, termed educational neuroscience, has taken several decades and often been difficult and contentious. Yet in the past few decades, the findings on how the brain learns have contributed to the transformation of education significantly (Miller and Tallal, 2006:19). Figure 1 shows the overlapping of psychology, neurology and pedagogy to create what is now termed educational neuroscience (Sousa, 2010: 2).

In the 1980's and 1990's there was an explosion of research regarding the workings of the brain (Sousa, 2010: 4). The first wave of brain-based education created a language in which educators could understand the new neurologically based knowledge, in order to apply it to the classroom (Jensen, 2008b: 408). Words such as 'axons, dendrites, serotonin, dopamine, hippocampus,' and 'amygdala' flooded the vocabulary, and created a discursive platform to work with (Jensen, 2008b:408). Now research is reaching the classroom on a more practical level, and comes from multi-disciplinary fields. Each field acknowledges that the brain affects everything we do. Brain-based education has increasingly become about building a bridge between scientific and educational communities (Willis, 2008: 424).

Journals bridging multidisciplinary fields include *Journal of Neuroscience, Biological Psychiatry, Nutritional Neuroscience, Social Neuroscience, Journal of Neuroplasticity, International Journal of Stress Management, Arts and Neuroscience, Journal of Exercise.*

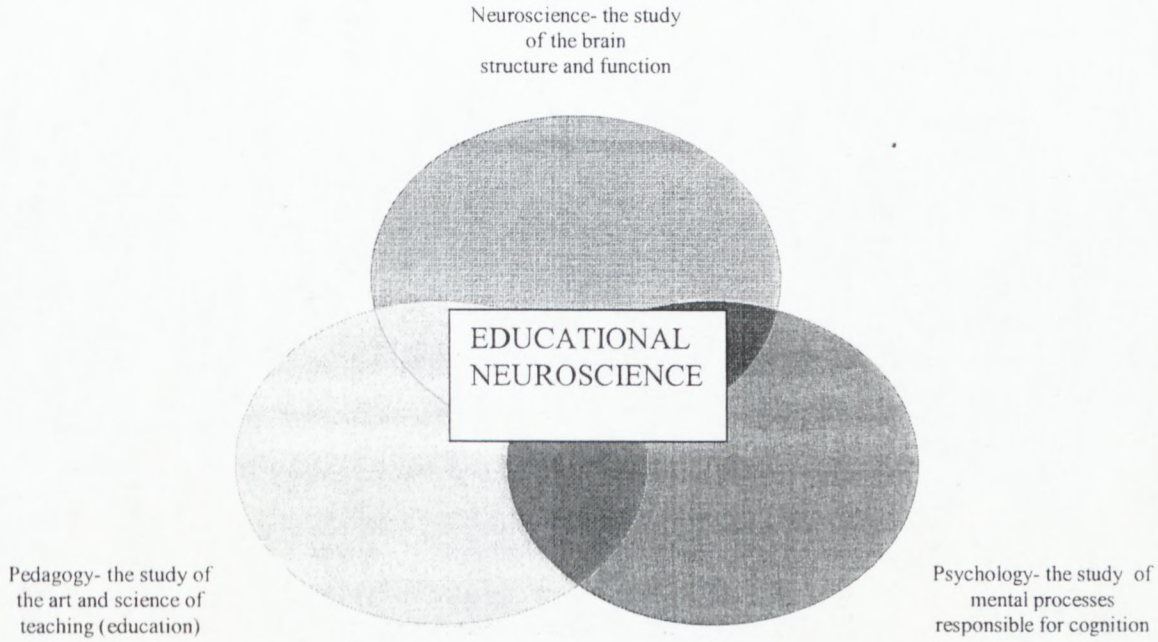

Figure 1: The interlink between psychology, pedagogy and neuroscience (Sousa, 2010:2)

2.4.1 Is there a brain-based rationale for a curriculum?

Jensen (2008b:413) asks, "Is there a brain-based education policy?" This could also mean asking whether there is a rationale leading to a brain-based curriculum that would make brain-based education transferable to other education systems. At the moment, Jensen states, not yet (2008b: 413); that it is

more a 'field' than a 'domain'. The field comprises a collection of scholars, consultants, publishers, staff developers, neuroscientists, conferences and school programs. Although it is far from concise or replicable, the mature step forward would be to establish a specific curriculum that would guide teachers in any brain-based school internationally.

2.4.2 Validating research

It is important to understand the brain and be cautious in receiving findings of brain research without a full analysis of their relationship to education (Wolfe, 2006:14). Wolfe outlines a set of questions to ask in determining whether a scientific study is valid:

- How many participants were in the study?
- What were the ages and characteristics of the participants?
- Was there a control group of participants who were matched with the subjects in the experimental group?
- What was the methodology used for this study?
- Has the study been replicated by other scientists utilizing the same methodology?
- Are there any similar studies with contradictory findings?
- Would truly work in a classroom situation, and how?

These questions highlight whether the research applied to the classroom is credible in terms of neurological findings.

As my particular research does not involve scientific studies, I did not feel I needed to be able to answer all these questions, but they are important when validating the research presented on brain functioning.

2.4.3 Critiques

There are critiques of brain-based education. Educators can struggle to read and understand neuroscience, which even neuroscientists admit is "challenging for even the brightest of us" (Willis, 2008: 424). Regarding neuro-imaging, many studies are derived from experiments on animals and those findings on humans often come from group averages (Kalbfleisch, M. 2008: 162). Cognitive neuroscience also suffers from a lack of consensus on definitions and norms related to data analysis and inference (Kalbfleisch, M. 2008:164). For instance, it is important to differentiate between the adult and child brain in functional magnetic resonance imaging (fMRI) scans, especially when applying the findings to education. These scans measure blood flow to neural activity in the brain. And while brain-based theorists have supported the idea that classroom instruction should be embedded in sensory-filled, brain-based and hands-on activities, still most "brain-based" classrooms remain unchanged from the traditional classroom, in many, if not most interactions (Wilmes, Harrington, Kohler-Evans, and Sumpter, 2008: 659).

Jensen cautions that one can never say, 'brain-based education proves that,' but rather that studies have shown something may be true about the brain, and that the strategies in the school may be useful (Jensen 2008b:430). Professor of psychology, Robert Sternberg (2008, in Colburn, 2009: 10) argues that in the future brain based theories will have promise for education, but for now they are too broad and sometimes contradictory in their conclusions to be truly practical for teachers. Willingham (in Colburn, 2009:10) reasons that most of the neuro-scientific research is being conducted in laboratory situations, where they may not be transferable into the real life school environment. This is due to many other complex factors which can potentially influence the outcomes.

Wolfe (2006:11) outlines studies that entered the education field, which she argues were not based on proper experimentation related to education. One example is a researcher from the University of Virginia, who found evidence that glucose, a sugar, improves alertness and memory. This led to media coverage promoting giving peppermint sweets to students to improve their memory capacity. The research on which the report was based was conducted with elderly people who drank lemonade sweetened either with glucose or saccharin. While those who drank the lemonade sweetened with glucose recalled almost twice as much of a narrative prose passage as the others who drank the saccharin sweetened drink, this experiment was not tested with any K-12 students, and the same results did not prove with college students. Wolfe (2006:12) asserts that:

> This lack of scientific knowledge has put us at the mercy of lay boards and politicians who have sometimes made decisions that are unrelated to what we know is best for students and their learning.

Ansari (2008) describes some of the neuromyths that people have accepted in a recent commercialism of 'brain-based education' techniques, where neurological ideas have been misrepresented and watered down. For instance, there is some notion that people operate either out of their left or right brain, but recent research has shown that most people utilize these two hemispheres simultaneously (Ansari, 2008: 9). Elaborate programs for reading difficulties can be sold as a computer program, supported by neuroscientific research but unproven in their efficacy (Ansari, 2008: 10).

Jensen acknowledges the critiques of brain-based education, but also states that often criticisms of a theory can also strengthen it (Jensen, 2008a: 413). He agrees that utilizing selective research; such as sensitive developmental periods, gender differences, or right-left brain differences can marginalize discussions in a

much larger forum and that many theories have brought interesting discussions into the discourse that cannot be totally discounted. While he agrees with Bruer (2008:44) that cognitive psychology is the strongest current for the basic science of education, he also validates the interdisciplinary nature of the brain, the mind, and education.

2.4.4 Creating bridges

Willis (2008: 424) suggests a two-tiered structure to create the bridge for educators to make sense of the large quantity of information entering the neuroscientific field. Firstly, that factual collaborative brain research is designated as such, and secondly that educational strategies strongly suggested by neuro-scientific data, are identified as interpretations of that research. Fisher (2009:3) suggests a new foundation in working with researchers and teachers, with a two-way collaboration between them to formulate the research questions and methods so they can be connected to educational practice and policy. It is not enough that researchers collect data at schools and give this to the teachers. There has to a collaboration of effort to determine which theories can really be tested and work in the classroom. While Jensen (2008a:429) acknowledges that in the field of neuroscience there have been many 'errors of enthusiasm' in the interpretations of research and applications within the classroom, he also acknowledges that trying ideas is acceptable, as long as there are no downside risks.

2.5 How the brain works in learning

The understanding of how the brain works is derived from experimentation with humans and animals, studies of brain damage or dysfunctions, surgeries and

autopsies. Brain research itself has touched on the domains of physiology, psychology, psychiatry, physics and new sciences, and education. Howard Gardner (1983, 1993) through his research with brain-damaged people derived the theory of multiple intelligences. Others such as Antonio Damasio (1994) and Joseph Le Doux (1998) researched the connection of emotions with the brain. Educators have perhaps been interested the most in brain research, as it is the organ of learning (Wolfe, 2006:10). Although many discoveries have been made along the path, the brain continues to hold many mysteries (Ornstein and Hunkins, 2004:100).

For an overview of the structure of the brain, see Appendix 1.

2.5.1 Three models of the brain

Whittle (2004:21) outlines three of the current models of how the body accesses and stores information so that learning can occur, namely, the traditional, triune and quantum models.

2.5.1.1. Traditional model

The first model is the traditional scientific or medical model, where the brain is the master of the human body, and in that way, almost distinct from it. The research on this model is directed to brain tissue and function, and how the brain makes the links between what is perceived as discrete and separate structures.

2.5.1.2. Triune Model

The second model is the triune model of the brain, developed by Dr. Paul MacLean, distinguishing three stages of evolutionary development in the brain, and that all stages of evolution exist simultaneously in the present brain system.

These are named in terms of age and function, as 1) reptilian, 2) early mammalian, or the limbic brain, and 3) neo-mammalian or neo-cortex. According to this perspective, the fetal brain develops through the evolutionary stages to its current potential at birth and beyond (Whittle, 2004: 21). Therefore acknowledging all aspects of the brain in development would be helpful in understanding education. It is this model of the brain that to this day influences research and its application to education, and from which the brain-based curriculum is derived. Brain-based education states that the reptilian brain must first feel safe, the limbic brain interested and loved, and if all those factors are cared for, then the neo-cortex can be involved in thinking (Brain-based assembly, 2008). Figure 2 shows the division of these three brain systems in the triune model.

For more on this model, see Appendix 2. Figure 2 gives an image of the three levels of the brain in the triune model, where the reptilian is the most ancient, then the limbic which governs the emotions, and finally the neocortex which controls serves for higher thinking.

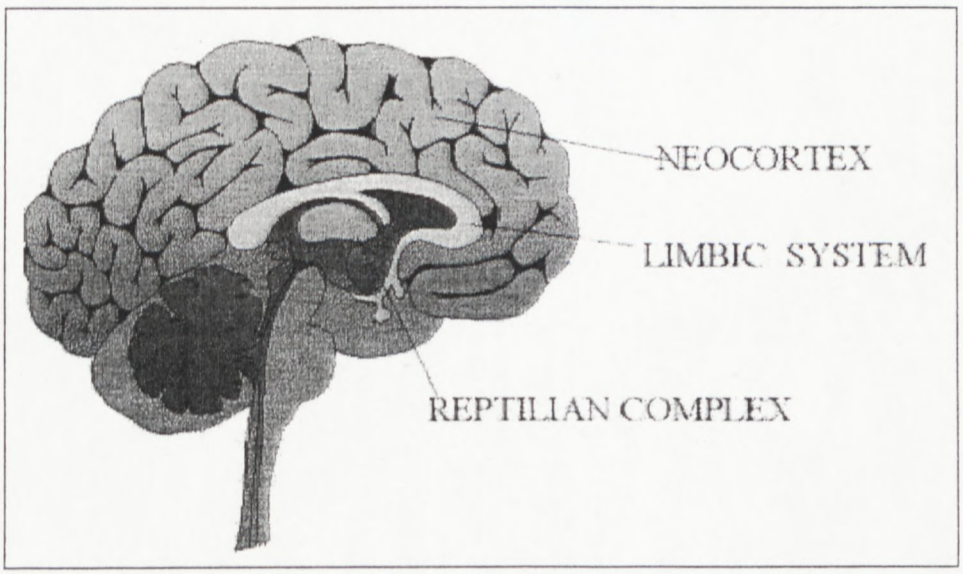

Figure 2: Division of the three brains (*Other alternative realities*, 2010)

2.5.1.3. Quantum model

The third model of learning and the brain proposed by Whittle (2004:24) is derived from quantum physics, and sees the entire brain and body-consciousness as an energy field not limited to the physical body. Rather it sees us being linked to all of creation through a universal energy field, or Zero Point field, which holds all the information of what was and will ever be. The brain in this model is like a radio, a receiving set, where we can 'attune' to access information and memories. Although the terminology of this model is contemporary, it also feeds from language of principles known in China, India and indigenous peoples for thousands of years (Whittle, 2004: 24).

2.6 Principles of brain-based education

Brain-based education intends to be a respectful understanding of how the brain receives, processes, interprets, connects, stores and retrieves messages, and the incorporation of these insights into the structure and practices within the classroom (Greenleaf, 2003:14). As the brain's primary function is to learn, Greenleaf asserts that the reluctance of students to learn cannot be attributed to the brain. Adept teachers have been discovering strategies and lesson plans compatible with the brain for years, what is new is an influx of research identifying specific processes, physiologies, functions and brain-body-environment relationships (Greenleaf, 2003: 14). Brain-based learning involves acknowledging the brain's search for meaningful learning and teaching with those principles in mind (Caine and Caine, 1991: 4).

Caine and Caine (1991:9) outline that an educational protocol can be termed brain-based if it focuses on cooperative learning utilizing both the intellect and

emotions, and asking for spontaneous adaptation to meaningful challenging issues. On the other hand, if the parameters are strictly defined, the learning processes are constructed and controlled and the outcomes are pre-defined, this is not brain-based education.

Caine and Caine also suggest 12 principles of brain-based learning (Caine and Caine, 1994, in Kahveci and Ay, 2008: 125) which form the theoretical basis to the approach. They are:

1. The brain is a parallel processor.
2. Learning engages the entire physiology.
3. The search for meaning is innate.
4. The search for meaning occurs through patterning.
5. Emotions are critical to this patterning.
6. The brain processes parts and wholeness simultaneously.
7. Learning involves both focused attention and peripheral perception.
8. Learning involves both conscious and unconscious processes.
9. We have at least two types of memory: a spatial memory system and a set of systems for rote learning.
10. We understand and remember best when facts and skills are embedded in natural, spatial memory.
11. Learning is enhanced by challenge and inhibited by threat.
12. Each brain is unique.

These principles, as discussed by Kahveci and Ay (2008: 125) can be linked to those in constructivist education, and have more to do with learning than only the brain.

Jensen (2008b), another strong proponent in the more modern brain-based movement has put together this set of propositions of brain-based education:

1. The human brain can and does grow new neurons.
2. Learning changes the human brain.
3. Stress affects brain development.
4. Social conditions influence the brain.
5. Genetic expression responds to chronic or acute environmental input.
6. Nutrition influences the brain's development and learning.
7. Movement and exercise assist both the development and workings of the brain.
8. Arts have a valuable role in education.
9. Our environment affects the brain and child, influencing learning.
10. New therapies involving opening the sense pathways, can help to regulate and even repair brain-based disorders (Jensen, 2008b: 409-411).

See Appendix 3 for a more thorough discussion on these ten principles.

This list of ten brain-based propositions is only a small representative sample of findings that influence children in the classrooms.

2.6.1 Neuroplasticity: the brain's capacity to change

William James, a father of experimental psychology in the United States first introduced the word plasticity to the science of the brain in 1890, positing that "organic matter, especially nervous tissue, seems endowed with a very extraordinary degree of plasticity" (Begley, 2009: 4). Although he was not a neuroscientist but a psychologist, this was later taken into neurological experimentation and theory. Conventional neuroscience postulates that the adult mammalian brain is fixed in both its structure and that no new neurons are born (Begley, 2009:4). Yet in the last decades, a few neurologists have challenged this and come to the discovery that the brain can be rewired, can form new connections, activate long dormant wiring, and run new cables (Begley, 2009: 7).

At the time of birth, all neurons are in place, and the basic connections, especially those over long distances, begin to form. Yet the majority of neurons in the cerebral cortex are not yet fully connected. It is only after the birth, and in the first years, that the structural architecture of the brain attains its full complexity (Singer, 2008: 100). In the developing child, especially in the first three years, the brain forms almost twice the amount of necessary synapses or junctions than it will actually use. The ones in constant use will strengthen to form the neurological structure for the mind. The unused synapses will either be replaced by others, or completely disappear (Blythe, 2005: 2). This process of circuitry formation and selection continues until puberty, occurring within precisely timed windows that differ according to different brain structures (Singer, 2008: 101).

Research since the early 2000's is pointing to the potential of changing pathways in later stages of development; that the brain can rewire itself as a result of environmental input (Sousa, 2010: 17). This has led researchers to look at the brains of young struggling readers and investigate possibilities of programs or protocols for rewiring cerebral networks for better performance.

Not only is the discovery that the brain can change challenging to conventional thinking, but also the way that it changes. According to Begley, "The actions we take can literally expand or contract different regions of the brain, pour more juice into quiet circuits and damp down activity in buzzing ones" (Begley, 2009: 8). Some findings suggest that the brain can generate change by pure mental activity, such as just thinking about playing the piano has physiological results in the brain's motor cortex, and thinking in a certain way can lead to a restoration of mental health. Repetition of tasks can also help to construct stronger, more efficient pathways for memory and learning (Willis, in Sousa, ed. 2008: 58). A common slogan of neuroplasticity is "Neurons wire together if they fire together"

(Singer, 2008: 101), meaning that the more a connection is done, the stronger the wiring. Neuroplasticity is giving ideas to researchers and educationalists on the potential of learning even when initial stresses have been imposed on the brain, and can have implications in literacy learning.

2.6.2 Senses, learning styles and multiple intelligences

The senses and their pathways through the body are seen to be very old in evolutionary terms. Most of the sensory stimuli enter into the brain stem, and on to the pons and medulla oblongata, which is located deep in the skull just above the spinal cord and discussed in the triune model as the reptilian brain. The evolving human body maintains all the key aspects of the previous evolution, such as fight and flight mechanisms, which are located in this region of the brain function (Whittle, 2004: 21). As Whittle says, the senses are the "front house staff" in this body of learning.

> We may be in awe of the brain's complexity within itself but the often forgotten miracle is in its links to the rest of the body through the motor/sensory and autonomic nervous systems together with its interface with the rest of the world through the senses...There is no other way in (Whittle, 2004: 21).

The different types of senses stimulated in learning can influence teaching practices, learning environment and the role of the student and teacher.

Whittle (2004: 35) describes eight senses which contribute to learning. These are vestibular/ proprioception, hearing, touch, smell, taste, sight, intuition and knowing. The systems for monitoring balance, motion, and equilibrium are now understood to develop in the embryo only three weeks after conception, and within five months in the womb they are fully developed.

The senses of vestibular and balance are essential in the activities of literacy. Whittle (2004: 35) describes these senses of balance and equilibrium as 'zero sense' and includes the vestibular nuclei of the medulla and pons in the description of the system. They are a bundle of neurons carrying impulses from the semi-circular canals of the cerebellum to the Reticular Activating System (RAS) in the brain. The RAS then transmits these impulses to the neocortex alerting it to incoming sensory stimuli. This is a waking up that allows our brains to take in and respond to what is being learned. "This connection between the vestibular system and neocortex, as well as the eyes and core muscles is highly important to the learning process" (Carla Hannaford, 1995, in Whittle, 2004: 35). While this connection highlights the importance of movement in learning, it also helps in the understanding of young children who cannot sit still, and the value of properly stimulating and settling the senses. These senses are essential to develop for reading and writing.

Wilmes, Harrington, Kohler-Evans and Sumpter (2008) investigate the role of sense stimulation within the teaching environment. Brain studies have revealed that the eyes are capable of registering 36,000 visual messages per hour and that over 80 per cent of messages to the brain come through the visual realm (Wilmes et al, 2008: 660). This influences the relationship between colour and light on the learning environment. Each colour has its own wavelength and affects our bodies and brains differently, and studies have been conducted on the colour of classroom. Students were given IQ tests and then put in different colour classrooms. When tested again, certain students lowered or raised their IQ's according to the colours they were exposed to (Katt, 1997 in Wilmes, et al. 2008: 661). Research has also shown a significant relationship between colour and memory. In testing learning cues and memories, the students showed a higher score of memory on colour cues rather than those of black and white (Wilmes, et al. 2008: 661).

Senses will also be discussed under the Waldorf schooling.

2.6.2.1 Learning Styles

Whittle (2004: 25) discusses four styles of learning that have become common in educational practices, especially in brain-based schooling. These are visual, auditory, kinaesthetic (movement) learning, and the notion that learners gravitate to one of these styles in order to best assimilate information. This means in lesson planning, teachers need to arrange the lesson to access each of the learners' styles so that all the children in the classroom can be met (De Jager, 2006). Although learning styles have received attention since the 1970s, there is still inconclusive evidence whether there are benefits to utilizing them in education, and some have suggested they are merely a myth (Ornstein and Hunkins, 2004: 114). Yet they have awakened many teachers' ability to plan a lesson to engage the various senses a child may respond to, and answered questions about why some children do not learn the same as others. Ornstein and Hunkins (2004: 115) point out that learning styles or preferences are not innate characteristics. While people do have individual preferences, they learn them both consciously and unconsciously. And one should not cater for one style to the detriment of the others.

For a more detailed account of these learning styles, see Appendix 4.

Felder and Silverman (in Ornstein and Hunkins, 2004: 115) developed a set of categories which a person can use to get to know learning styles. It deals with:

1. How information is best perceived (visually or auditory);
2. The type of information a person prefers to perceive (sensory or intuitive);

3. How a person prefers information to be organized (inductively or deductively);
4. How information becomes processed (actively or reflectively), and
5. How one progresses to understanding (sequentially or globally).

Therefore people who visually deal with information prefer pictures, diagrams and demonstrations. Those with an auditory mode enjoy receiving and interacting with information through the medium of words and sounds. Those with a sensory mode of processing information combine sights, sounds and physical sensations. Intuitive people process information through insights, hunches or intuitive leaps. Active learners like physical activity while they learn, as well as engaging with others, while reflective learners prefer introspection. Those with sequentially developing thought patterns see learning and thinking in a sequence of steps, while global thinkers process information quickly in leaps, holistically, and then have to synthesize it to create logic (Ornstein and Hunkins, 2004: 115).

2.6.2.2 Multiple intelligences

Howard Gardner's theory of multiple intelligences has also inspired teachers to expand their repertoire of teaching methods, and understand that children may have intelligences which lie outside the realm of the usual academic profile. He has outlined eight intelligences, with an added half: linguistic, logical-mathematical, spatial, bodily-kinaesthetic, musical, intrapersonal, interpersonal, naturalist, and the half is existential (as it does not follow all of the criteria). The definition of intelligence he gives is "a neural mechanism or computational system which is genetically programmed to be activated or 'triggered' by externally or internally presented information" (Gardner, 1993: 64). Appendix 5 outlines the criteria for a quality being considered an intelligence.

Multiple intelligence theory was originally developed as an explanation of how the mind works, not necessarily as an educational policy or panacea (Moran, Kornhaber and Gardne, 2006: 22). Gardner began by asking the following questions: How did the human mind and brain evolve over millions of years? How can we account for the diversity of skills and capacities that are or have been valued in different communities around the world? His conclusion is that all human beings possess all eight intelligences (and the last one and half added later), but in different proportions. Linguistic and logical-mathematical are the two intelligences most regarded in the school system and standardized intelligence tests. He goes as far as defining Homo sapiens as the animal that possesses these eight forms of mental representation (Gardner, 1999).

Multiple intelligence theory proposes that it is more appropriate to describe a student's cognitive ability in terms of several relatively independent but interacting cognitive capacities than a single concept of intelligence (Moran et al., 2004: 23). An intelligence profile consists of a combination of relative strengths and weaknesses among the different intelligences. While each intelligence has to stand as an autonomous quality to comply with the criteria, they are not isolated in their expression. They may harmonize with each other, conflict, compensate one for another, or enhance another quality. Teachers can find how to work with these intelligences in their classroom, in order to create a rich experience of differing intelligences and to learn along various dimensions at once.

Teachers have found the theories to enhance their teaching practice. Some have utilized it in the presentation of the curriculum, others in the organization of the classroom into learning stations representing the differing intelligences, and also in directing the stimulation of strong intelligences to a child through apprenticing or self-directed learning (Campbell,1997:15). Schools can validate the necessity

not only for academic subjects, but also music, art, speech and people skills, which all have a place in society and help people deal with social situations that can foster economic achievement and success in adulthood (Ornstein and Hunkins, 2004:114).

Ornstein and Hunkins (2004: 114) describe Gardner's theories as not only framed in the cognitivist way of thinking, but as having created a new term for it as 'positive cognitivist'. This means that there are many opportunities in life for learners, and those strong in other intelligences such as music or sports can also rise to the level of mastery. The challenge is how schools can expand their vision beyond intellectual and academic pursuits, without watering down the curriculum.

2.6.3 IQ, EQ and PQ

De Jager (2006), a proponent of brain-based education in South Africa, speaks of thinking, feeling and doing in terms of intelligence quotient (IQ), emotional quotient (EQ), and physical quotient (PQ). Howard Gardner redefined intelligence (IQ) from the typical intelligence quotient test to say it is the ability to operate successfully in one's environment (Gardner, 2004: 29). This is seen as intellectual intelligence which, Gardner asserted, everyone contains a latent capacity to unlock. Traditionally linguistic and logical-mathematical intelligence fell into the category of IQ, and studies into the UK national curriculum indicated that traditionally 70% of the IQ test was aimed at these two intelligences (De Jager, 2006:10). IQ has been referred to interchangeably with other conceptually similar concepts such as general intelligence factor (g), and cognitive mental ability (Lin, 1996).

Emotional quotient (EQ) is defined as the ability to identify, understand, and control your own thoughts and feelings. It then relates to communicating them

appropriately to others, showing empathy and interacting with one's own emotions (Le Roux and De Klerk, in De Jager, 2006: 10). According to Golemen (1995, in Lin, 1996), who wrote the book Emotional Intelligence, emotional intelligence includes the following domains: the ability to identify your emotions, the ability to manage your feelings, persistence and optimism despite setbacks, empathy and social skills (Golemen, 1995: 17). Intelligences such as interpersonal, intrapersonal, and musical could fall into this category, as all of them stimulate emotional responses.

Physical quotient (PQ) refers to the ability to stimulate and manage the neurological equipment needed for learning and performance. This 'equipment' includes the sensory system, the brain and the motor system (De Jager, 2006: 13). This is a body-centred intelligence, and relates to the intelligences of spatial, bodily-kinaesthetic, and possibly naturalist orientations.

While students have the potential for all these intelligences, they also may have certain strengths and weaknesses, which can be acknowledged and nurtured by the teacher. De Jager (2006: 13) asserts that understanding the many potentials for students to be intelligent in the classroom, allows for a greater possibility for engagement and learning to occur. Table 1 outlines these factors, with their relation to intelligences and offers ways of enhancing their abilities.

Table 1: Physical, Emotional and Intelligence Quotient

Quality	Description	Intelligences it includes (Multiple Intelligences)	Ways of enhancing
Physical Quotient (PQ)	The ability to stimulate and manage the neurological equipment needed for learning and performance	Body- centered intelligence relating to spatial, bodily-kinesthetic, naturalist	Movement, nutrition, acting, sports
Emotional Quotient (EQ)	The ability to identify, understand, express and control your thoughts and feelings.	Interpersonal, intrapersonal, musical	Empathy, sharing and recognizing emotions, storytelling, artistic expression, music
Intelligence quotient (IQ)	The ability to operate successfully in one's environment; cognitive mental ability.	Linguistic and logical-mathematical intelligence	Rational thinking, memorizing, logic, maths, language.

2.7 Effect of the classroom environment on the brain and learning

The learner is affected by the physical and aesthetic qualities of the classroom and school environment. Many researchers are now considering the environmental influences more significant than hereditary factors (Wilmes, Harrington, Kohler-Evans and Sumpter, 2008: 659) The Academy of Neuroscience for Architecture promotes and advances the knowledge linking neuroscience to the effects of the built environment on human responses. Physical environments influence how we feel, hear and see, and these in turn affect cognitive abilities (Jensen, 2005: 81). Research has shown the effect of colour and lighting in the classroom affecting learning, as over 80% of the information absorbed by the brain is visual in nature (Wilmes, et al. 2008: 660). These issues become relevant for policy makers and administrators responsible

for building designs (Jensen, 2008b: 411) as well as the teachers who make the decisions in their own classrooms. These will be assessed in the findings and discussion, and have been considered important for their effects on literacy and learning.

Jensen (2005: 82) asks the question of how the environment makes a learner feel. Do they feel safe, friendly, are they breathing properly? All of these have effects on the cognitive abilities in learning. He states five important qualities to look for in the classroom environment, in order to assess their effect on learning: seating, temperature, lighting, noise, and building design. While these factors do not affect literacy specifically, it is seen that they contribute to the student's ability to learn and therefore do influence literacy abilities.

For a discussion of the effects of these environmental factors, see Appendix 6. These will be used in the analysis of the classroom environment in chapter 4. Table 2 constructs a synopsis of classroom environmental influences on effective learning.

Table 2: The impact of environmental influences on learning in the classroom

Aspect of Classroom	Influences
Seating	Location influences access to resources, i.e. material, lighting, teaching, bathrooms, fresh air, heat, and quiet. Large groups at a table can affect attention in some children. Chairs must be of appropriate height to table, so that posture can be attained for better writing.
Temperature	The brain must be cool to think properly. High temperatures can increase lethargy, and stimulate stress or aggression. Drinking water often can help keep down body temperature.
Lighting	Full spectrum better than fluorescent. Children need natural sunshine, and natural light has been shown to improve learning, although not glare. Fluorescent lights also have a hum and a flicker that can affect learners.
Noise	Background noise can affect attention of learners, as well as their heart rate, blood pressure and stress levels. Children learning in a second language also struggle with excess noise, and the teacher/learner ratio can influence this.
Building design	The flow and utilization of space influences the above factors, as well as opening possibilities to various learning styles being stimulated. Linking outdoor and indoor spaces help improve movement. Ownership of space, such as places for quiet time or student's work on the walls provides a sense of belonging.

2.8 Waldorf Schools

Waldorf schooling will be discussed in terms of its principles, techniques of teaching, and position on the linking of physical, affective and cognitive domains,

in particular, perspectives on emotions, movement and literacy. To understand the language of Rudolf Steiner, the originator of the Waldorf schools, is not an easy task. It is perhaps one of the reasons that Steiner is not often quoted in mainstream educational psychology or philosophy. This also means that there is little academic writing on the subject of Waldorf schools, although more and more Waldorf teachers are realizing the importance of gaining an academic language for their practices.

After observing the impact of World War I in Europe, Steiner suggested an educational reform that would be sustainable beyond the confines of the current political climate. Over the next 6 years until his death, 1919- 1925, Rudolf Steiner and his new faculty of teachers he was training developed what would be known as the Waldorf school curriculum. Steiner lived to see the opening of four Waldorf schools, two in Germany, one in Holland, and one in England. By 1938, nine Waldorf schools existed in different countries (Oberman, 1997:6).

At the time of the school's conception, the brain and nervous system had long become evident as the primary instruments for consciousness, in both natural sciences and the studies of the soul. But the unanswered question for Steiner was how human feeling and human will were grounded organically. At the time, there were schools of thought that connected feeling to a subtle sympathetic vibration in the nervous system. The will was seen as merely a function of the motor nerves, controlled and stimulated by a corresponding region of the brain. Even where an objective existence of the soul was acknowledged, the notion of the will and feelings as independent features of the soul, having direct access to the physical body, as an instrument, was not given theoretical consideration (Barnes, in Steiner, 1996:13).

Into this theoretical climate, he introduced the results of his three decades of intense spiritual-scientific inward research. It involved the three-fold human organism as a basis for the soul's life of willing, feeling and thinking. He stated that one could only look to the brain as the physiological instrument for the capacity to think. For willing, or doing, one must look at the metabolic system and the limbs. The physical basis for feeling is in the rhythm of breathing, closely linked with the circulation of the blood (Barnes, in Steiner, 1996:15):

> Therefore, to understand how the soul- and through it the human spirit- works into earthly life through the instrument of the body, we must come to recognize that the soul, as a being of thinking, feeling and willing, engages itself as a whole with the whole physical organism as metabolism, rhythmic breathing, and nerve sense system.

Although this language dates back nearly a century, it continues to reflect a focus on the integration between the psycho-motor, the affective and the cognitive domains.

Importantly, Steiner asserted that Waldorf schools were not a place to teach his philosophy, but rather to base schooling around the practical treatment of children. He felt that through understanding the human being in its fullest capacity, practical rules for the treatment of children would arise (Steiner, 1924: 29). And Steiner stated, in 1924, that although there must be model Waldorf schools where the methods are carried out in detail, the impetus must also be taken up by teaching practices in schools worldwide. Steiner says (1924: 31):

> But our education concerns itself with the methods of teaching, and is essentially a new way and art of education so that every teacher can bring it into his work, in whatever kind of school he happens to be.

Such is the intention of my research project, to see if some of these insights can be carried through into public education systems and connect with the more modern language of neuroscience.

Although the teachers were at the time, and still continue today, to put much of their own creativity into the teaching, the curriculum and structure of the school is outlined.

- A class teacher stays with the class for a full eight years (seven in some countries, including South Africa) of primary school.
- To avoid a sense of fragmentation of information, the main subjects are taught in two-hour, three week long blocks at the beginning of each day, called the 'main lesson.'
- The teachers instruct these main lessons, not through text books, but through their own curriculum design.
- Just as the teacher designs these lessons, the students become the authors of their own texts, through illustrations, essays and thematically relevant verses they construct in their 'main lesson books' (Oberman, 1997: 5).

Steiner outlined the qualities in teachers that must be awakened if they were to have the responsibility to awaken, thus educate the children, into becoming the human beings. The first quality is **imagination**, which transforms the intellectual content of one's teaching into a language of experience that speaks directly to the child's soul. The second is **courage for the truth** of world realities, and the third is a **feeling of responsibility** towards what is truly human in the children they are caring for (Barnes, in Steiner, 1996:21). These are the three nerves of the pedagogy, with a motto which reads:

Imbue yourself with the power of imagination
Have courage for the truth
Sharpen your feeling for responsibility of soul.

In his curriculum, Steiner combined the old and the new. The lessons were imbued with stories which were associated with the developmental level of the child. Artistic activities were blended into each lesson rather than as a separate subject. And the development of the child was seen to involve the simultaneous integration of mental, emotional, physical and social capacities (Oberman, 1997:5).

Waldorf schools now comprise the largest independent schooling system in the world (Blunt, 1995:9) with over 900 schools and 1600 kindergartens in 50 countries worldwide (Glöckler, Langhammer and Wiechert, 2006:7). The first school was for the workers of the Waldorf Astoria Cigarette factory, who were from working class families, and Steiner's intentions were to create a system for all children, of all socio-economic and cultural backgrounds. But with the financial pressures of private schooling, soon it became a middle class movement. Currently, Waldorf schools are beginning to move into less wealthy communities around the world (Oberman, 1997: 6). Locations of schools in communities of South Africa include Soweto, Khayelitsha, Guguletu, Masiphumelele, and Mannenberg. Worldwide there is a school for war refugees in Sierra Leone (Avison, 2008: 86), urban schools in San Paolo, Brazil, Santiago, Chile, Milwakee, United States and the West Bank in Israel. The first urban elementary school to be opened in the United States of America was in inner city Milwakee, in 1991 (Oberman, 1997:6).

Oppenheimer (1999: 72) reviews his visit to a school in California housing delinquents that could not manage anywhere else, and that runs with the Waldorf method:

> Much of what the teachers learn (in the Waldorf training) is how to reach children through all their senses. Child-development experts have long advocated a multisensory approach to learning - as a way to both deeply imprint lessons in a youngster and to accommodate the different learning styles that are bound to exist among diverse students, particularly those with learning difficulties. Yet few education systems in this country (USA) have the history with these methods that the Waldorf schools do.

The true indication that it worked, for Ruth Mikkelson who initiated the school, was that, "Kids that can't make it anywhere else, make it here" (Oppenheimer, 1999: 73).

2.9 Principles of Waldorf education

Some of the fundamental principles in Waldorf schooling are:

- A threefold thinking process in the human being that embodies the qualities of thinking, feeling, and willing. This threefold-ness exists in the human but also in the plant world (flower, stem, and roots), architecture, businesses, and many other aspects of the world.
- The school day is also divided into time for thinking, feeling and willing activities.
- The developmental pathway of a child follows this threefold development, in age gaps of 7 years. From 0-7years the child is developing its willing aspects, from 7-14 years the feeling, and from 14-21 years the thinking. Although this is generalized, most children are believed to fall into this pattern and the curriculum is designed around it. This is discussed in depth in Appendix 7.
- The focus of Waldorf schooling is to utilize all the senses. Rudolf Steiner outlined 12 senses, inclusive of the standard five we know. These are

touch, life, movement, balance, smell, taste, sight, warmth, hearing, speech or word, thought and ego or knowledge of another. These are discussed below. Some of these senses have now been confirmed by recent research (Oppenheimer, 1999:5).

- Imagination is at the heart of learning in a Waldorf school. Each subject, be it literacy or mathematics, involves the activation of the imagination through storytelling and artistic expression. This allows the child to fully embody the knowledge. Imagination is also linked to thinking, through the capacity of image making.
- Through imagination and storytelling, a sense of goodness and ethics is developed, seen as essential to the emotional development of the child in the world today.

The primary school years, on which this study is focused, is within the range of ages 7-14 years. The focus is on the opening of the feeling world and the development of knowledge around real experience of the child's own feelings. This is done through storytelling, movement, rhythm and artistic expression.

2.9.1 Theory of the twelve senses

In the 1920s, at a time when conventional physiology only recognized five or six senses, Rudolf Steiner proposed that there were twelve. These can be seen as windows or doorways through which the inner self receives impressions from the outside world and learns to orientate, as well as relate to and express itself in its surroundings (Goldberg, 2008: 1). These senses are touch, life, movement, balance, smell, taste, sight, warmth, hearing, speech or word, thought and ego. Of these twelve, the first nine are now well-recognized: touch (tactile), the sense of life or wellness and pain (nociceptive), movement (proprioceptive) , balance (equilibrioceptive), taste (gustatory), smell (olfactory), warmth (thermoceptive),

visual and auditory senses. Steiner proposed three more senses as well: the sense of phoneme or language, the sense of thought and the sense of ego (the ability to recognize an ego outside of our own). Steiner categorized these last three the 'higher senses, ' which depend upon the healthy development of the foundational or 'lower senses' of balance, movement, pain/wellness and touch in order to develop fully (Green, 2007:2).

The senses, as most concepts in Steiner education, are divided into the same threefold image of the soul of man comprising willing, feeling and thinking, and the division of the senses also correlates to this. The first four senses of touch, life, movement and balance are related to the physical body, which is connected to the willing faculty. They enable the child to find a relationship to the physical body and its connection to the physical surroundings (Goldberg, 2008:2). Much of the kindergarten life, and the life of the child under age seven, focuses on these four senses. Senses at this age are a form of nutrition to the developing child, and especially the developing brain (Green, 2007:1). The neurological concept of 'plasticity' which shows the organic vitality of the brain's developing forces, links to Steiner's concept of 'etheric, or life forces' which are available to the developing body and brain at this time (Green, 2007:2). If these senses are either over- or under-stimulated in the ages of early childhood, this can result in a degeneration of healthy attributes into fears and anxieties, insecurity, hyperactivity, lethargy or depression.

The sense of smell, taste, warmth and vision are the middle group, termed the soul or sentient senses (Goldberg, 2008:2). They are also called the mood senses, as they all create soul moods (Sousman,1990:100). They are those which help the human make sense, not of their own physical body, but of the world. This leads to the ability for inner orientation and abilities to experience the polarities of emotions as well as their balance, through light, darkness, and

colour. The development of emotional intelligence and maturity is influenced by these middle senses, if not either over- or under-stimulated. In the cases of stimulation, they can degenerate into a negative picture of the world, the inability to relate warmly and openly to others, the lack of sensitivity in the regions of taste and smell, both on a physical and emotional level (Goldberg, 2008: 2).

The four higher senses are called the consciousness or spiritual senses, and are more linked to the intellectual development of the student. They are hearing, speech, thought and individuality (which is also termed the Self, the Ego, or I). They enable an active relationship of the inner being of the child to the world and the people within it. The healthy stimulation, development and maturing of these senses provides the ground for self-awareness, empathy, open mindedness and a deep sense of the recognition of another person. If these higher senses are not adequately developed or stimulated, degeneration can occur leading to the absence of the abilities for listening, expressing oneself, and the tendency towards fixed ideas or compulsive thought patterns. There can also be the inability to understand or recognize and respect the true identity of another (Goldberg, 2008:3).

The senses are listed as follows. They are outlined according to the language of the thesis, being psychomotor, affective and cognitive. In Steiner education, this is listed as willing, feeling and thinking.

Table 3: Twelve senses according to physical, feeling and thinking

Psychomotor or Wiling	1. Touch 2. Life 3. Movement 4. Balance
Affective or Feeling	5. Smell 6. Taste 7. Sight 8. Warmth
Cognitive or Thinking	9. Hearing 10. Speech or word 11. Concept or thought 12. Ego, or sense of another

Each of these senses develops in the child, but the early years are focused on the foundation senses of touch, life, movement and balance. These provide the foundation for the other senses, and for the development of literacy skills.

2.9.2 Imagination and education

It is considered a danger in this modern world that stories which invoke inner pictures are not brought into the more intellectually-based curriculum, and are being lost in the upsurge of electronic entertainment. When children engage only in external images such as seen on television, movies and even at a certain level, picture books, they can become so used to ready-made pictures, that they become lazy in the creation of picture images of their own imagination:

> This use of imagination in forming picture images is a young child's training for when he becomes older and imagination is replaced by thinking. The forming of pictures keeps the young mind mobile and active, while the will power is strengthened. As the child grows- after nine- imagination begins to give way to the ability to reason and think. The more active and healthy is the imagination,

> the more active and mobile the thinking will become (Maher and Bleach, 1996:33).

This imagination is close to memory. If asked a question such as, 'What did you do on New Years Eve?', the answer would come in a mental picture. So memory is associated with recalling pictures, and also relates to concentration. Therefore when a teacher tells a story one day, and asks the children to recall it the next, they are motivated to concentrate on their awareness of the images in the story. Then if they draw freely their images of the story, it defines a colour and form for these pictures. If each day, for the first two years of primary school, the children must bring up the pictures of the story from the day before, their memory is strengthened, and the children's capacity for clear and original thinking in later years will be enhanced. How well the children remember is impacted by the teacher's own gift for verbally creating clear and detailed images (Maher and Bleach, 1996:33).

Imagination also requires offering the student time for reflection. This can be done by artistically expressing the content of a lecture, and by giving the students real experiences so that they can come up with their own concepts. Sometimes this takes longer, but it strengthens the will and the wonder of the learner. Oppenheimer (1999: 9) states that most schools, for example in a science class, will teach the concepts first and then give an experiment as an example. Waldorf turns this around by giving the student an opportunity to experience an experiment, without giving much conceptual information. Then they go home and sleep on it, and a lot occurs in the sleep space. The next day the student will come with many more questions than they left with the day before. He quotes the woman who initiated the school for problem children in California (Oppenheimer, 1999: 9):

> Nowadays we always push people to think so fast, instead of letting them reflect. The process institutionalizes an important principle that evades many a

> teacher—to let students struggle toward their answers and individual understanding.

Her notion is that if you give answers the students shut down. If you open the door for experiences and questions, there is a much stronger learning process, where students become the authors of their own experience.

Mollet (1991:55) describes how he went into one of the toughest schools in Los Angeles and changed the learning experience through Waldorf methods of imagination and artistic expression, even in the academic subjects such as mathematics. For a further report on how he did this, see Appendix 8.

2.9.3 Ethics and goodness

Storytelling in Waldorf schools not only helps to build up the conceptual awareness of a subject, but also to offer the children a sense of ethics and goodness. This process was existent in the early civilizations of humankind, but has also been validated by modern child psychologists such as Bruno Bettelheim and Robert Coles, who stress the importance of immersing children in moral stories (Oppenheimer, 1999: 10). Waldorf schooling believes these stories enhance a sense of wonder and empathy for the world, which contributes to their corresponding experience of the world.

Barnes (1991: 52-3) comments,

> The wealth of an earlier, less intellectual age - folk tales, legends and mythologies, which speak truth in parables and pictures - becomes the teacher's inexhaustible treasure house...Whatever speaks to the imagination and is truly felt stirs and activates the feelings and is learned and remembered.

He emphasizes how the primary schooling is the time for educating the 'feeling intelligence' or affective realm. When information is given purely in an intellectual manner, without a sense of imagination or feeling to a child who is too young for it, this can create within the child a sense of numbing or cynicism, and at worst, apathy (Oppenheimer, 1999: 10). Where most educational understanding sees the affective realm as an important aspect of cognitive learning, Waldorf schooling considers it the most important window for learning in primary school. Waldorf philosophy postulates that it is only after puberty that this emotional learning metamorphoses into the rational, abstract power of the intellect (Barnes, 1991: 53). Until then, the focus is on the emotional experience of the content given. The importance of children feeling a sense of goodness and empathy within this emotional awakening gives them strength in life for the future. Storytelling and the use of the imagination also offers a greater appreciation for the oral and written words, and can then inspire children to be greater writers and readers.

2.9.4 Looping in primary school

Kenney (2007) investigated the benefits of primary school 'looping' of teachers, which means that the students stay with one teacher for the duration of their primary years. This research showed that the benefits of a teacher remaining with a class for more than one year resulted in increased student attendance, a decrease in discipline problems, and a heightened opportunity to observe the needs and strengths of the students. This also allows for an adjustment of instruction techniques based on these observations and longer term experiences (Kenney, 2007: 4). In her thesis, Waldorf schools are used as subject of her research, as the teachers stay with the children from class one to seven (or eight, depending on the country). The benefits were proved in both social and academic spheres. Students become safe in knowing the teacher's style of

instruction, enhancing a feeling of safety in learning. They are also more comfortable to take risks, such as reading aloud in class, answering questions, or working with different partners (Kenney, 2007: 9).

Kenney refers to brain-based theorist Dr. Jane Healy (1991) who states that children need adult role models to help 'shape their brains' both socially and academically and that teachers who really know their students can understand their own 'blueprints' that need to be worked with to succeed. Healey focuses on intellectual language, listening skills, and ability to reason as fundamental 'habits of mind' (Healey, 1991 in Kenney, 2007: 11). Constant change of teachers can lead to anxiety and stress on a student's ability to venture out and explore their surroundings (Kenney, 2007: 12). Looping creates a family environment among the students, and in my opinion with the rapidly disintegrating family unit, this becomes essential in today's world.

Steiner education affirms a reverence for the world and the child that becomes what is called 'the third factor' (Shmitt-Stegmann, 1997:2). This means that hereditary and environmental influences are not the only factors in human development. The child is also a unique individual who unfolds in a developmental cycle, while it interacts with the two preceding factors of their body (hereditary) and environment. The individual has been called 'the Self,' and is the one that learns, strives, thinks, is motivated, creative, inventive, and active in it's attributes. It is in a process of awakening to its natural and human-cultural environment on one hand, and its own personal abilities on the other (Shmitt-Stegman, 1997: 3).

2.10 Literacy in Waldorf schools

The literacy curriculum in Waldorf schools is perhaps one of the more contradictory aspects of Waldorf education when compared to other forms of education. According to Oppenheimer, the relaxed way in which the schooling teaches children to read is most likely one of the most frightening aspects to parents as well. He states (1999:6),

> Whereas students at more competitive schools are mastering texts in first grade, sometimes even in kindergarten, most Waldorf students aren't reading fully until the third grade. And if they're still struggling at that point, many Waldorf teachers don't worry. In combination with another Waldorf oddity - sending children to first grade a year later than usual- this means that students may not be reading until age nine or ten, several years after many of their peers.

Oppenheimer emphasizes that in earlier times, coming to reading at a child's own pace was considered acceptable, and that Rudolf Steiner himself, as well as Albert Einstein and Winston Churchill, were late readers. David Elkind, a child psychologist from Tufts University cites prodigious evidence that late readers ultimately fare better at reading and other subjects than early readers. "But in today's competitive frenzy the drive in this country is to get children to learn as much as they can, about reading or anything else, as quickly as possible" (Oppenheimer, 1999: 6).

This delay in mastering reading is partly because Waldorf schooling emphasizes, instead of the memorization of reading abilities, the love of language (Oppenheimer, 1999: 7). This technique is slowly being introduced into some public schools, and Barbara Warren (in Oppenheimer, 1999: 7), a public school teacher at an inner city school in Sacramento states that since Waldorf methods

were introduced into her Grade 4 class, mostly of minority children, the number of students who read at a grade level doubled, rising from 45% to 85%. "I didn't start by making them read more," Warren says. "I started telling stories, and getting them to recite poetry that they learned by listening, not by reading. They became incredible listeners." The finding is that most children who were behind their non-Waldorf friends in the earlier grades, catch up and become avid readers by the third or fourth grade (Warren in Oppenheimer, 1999: 7).

Research is showing the relevance of early oral skills for the uptake of literacy skills later. Stahl and Yaden (2004 in Wilmes et al., 2008: 663) look at the relevance of oral-based learning in a classroom, by correlating memory and recall tasks given in a television episode and a verbally spoken story. The children were much better able to remember tasks that were presented through the story. Kanoid, Juel, Minden- Cupp and McKinnon (2000, in Wilmes et al., 2008: 663) found in a longitudinal study of 213 children that oral language used in kindergarten greatly contributed to the growth of phonological awareness. Benefits of attention given to oral language skills can also be related to written word knowledge, comprehension and phoneme awareness (Wilmes, et. al. 2008: 63). Research is now highlighting the direct link between preschool oral language ability and early elementary reading skill (Bracken, 2005: 998). Therefore the more storytelling told in the younger ages, the higher the language skills and greater confidence can develop in the act of reading itself.

2.10.1 Memory and the loss of teeth

Rudolf Steiner emphasized that the transition from kindergarten (age 0-7) into class one is marked by a very important event - that of the losing of the milk teeth and the growth of the permanent ones (Goldberg, 2009:215). It is then that the vital energy of a child is not predominantly required for the development of the

physical body, but can be freed for the process of imagination and memorization. This is described as seeing the world through a picture form, and that after the change of teeth, the child has the capacity to create their own pictures within their imagination and can then be expressed artistically, and remembered (Harwood, 1967: 49).

Earlier memory, before age 7 years, has to do with creating habits and imitation of his surroundings. When activities are performed routinely in a rhythm, the young child remembers them outwardly, but also deeply in their bodies. But after the change of teeth, the memory changes, as what Steiner states (1924:49) as, "the soul and spirit are freed from the body, and a picture content can arise of what has been experienced in the soul, a formation of images which are not of a bodily nature." The child now has the ability to bring inner pictures into their minds, and then remember them. For the younger child, the imagination is fleeting. With the child after 7 years, the imagination can take hold, and begin to develop, through feeling, towards concepts.

Building on these ideas, the learning of letters in the first grade occurs through pictures, which arise out of stories, which the children then draw themselves. Each story is filled with rich language and emotional engagement. The child at 7 years is seen as ready to learn through emotional learning, as to fill his imagination with images that he can emotionally relate to, and develop those into a thinking picture. Lessons must appeal to a child's awakening feeling body, and therefore they can be engaged in the content of the lessons (Harwood, 1967: 50).

The Waldorf approach emphasizes later entry to Grade 1, as close to age 7 years old as possible, so that both the body and mind are ready for learning.

2.10.2 Teaching literacy

Literacy is taught as the progression of speaking to writing to reading.

> It is the most abstract and intellectual of the three activities and makes higher demands on inner picturing and conceptualization. This ability is just developing. Therefore the child is led gradually from a very strong and joyful oral language experience to the written sounds and words, and finally to reading (Schmitt-Stegmann, 1997: 7).

Writing and reading is connected to the spatial consciousness of the child (McAllen, 1977, 25) In Waldorf schools it is taught in an artistic way, using storytelling, drawings and movement. The teaching of reading occurs after writing, "as if it were a matter of course. It comes rather later than usual, but it comes as if of itself" (Steiner, 1922 in McAllen, 1977, 24). Writing is seen as a task more active than reading, which engages the whole body (Henderson, 1998: 15). Through the child's kinaesthetic sense develops a relationship to the straight line and curve, which become the movements done with a pen to form the letters when writing occurs. The spatial experiences of up, down, front, back, left and right form the spaces in which the letters will occur, but can firstly be moved by the whole body (McAllen, 1977:11). Research has shown that the more dexterous the child is with fingers, hands and feet, the better the cognitive centre in the brain develops and the child's ability to learn is increased (Henderson, 1998: 14).

The act of writing before reading also links with the idea that the young child is coming out of the 'will' or doing space, where the feelings and thinking have until then been asleep. The more movement that is done in preparation for the writing process, the more the whole body experiences the writing (Henderson, 1998: 14). Even before the letters are drawn, a relationship to patterns is established

through rhythmically repetitive movement. This is also done by form drawings, which are patterns drawn for the sake of movement, of the straight line and curve, and leads into the learning of block capitals, which are introduced through stories.

An outline of the process of learning letters is described in Appendix 9.

2.10.3 Waldorf schooling: literacy foundations

Adachi (2003: 294) states that the Waldorf learning of reading, writing and grammar is based on four underlying principles: developmental theory, artistic education, authority and moral education.

2.10.3.1 Developmental theory

From the ages of 7-14 years old, Steiner believes that the child has a great need for images and pictures (Steiner, 1919 in Adachi, 2003: 295). At the same time they have a need for an authority which they can respect. Only once they are about 9 or 10 years old are they able to differentiate themselves fully from their environment and this time is a coming to self-consciousness. As their comprehension increases, so the space to introduce concepts intellectually arises. For Waldorf education, that is at around 12 years old (Adachi, 2003: 295). In this whole phase it is necessary that children are shown idealistic and beautiful pictures as an example of what they can work towards. One of the ways this is done is through storytelling.

2.10.3.2 Artistic education

It is the artistic principle in education that makes Waldorf stand out. Children at this time are in need of images and pictures, which are given from the authority

to the child. In a sense, it is the training of the imaginary capacities, which later become the mechanism behind thinking. And central to the focus of Waldorf education is narrowing the gap between theory and practice (Nobel, 1991: 17). As well as pictures in this time should be an importance of rhythm and melody(Adachi, 2003: 295). This relates to the rhythmic breathing system. The entire introduction to writing is done through pictures, images, rhythm and song. At this age children develop a strong desire to do art, and this must be expressed through pictures and images.

2.10.3.3 Authority

Children in the ages of 7-14, the primary years, have a great need for an authority that can teach them. With the help of the artistic images developed by the teacher, the child comes to know concepts such as truth, beauty and morality. As they get closer to age 15 they rebel against the need for authority, thus developing their own capacity for judgement (Adachi, 2003:295).

2.10.3.4 Morality

When an authority offers a rich and lively picture of what is beautiful, good and true, this becomes part of the child's inner worldview. They will acquire the ability for them to judge it later (Adachi, 2003:295).

Many of these images and pictures that the child needs are not available in text books or readers. But they can be transmitted through the teacher. So in Waldorf it is the teacher's responsibility to bring these pictures to the children as a means of providing them self-consciousness (Adachi, 2003: 296).

2.10.2 Threefold planning in teaching

In a Waldorf Grade 1 class, reading skills are developed by the students reading their own writing.

> Reading difficulties have become so prevalent today just because we have put the cart before the horse. The young child is not given sufficient opportunity to write before he is faced with the printed page. This, from a historical developmental aspect, is quite out of step. Only when we have something to write does the capacity and desire to read arise (McAllen, 1977:11).

The very act of writing lays the foundation for the subtle movements which, in the reading process, must be accomplished in a few split seconds. In Waldorf schooling, this begins with the children's drawings, into the stories, and then into actual letters.

Each lesson in a Waldorf classroom aspires to include elements of thinking, feeling and willing. In the same way, in a brain-based classroom, they may attempt to bring in material for the three learning styles, the visual, auditory and kinaesthetic, or even the multiple intelligences. For Waldorf lesson planning, this means that each lesson has:

1) An imaginative, conceptual part
2) A rhythmic part, and
3) A part for practical work.

The imaginative aspect is entered through a story, giving the students a picture to work from. The rhythmic section may include speech exercises, verses, poems, clapping games, singing and movement. And the practical work could include work such as doing sums, drawing pictures, or writing in books and

illustrating the work with pictures they draw themselves (Maher and Bleach, 1996: 36).

2.11 Connecting themes: brain-based and Waldorf education

The purpose of this study is to make a comparison of the two educational systems in order to see if there are similarities and differences that can shed light into literacy practices that may enhance learners' experiences of reading and writing. The following connections are derived from the literature and will be further discussed in the results of the research.

2.11.1 The threefold interaction of the psychomotor, affective and cognitive domains

1) Psycho-motor: This realm includes the importance of keeping the body active for the mind to function. It also involves the importance of movement within the learning process, which balances the brain, strengthens the body and allows the integration of thought and practice. In addition, the integration of the left and right brain hemispheres involves movement, and therefore affects the learner's sense of presence, and ability to focus.

2) Affective: The impact of emotional stress on the student is recognized, as well as the benefits of a heightened emotional interest within the classroom and curriculum. The feeling of safety in the child allows for a relaxation and expression of emotion, which then helps in the retaining of information through memory. Thinking is activated by a safe environment filled with interest and enthusiasm.

3) Cognitive: The brain has two hemispheres which both need to be activated and utilized for proper reading and learning to occur. This also requires that the above domains, the psycho-motor and the affective, be involved in the learning process for true thinking to occur. Environmental factors of the classroom also have an influence on the ability to focus and think.

2.11.1.1 Psycho-motor domain and the role of movement

Movement is one of the first experiences of a child, even in utero, where the baby is not using their vision as a means of focus. From utero, birth and in the first few months, the baby begins to move its head to one side and the arms and legs automatically follow to that side while the other arm and leg flex. This movement is called the Asymmetrical tonic neck reflex (ATNR). This action is a stimulus to kicking, muscle tone, the inner balance of the vestibular system and vision, as well as increasing the neural connections between these systems (De Jager, 2006: 59). The ATNR establishes the neural connection between the eyes and the hand when the arm follows the direction of the head, and the baby can focus on the hand at arm's length. Since there is no visual stimulation in the womb, this is one of the first steps in the process of reading. In this beginning phase, any eye movement necessitates a whole body movement and as the baby lifts the head to look up, it activates the core muscles, arms and legs. This illustrates the intricate connections between reading and movement: physical movement is the precursor of visual development (De Jager, 2006: 60).

The cerebellum is the section of the brain responsible for controlling movement by muscle coordination and maintaining body equilibrium. It lies lower than the mid-brain region and towards the back of the head cavity, below the occipital lobe, and contains half of all the neurons in the brain. Although we have evolved into an intelligent species, we continue to rely on mobility as it relates to context and meaning (Greenleaf, 2003:18).

Greenleaf (2003: 18) divided the capacity for movement into three bottom-to-top experiential systems. The bottom system consists of the toe, foot and leg, and is involved in gross motor movements. The middle section is the finger, hand, and arm, which engage in fine motor movements. The top system contains the head and neck, and comprises the aural motor system. These three systems work together to interact with the world of stimuli. The integration of learning with movement in one or more of these body areas is as, or even more, neurally intricate than any other form of learning (Greenleaf, 2003: 18).

2.11.1.1.1 Proprioceptive system

Reading difficulties have been linked to a lack of development in the proprioceptive system. This proprioceptive system connects the brain to the muscle receptors, mostly in the muscles and skin, but also in the joints, ligaments, tendons and connective tissue (Kranowitz, 2005: 137). It is the system that connects the psycho-motor domain to the cognitive. This is the system that allows a child to 'know where they are in space' (Johnson, 2004:1). When the proprioceptive system, which involves both balance and movement, is well developed, the child's brain is no longer required to monitor the body, and the cortex of the brain is made free for thinking and learning (Henderson, 1998: 15).

Many children who have not balanced this system properly are constantly fidgeting in class, touching the desk with their feet or tapping their hands. Activities such as carrying heavy groceries, climbing on monkey bars, pushing wheelbarrows, climbing trees and anything that stretches the muscle receptors helps to develop the children's relationship between their muscle receptors and the brain. A lack of development in proprioception is linked to bad posture, a resistance to movement or play, or a lack of coordination (Kranowitz, 2005: 142).

According to Johnson (2010), a child does not fully develop the proprioceptive system until between ages 6-9 years old. The myelination or insulation of the

nerve fibres connecting the brain and the muscles are not complete in their formation until the child is at least five years old (Henderson, 1998: 15). There are many factors influencing this system to become underdeveloped, such as when the natural play and movement of a child is replaced by electronic media or activities that do not require muscle use (Johnson, 2010:64).

Johnson (2010:63-4) proposes that before the system balances in age 6-9 years, reading will be done by the right brain only. The right brain sees the word as a picture and tries to work out the word as a whole. The left brain is able to work it out phonetically. The two brains working together, in a harmonized proprioceptive system, allows for full phonetic and whole word reading. Johnson, who is a medical doctor whose practices are based on the Waldorf methods, cautions the teaching of reading before this system is balanced. The necessity for the proprioceptive system to balance also supports the need for all movements that challenge and stimulate the muscle reflexes to be accommodated within the schooling environment.

Because of the connection between the eyes and core muscles, it is essential that learning takes place through movement (Whittle, 2004: 23). This realization is a large part of both brain-based and Waldorf education. Without the development of balance and movement, the proprioceptive system cannot fully integrate, and therefore further skills such as those required in literacy cannot be developed (Johnson, 2007). The proprioceptive system is stimulated by movements that involve pressure receptors within the muscles, tendons and joints, which then allow the mind to map where these receptors are in the body. Activities that may have been common in past society, such as carrying groceries, pushing wheelbarrows, sweeping, pulling weeds and hanging laundry, or from monkey bars and trees are quickly being replaced by sedentary habits in response to computers and other media experiences. Therefore the priority of movement in the foundation phase curriculum is highlighted, not only to develop

the proprioceptive system, but also to allow the movement necessary to learn (Whittle, 2004: 23).

The need for movement in the foundation phase child during learning is acknowledged in both the brain-based and Waldorf schooling. Brain-based education uses systems of 'brain gym' (see De Jager, 2006 as an example) within the classroom. These are exercises to stimulate and relax the brain, increase breathing, and cross left and right sides of the brain. Waldorf also uses movement, for example the walking of letters before writing them, rhythmic stomping during a mathematics lesson, and a movement art called eurhythmy, which connects movements to sounds and letters. In addition, a great emphasis in the curriculum is on crafts, which utilize the small movements of the fingers. Neurological evidence is now proving what Rudolf Steiner was stating at the start of the century, that the more dexterous the child is with the hands, feet and fingers, the better the cognitive centres in the brain develop, which strengthens the child's ability to learn (Henderson, 1998:14).

Table 4: Similarities and differences between Waldorf and brain-based learning regarding the psycho-motor domain

- Both systems acknowledge the value of movement as essential to learning.
- Both systems promote healthy eating and habits.
- Brain-based education uses specific movements during class time to help balance the brain.
- Waldorf schooling utilizes movement in the learning of letters and within the classroom experience.

2.11.1.2 The affective domain: emotions and learning

Emotional intelligence is defined as "the ability to perceive emotions, to access and generate emotions so as to assist thought, to understand emotions and emotional knowledge, and to reflectively regulate emotions so as to promote

emotional and intellectual growth" (Mayer and Salovey, 1997 in Greenleaf, 2003: 18).

Modern biology reveals humans to be fundamentally emotional and social creatures. And yet those of us in the field of education often fail to consider that the high-level cognitive skills taught in schools, including reasoning, decision making, and processes related to language, reading, and mathematics, do not function as rational, disembodied systems, somehow influenced by but detached from emotion and the body.

> It is not that emotions rule our cognition, nor that rational thought does not exist. It is, rather, that the original purpose for which our brains evolved was to manage our physiology, to optimize our survival, and to allow us to flourish (Immordino-Yang and Demasio, 2007: 3-4).

Flourishing, it appears, includes the optimal use of the emotional quotient, or affective realm.

Goleman, in his book *Emotional Intelligence* (1995) states that the root of the word emotion is *motere*, Latin for 'to move'. The prefix 'e' suggests 'away', therefore emotion is 'to move away' (Golemen, in Ornstein and Hunkins, 2004: 115). Therefore emotions have the power to affect action. Neurology has also determined certain neurotransmitters, such as dopamine, which are emitted in the brain during emotionally happy or excited states, and contribute towards focus and memory in the learning process (Berridge and Robinson, 1998, Willis, 2008). Golemen sees humanity in crisis, with a great need for educators to incorporate emotions, which are not contrary to, but necessary for cognitive development (Patten, 2004: 2).

Demasio proposes that the link between the body and mind is through the emotional and feeling function in the brain (Demasio, 2003 in Patten, 2004: 9).

He sees emotions as unconscious and producing states of physical experience, while feelings are conscious and based on the neural maps created through these repeated experiences. These maps can be learned from, and as a result both followed and changed. He argues that feelings are actually cognitive, as they rely on functions within the brain; they are based in memory, knowledge and the sense of autobiographical self (Demasio, 2003 in Patten, 2004: 7). They guide learning like a rudder on a ship. Though the emotions and their influence may not be visibly apparent, they provide a force, which stabilizes the learner's decision-making and behaviour over time (Immordino-Yang and Faeth, 2010: 73).

Emotions are bioregulatory devices that are preset and universal to both primates and humans. Examples of primary emotional states are fear, happiness, anger, surprise and disgust (Demasio, 1999 in Patten, 2004: 7). All emotional information is sent to the amygdala and cortex through the thalamus, which then sends it to other parts of the brain. All objects available to the senses are first assessed for their emotional content, and either allowed into the higher thinking realms through the amygdala or short circuited if fear arises (Patten, 2004: 9). Therefore information in learning must be emotionally attractive for learning to occur.

2.11.1.2.1 Reticular Activating System, Amygdala and Dopamine (RAD)

Willis (2008) is a neurologist and mathematics teacher in California, and has developed a system of understanding she calls RAD, to outline the emotional responses through the brain that occur during learning. RAD comprises the Reticular Activating System, Amygdala, and Dopamine. The Reticular Activating System (RAS) is the attention activating switching system located at the

brainstem of the reptilian brain. All sensory information must first go through this system if it is to reach other parts of the brain. The amygdala is the center of the brain's emotional relay, located within the limbic system, which determines the storing of long-term memory potential of information that enters the brain, accompanied by positive emotion. Dopamine is one of the brain's most important neurotransmitters, which can carry information across spaces between nerve endings.

Joseph Le Doux (1998) is said to be the first scientist to identify the significance of the amygdala in emotional reactions. When sensory information enters the brain the thalamus directs it to the amygdala and simultaneously to the sensory cortex of the brain (Le Doux, 1996 in Patten, 2004: 10). These incidents of sensory input register as memory. The amygdala has more axons leading out to other parts of the brain than those reciprocating it back, so it becomes a controller of where neural pathways become formed. For Le Doux feelings and emotions are distinguished by being out of conscious awareness. Feelings occur when emotions have joined memory and knowledge, and become conscious and individualized (Le Doux, 1996 in Patten, 2004: 11).

Willis brings this information into brain-based teaching, through the understanding of positive emotions leading to information storage. She explains that the goal of successful teaching is to control the flow of information through the student's RAS so that the most useful information, which can then become knowledge, can reach the higher cognitive networks in the pre-frontal cortex. It is activated by changes in the environment, so utilizing novelty and surprise can stimulate the RAS to be more open to the intake of information. Examples of this are variations in sensory stimuli such as pitch, tone, volume, rhythm, visual changes and other tactile stimulation (Willis, 2008: 5).

The limbic system is where the emotions and the mind meet. The brain is a pleasure seeking and self-protecting organ. Any emotional response to sensory stimuli must get beyond the RAS and must now pass through the brain's emotional core, in the limbic system. The amygdala and hippocampus are where emotional significance connects to information, and is reviewed for its survival and pleasure value. This determines whether the information is given further access to the higher brain, and if so, where the data will go. If the student is feeling under stress, then this data will go into the survival (reptilian) brain, away from the higher thinking centres, and rather to the automatic reflexes subject to the instincts of flight, fight or freeze. If the classroom has a threatening atmosphere, such as confusion from overly challenging material, boredom from too much repetition of a subject or social stresses such as bullying, then the information will not make it to the higher cognitive brain. But if the lesson is associated with pleasure, such as topics of interest, satisfying goal achievement, and other positive experiences, then higher thinking can occur.

When positron emission tomography (PET), and functional magnetic resonance imagining (fMRI) scans have been done on students under these conditions, it has revealed that in times of stress, lower metabolic energy is shown in the scans, with less oxygen and glucose used in these regions. Therefore if a student is frustrated with the vocabulary of a question, then her amygdala is in survival mode, and the filters utilize more oxygen and nutrients that are made available to the brain. These filters are blocking information reaching the thinking brain, and it will never make it to the memory storage (Willis, 2008:5).

The understanding of RAD and the limbic system only prove what educators have recognized over time - that learning is more successful when the class is made emotionally interesting. Through incorporating learning styles, multiple intelligences and reducing stress, brain-based education advocates an

environment where cognitive learning can take place while emotions are also included. This reduction of stress is also enhanced when the physical and affective domains are integrated within the cognitive activities. The theory is that if the reptilian brain feels safe in the process of learning and the limbic system is attracted to what is being taught, then the cognitive domains can function freely (brain-based school assembly, 2008).

Emotional content is also important to the Waldorf class, and is stimulated through creative expression and storytelling. In this system, primary teachers are taught to tell a story using the four temperaments, or archetypes: melancholic, phlegmatic, sanguine and choleric, which are terms that describe emotional states and date back to the Greek era (Grant, 1999: 56). These are seen to be emotional states that all children, and adults, experience. Usually the child predominantly expresses one type of state, but the storytelling allows them to experience all of them, and stretch their emotional experiences.

A glimpse into A.A. Milne's *Winnie the Pooh* stories gives a wonderful example of the temperaments - the melancholic Eeyore, who is always looking at the sad and deep side of life; the phlegmatic Winnie the Pooh who is happy if his honey pot is full and rhythms are predictable; the sanguine Piglet who is always ready for a party, and the focused Christopher Robin who is always able to get the job done (Milne, 1956). By telling the stories in the same emotional states that the children themselves are experiencing within, the interest is enhanced and the experience gives deeper meaning to the content. In addition, the teacher can have a greater understanding of the behaviour of children due to their dominant temperaments, and can adjust discipline styles in line with them (Steiner, 1987: 46). Bringing storytelling and artistic expression into the lessons enhances the emotional experience.

Waldorf practice also brings in the affective domain through the focus on goodness and ethics in stories, using imaginative pictures for the children to listen to, create in their minds, and artistically express. In the primary schooling, the looping of teachers, where one teacher remains with the class for a full primary school period (seven or eight years) is also a way for the relationships between teacher and class to develop in an emotionally secure way.

Table 5: Similarities in Waldorf and brain-based schooling in the affective domain

- Promote the decrease in stress in the classroom so that the brain can be freer for higher thinking and creativity
- Using various ways of teaching to create interest in the subject for greater focus
- Expression of emotions allow for more creativity and bonding with the material.
- Less emphasis on testing, examinations and homework in the foundation phase, in order to decrease stress and enhance learning.

Table 6: Differences in Waldorf and brain-based schooling in the affective domain

Brain-based	Waldorf
• Awareness of multiple intelligences, learning styles and PQ, EQ and IQ to meet the needs of children.	• Looping to give students and teachers full benefit of a safe and secure class • Artistic expression • Using temperaments in storytelling as means of engaging emotions • Imagination considered essential to learning • Focus in stories on goodness and ethics

2.11.1.3 Cognitive domain: utilizing and balancing the brain hemispheres

Nobel Prize winner Roger Sperry identified the dual nature of the brain with its left and right hemispheres. The left hemisphere is noted as mobilizing thinking both verbally and analytically, while the right brain functions more in a visual and perceptual way (De Jager, 2006: 30). According to Shlain (1998) the right brain develops in utero, at a time before speech, but comprehends the spoken words through listening to the forms of speech, while the left brain deciphers its content (Shlain, 1998: 20). The right brain will assess the speaker's posture, facial expressions and gestures below the conscious awareness, gaining a sense of what is really going on during a conversation.

While the right brain is concerned with the invisible being within something, the left brain focuses on the doing, and the left lobe controls the willing functions. "Its agent, the right hand, picks berries, throws spears, and fashions tools" (Shlain, 1998: 21). The left lobe knows the world through forms of symbolization, such as tools and speech. Speech in itself is abstract, and depends on the left brain's ability to process information without the use of images. People who excel at

reading and speaking may be referred to as 'left-brained' and those who are artistically strong may be termed 'right-brained' (Williams, 2010: 88).

The assumptions about the left brain dominance for language processing have been supported by modern computer testing of the brain, such as structural and functional imaging studies. Neuroimaging studies point that the majority of right handed persons (and 76% of left handed persons as well) have left brain dominance for language processing (Williams, 2010: 88). Says Williams (2010: 88), "Speech and language are the most lateralized functions in the human brain." For the majority of people, language processing is lateralized to the left hemisphere.

2.11.3.1 The right hemisphere in language processing

While the left hemisphere is dominant in language processing, the right hemisphere also has its function in language processing. The right hemisphere has been considered to be important for the understanding and producing of prosody, which are the intonations and 'unspoken' emotional aspects of the spoken language (Williams, 2010: 89). This can change the meaning of words by how one says them, adding emotional content. The right hemisphere matures slightly ahead of the left, and the articulate brain is a product of the foundations in early childhood. These foundations include motor, sensory and emotional language, and are all stepping stones contributing to being fluent verbally (Goddard-Blythe, 2005: 84)

The right brain has more connections to the lower centres concerned with feelings, emotions, hormones, sensory experience and survival functions (Goddard-Blythe, 2005: 84). The right side appears to learn from sensory, motor and emotional experience, while the left is more technical in specified skills (Goddard-Blythe, 2005: 84). Shore (in Goddard-Blythe, 2005:84) proposes that

during development, both sides of the brain are doing a juggling act, where one takes the lead, and then the other.

Other language functions which have been allocated to the work of the right hemisphere are:

1. Interpreting humour, metaphor, making inferences and understanding sarcasm or irony (Beeman, 1993; et al in Williams, 2010: 88).
2. Language tasks that require the brain to process larger units of language information, such as comprehending discourse (Benowitz, Moya and Levine, 1990 in Williams, 2010:88).
3. Identifying a central theme to a story (Hough, 1990 in Williams, 2010: 88).
4. Demanding semantic tasks such as processing distantly related words (Beeman, 1998, in Williams, 2010:88) and deriving the connotations of words (Bronwell, Potter, Michelow and Gardner, 1984 in Williams, 2010: 88).

These demanding tasks are possibly taken on by the right brain as the left is too taxed, and the left hemisphere cannot do the job alone and utilizes the right brain capacity to fulfill this (Monetta and Joanette, 2003, Murray, 2000, in Williams, 2010: 91). This is one viewpoint on the relationship of tasks spread between the two hemispheres. The other is that the two sections of the brain work parallel, fulfilling their own functions to a larger process. Neuroimaging research has provided brain imaging results which support both views (Williams, 2010: 91).

2.11.3.2. Early pictures and literacy: neurological re-wiring

It is interesting to note that a similar developmental process from right to left brain may have occurred in humanity through the ages, revealed in the development of writing itself. Even shapes reflected in the early pictographs of human beings around the world (petroglyphs and rock engravings) are also seen in young children's drawings (McAllen, 1977:12). From the pictograph writing emerged hieroglyphic writing, which was picture based.

The Semitic languages developed as a writing system, which were read from right to left, and did not contain the vowels. Greek itself took 350 years to develop into a system of writing from left to right. According to Ornstein (1997:34) Greek was first read right to left, then 'as the ox ploughs,' which is right to left and left to right, and only later as present. When a person reads from right to left, they concentrate focus in their left eye (right brain) and when they read from left to right, the right eye (left brain) is more utilized (Ornstein, 1997: 36). So this changeover may have been one that altered neurological pathways as well.

Johnson (2007) states that right brain reading occurs when a person sees the whole word, the picture of the word in a way, and tries to work out what that word says. Left brain reading functions phonetically, where each individual sounds can be worked through. If the Semitic languages, read right to left, did not have vowels, then it is very possible that they were read in a right brain manner, as it were more the appearance of the word that gave indication to how those vowels may be inserted (Ornstein, 1997:36).

2.11.3.3 The corpus collosum: a bridge across the hemispheres

The corpus collosum is a thick bridge of neural tissue that links the right and left hemispheres of the brain, containing millions of nerve fibres which facilitate messages from one side to the other (Goddart-Blythe, 2005 84). It functions during cognitive activities in maintaining the balance between arousal and attention in each hemisphere to enable each part to function as an integrated whole. It is also involved in eye movements, where input goes to both sides of the brain, and integration of the material requires this inter-hemispheric conversation. This becomes very important in both reading and writing.

Both brain-based and Waldorf schools involve activities within their curriculum for crossing of the midline, which helps to integrate the information processing of the

corpus collosum. The healthy development of this crossing begins at the time of crawling, where cross lateral movements help to integrate the two hemispheres. If this crossing has not occurred sufficiently, it has been shown to be helpful to allow a child to crawl again, even if they are far beyond that stage (De Jaguar: 2004: 61). Movements within the brain-based curriculum allow for crossing of the body to occur, which results in an integrative pattern between the two hemispheres. Even an activity such as a jumping jack engages the left and right side of the body symmetrically, and with quite an effort of concentration. These sorts of movements, where both sides of the body are used symmetrically, enhance the relationship between the hemispheres. Brain-based education brings these movements into the learning day, so that the brain can be more relaxed, open and focused to the material being presented.

In Waldorf schools, form drawing is a means of crossing the midline and exploring the angles of the written letters- the straight and curved line. These forms are drawn in rhythmic repetition, practicing simple linear patterns and designs. They assist in hand-eye coordination, fine motor skills and the development of handwriting. An example of a simple form is shown in Figure 2.1 (James, 2006: 7), with a repetition of a motif in horizontal direction from left to right. The teacher may introduce these forms by having the children walk in stiff straight lines, changing the directions abruptly into an opposite experience, where the children may then practise flowing-like form. After acting them in movement, they can then draw them on the paper. Figure 3 (James, 2006: 7) shows the complexities that the same lessons can develop towards in a later grade, which becomes an exercise in mathematics as well. The understanding is that writing requires a spatial intelligence that can be practised before the abstract letter is put on paper (McAllen, 1977: 15).

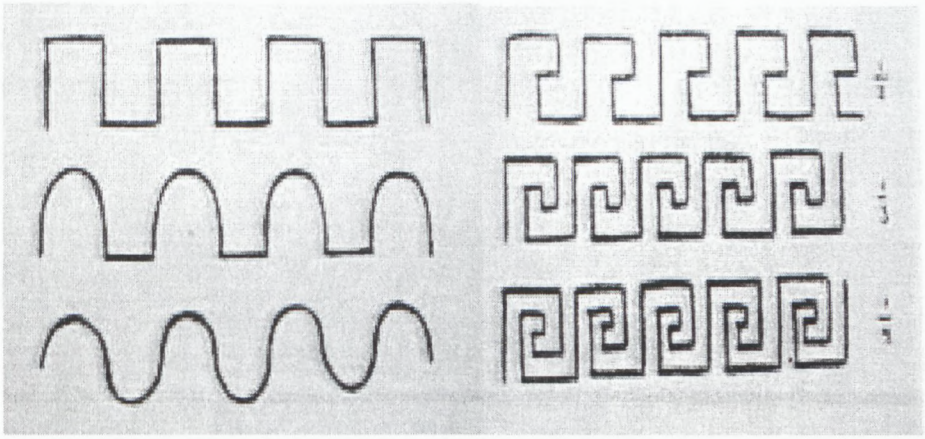

Figure 3: Form drawing in the Waldorf school (James, 2006:7)

The cognitive domain is generally the focus of education. But in both education systems there is also an acknowledgement that by the inclusion of the other two domains in the learning day, enhanced cognition can occur. Both systems place in their practices and policies that an integration of the psycho-motor and affective domain is essential to cognitive learning.

The cognitive domain also includes the levels of academic stimulation is included in the work. The importance is that both schools acknowledge that in order for proper thinking to develop and occur, the other domains are needing to be integrated with:

- Movement
- Decreased focus on results, causing stress
- Healthy nutrition
- Work to be emotionally and sensually interesting

2.12 Gender differences in learning

The notion that girls read better than boys has been a strong assertion and attended to in brain-based theories as having validity (Brozo, 2006: 71). Assessments in primary school through to high school have revealed that boys score significantly lower than girls on standardized measures of reading achievement (Grig, Daane, Ying, and Campbell, 2003; Mullis, Mártin, Gonzalex and Kennedy, 2003: 2003; in Brozo, 2006: 71). These differences in reading abilities date back to the 1930s (Holbrook, 1988, in Brozo, 2006: 71). This historical truth has led to a perception, and even an expectation, that many boys will not become thoughtful, accomplished readers (Brozo, 2002, in Brozo, 2006: 71). Yet only a limited number of brain imaging studies have actually been conducted examining the differences in language processing between genders, and the results have been mixed, some reporting no differences (Gaillard, et al. 2003 in Williams, 2010: 98), and others willing to consider gender differences when also factoring in age differences (Plante et al. 2006, in Williams, 2010: 98).

The results of studies do show that boys may process language skills differently from girls. Studies showed that boys may actually process language in a different way to girls. One study showed that girls used the same brain regions to process tasks that both involved language and visual activities; while boys processed the audio and visual in different regions of the brain (Williams, 2010:99). Williams (2010: 99) suggests that boys may not convert sensory information into language as easily as girls did, and that this difference can then influence boys' performance in receiving auditory instruction and learning to read. Examples of activities such as turning a classroom necessity into a creative exercise, such as the making of a hip hop song with boys as an opportunity to teach word families (Brozo, 2006: 72), reveal ways to integrate the creative and the academic in learning.

Brain-based education acknowledges these learning differences, and the school that I studied separates the boy and girl classes in the foundation phase - the early years of reading. With the addition of special boy-oriented exercises in learning to read, such as playing with balls to enhance focus and keep a rhythm in a mathematics class, the emotional side is made attractive by engaging the visual and auditory together (SAPA, 2008).

Males have been shown to act out and be more physical when frustrated or simply communicating a need. Females are typically more likely to use language and covert behaviour to meet their needs. Girls are also more inclined to work cooperatively than boys, but also to socialize (Jensen, 2005:88).

Research has shown anatomical differences between the male and female brain. The mean and medium sizes of the brain vary between genders, even when adjusted for body size (Ackney, 1992 in Jensen, 2005: 114). It has been discovered that women have between ten to thirty three percent more neuronal fibers in the forward part of their corpus collosum than men (Shlain, 1998: 23). The corpus collosum is the largest of several 'bridges' linking the left and right hemispheres (Caine and Caine, 1991: 32). The extra connecting neurons seem to enhance the communication of emotions and increase global awareness, field perception, and understanding of the moods of offspring in women (Shlain, 1998: 23). Female brains tend to form more uniformly, while male brains do not, and the developmental schedules vary between men and women (Yurgeleun-Todd, Killgore and Young 2002, in Jensen 2005: 114).

If these differences have relevance, then learning styles vary between girls and boys. According to Ford, the Headmaster of a brain-based school (SAPA, 2008) boys respond more to moving objects as a means of learning, such as throwing a ball to enhance a mathematics lesson, whereas girls are more likely to utilize a

whole space, such as drawing a picture. If these differences have relevance in the teaching of literacy, they need further study.

2.13 Conclusion

This literature review is an attempt to link concepts developed in the 1920s by Rudolf Steiner, and continued by the teachers of Waldorf schooling, put together with modern neuroscientific findings, to see if a bridge truly could be built between the two.

The literature review involves an overview of both brain-based and Waldorf schooling, and gives comparative perspectives on their positions with regard to the physical, affective and cognitive domains of learning. It looks at brain integration between the right and left hemispheres. It investigates the role of emotional expression both in the reduction of stress and the creative presentation of material. This includes the aesthetic aspects of education such as artistic expression. It also investigates the importance of movement for health, focus, and integration of information. All of these are possible insights towards improving the experience and outcome of literacy practices in South Africa.

CHAPTER THREE

METHODOLOGY

The following chapter outlines the research undertaken in this study, exploring both Waldorf and brain-based Grade 1 classes with regard to literacy. An overview of ethnographic research, looking at issues of reliability and validity, as well as my own self-reflexivity as a researcher is conducted. The research question is stated, and an outline of the instruments used in the research is given. These are observation, open-ended interviews and document analysis. The ethical clearance and limitations of the study are given.

3.1 Ethnographic research

Ethnographic studies focus on groups of people, studying their way of life. This includes getting to know the group of people in their practices occurring in every day actions (Henning, 2004:42). The purpose of ethnography is to conduct the study in a natural setting, with no manipulation of variables, simulation or externally imposed structure (Weirsna and Jurs, 2005; 244). The intention is to capture every day practices, as well as rituals and actions that bind a group of people and capture the various means whereby they represent themselves (Henning, 2004: 43). The focus is usually on an organization or community, who interact in regular and structured ways. A school is a social organization, as is a classroom (Wiersna and Jurs, 2005: 246), and therefore can be studied as a structured system.

Ethnographic research differs from positivistic research and its contribution to the scientific processes lies in those differences (Le Compte and Preissle Goetz,

1982:3). Differences include the method of data gathering, as well as the procedure of hypothesis formulation. In ethnographic research the hypothesis is often derived or revised from the data. The frame of research is inclusive of the subjective perspectives of both the researcher and participants, which has the potential of providing "a depth of understanding lacking in other approaches to investigation" (Le Compte and Preissle Goetz, 1982:3). These potentially subjective aspects need to be outlined in order for transparency and an understanding of the conclusions.

There has been controversy in defining ethnography. Where some regard it as a philosophical paradigm, others view it as a method used in research only when it is appropriate. Furthermore, there are the variations in between these positions (Atkinson and Hammersley, 1994: 248). This controversy results in various schools of ethnography, where some regard a greater 'scientific stance' in their methods, and others reject this "in favour of an engaged advocacy and a critical stance" (Atkinson and Hammersley, 1994: 249). These ethnographers tend to distance themselves from a mainstream orthodoxy.

Barnard (2006), in his essay 'Anti-ethnography', argues that there has been a theoretical lapse over the past two decades in the use of ethnography as a methodology of research. This may be compounded by the difficulties of teaching a postmodern understanding of subjectivity, truth and epistemology in an:

> ..increasingly commodified teaching context, where consumers expect to purchase a clear, identifiable, and literally usable product and where "knowledge" often means easily digestible and repeatable content rather than analytic skills, critical understandings, or complex world views (Barnard, 2006: 95).

Often the assessments and outcomes have greater value in these cases, than the ideas expressed.

Denzin and Lincoln (2008) describe the crisis in perceiving qualitative enquiries, including ethnographies, as coded in multiple terms, "variously called and associated with the critical, interpretive, linguistic, feminist and rhetorical turns in social theory" (Denzin and Lincoln, 2008: 26). These turns develop two key assumptions of qualitative research, the first of which is that the ethnographic, or qualitative researcher cannot directly capture a true representation of lived experience, but that rather it is a created social text written from the perspective of the researcher. This is described as a representational crisis.

The second assumption outlined by Denzin and Lincoln (2008) is that serious attention must go to interpreting the data, questioning terms such as validity, generalizability, and reliability (Denzin and Lincoln, 2008: 26). The question becomes how qualitative studies can be evaluated in a more contemporary, poststructural analysis. These two assumptions provoke the questions regarding how research can affect change in the world if it remains "only and always a text" (Denzin and Lincoln, 2008: 27).

While a new breed of 'post-modern' ethnography is emerging in several disciplines, in many situations the gap between theory and praxis is wide. Traditional, uncritical ethnographies are being produced, and the new textbooks do not acknowledge a history of 'anti-ethnography' (Barnard, 2006: 97). Experiences of the 1980s and 1990s have led to a more complex and contested understanding of ethnography which is often forgotten in these texts.

Historically, ethnography has its links to early fieldwork by social and cultural anthropologists in the late nineteenth and early twentieth centuries, shifting to a practice of collecting data firsthand (Atkinson and Hammersley, 1994: 249). Earlier influences shaping the methodology are the association of Western

interest in non-Western societies. In the nineteenth century the theoretical standing of hermeneutics, the studies of the principles underlying historical texts, also added its influence, especially in the recognition that people of the past differed from those living today (Atkinson and Hammersley, 1994: 249). It is not only the recognition that the past was different, but also the discernment that these differences cannot be properly comprehended as only a deviation from the norm of the observer, or signs of cultural backwardness. This led to an even greater exploration into the objectivity of social research and the assumptions of those who were conducting it.

Denzin and Lincoln describe the overlapping stages of ethnography in America, beginning with the early ethnography, lasting until the 17th century (Denzin and Lincoln, 2008: 18). The second period was the colonial ethnography, lasting from the 17th to 19th century, involving the explorers of those times. From the late 19th to early 20th century, anthropologists researched the American Indians, viewing them as the "Other". From the early 20th century through until the 1960s, there were community studies and ethnographies of American immigrants. From then until the 1980s came studies of ethnicity and assimilation, which occurred until the present day and spread throughout the world (Denzin and Lincoln, 2008: 18).

In all of these eras, Denzin and Lincoln claim, the researchers were, and still are, being influenced by their political hopes and ideologies, deriving conclusions in the findings of their research to confirm their prior theories and beliefs (Denzin and Lincoln, 2008: 19). These conclusions then affected the perspectives that people had on other cultures, confirming theories of racial and cultural diversity to fit into their theories of the historical truths on race and civilization.

> Colonial ethnographers, before the professionalization of ethnography in the 20th century, fostered a colonial pluralism that left natives on their own as long as their leaders could be co-opted by the colonial administration. European

> ethnographers studied Africans, Asians, and other Third World peoples of colour. Early American ethnographers studied the American Indian from the perspective of the conqueror, who saw the life world of the primitive as a window to the prehistoric past (Denzin and Lincoln, 2008: 19).

The Calvinist movement then fostered the notion of 'saving the Indian', which was soon transferred to an enormous mission of saving all the immigrants who were entering the United States of America in order to benefit from the early industrial age. Between the 1900s to the 1960s many qualitative community studies were conducted with early researchers such as E. Franklin Frazier, Robert Park and Robert Redfield, as well as their students. From the 1960s, ethnicity studies challenged these earlier theories, termed the 'melting pot' hypothesis, moving towards ethnic studies programs which viewed Native Americans, Latinos, Asian Americans, and African Americans as a process of taking control of the study of their own peoples (Denzin and Lincoln, 2008: 19).

A line of ethnography developed at this time, linked to Marxist and neo-Marxist critical theory, became 'critical ethnography' (Carpecken, 1996 in Denzin and Lincoln, 2008: 287). With the growing social movements focusing on gender, sexual identity, and postcolonial social movements, the philosophical basis for a critical ethnography was expanding. The discourse not only rejected positivism, but also worked at the divide between the powerful and powerless, in the hope of producing both universalistic theoretical knowledge and local practical knowledge (Foley and Valenzuela, 2008: 288).

There was a shift from the positivist universalistic, objective standpoint, to a more participatory style, where the speaker herself is situated within a historical and cultural standpoint which needs to be identified.

> Critical ethnographers are mere culture-bound mortals speaking from very particular race, class, gender, and sexual identity locations. Because all standpoints represent particular interests and positions in a hierarchical society, they are 'ideological' in the sense that they are partial (Foley and Valenzuela, 2008: 288).

In the mid-1980s with the rise of postmodernism and post structuralism there was a deeper challenge to the earlier assumptions which had influenced the history of ethnography. This called on researchers to abandon established and preconceived values, theories, perspectives and prejudices as tools for the ethnographic study. In the new era, the researcher does not only observe history, but rather plays a part in it (Vidich and Lyman, 2000, in Denzin and Lincoln, 2008: 19). This shift in position, from seeing oneself as a passive student of research, to seeing oneself as an activist taking on the counter-hegemonic struggle over research, is a significant one (Smith, 2008: 116). It allows studies with greater subtlety, with a more flexible understanding of a system as a work in progress, and has given me, as a researcher, the opportunity to lay aside preconceived positions in order to observe; at the same time acknowledging the effect of the researcher on the system or concepts developed from it.

Wiersna and Jurs (2005: 242-44) outline five implications for how ethnographic research is conducted. These are:

1. As much as possible, a priori assumptions about the phenomenon under study are avoided.
2. Reality is regarded holistically and complex phenomena are not reduced to a few variables.
3. Data collection procedures and instruments should have a minimum influence on the phenomena under study, although there is some structure.

4. There is an open perspective to alternative explanations of the phenomena which may lead to alternative or changing concepts of reality.
5. Theory, as applicable, should be derived from the data, as grounded theory, instead of imposing preconceived theory on the data.

To some extent, the methodology of ethnographic research emerges as the research is in progress. There is no research technique that is exclusive of ethnographic research (Wiersna and Jurs, 2005: 245). Ethnographic methods can give shape to new constructs or paradigms, and create new variables for further studies (Genzuk, 2003: 2). Actions which exist in the world are often generated by unreflected and unquestioned underlying expectations and implicit rules, and it is the task of the ethno methodologist to discover them, and to find common-sense patterns of how they are utilized to construct daily life (Alvesson and Sköldberg, 2000, in Henning, 2004: 39).

There is reflexivity about ethnographic research, and it is acknowledged that the researcher offers a specific tone to the research. The researcher herself is seen as a co-creator of meaning within the studied reality (Henning, 2004: 18). This is a challenge to the ethnographer, and questions the validity of social scientific research itself (Atkinson and Hammersley, 1994: 252). The accounts produced by the researchers are considered constructions of their own presuppositions and socio-historical circumstances. The researcher becomes the meaning maker of the inquiry, attempting to create a balance between the reality 'out there' and a narrative of her own knowledge of this reality (Alvesson and Sköldberg, 2000, in Henning, 2004: 39). Therefore the design type also reveals an insight into who the researcher is.

This challenges the nature of validity and reliability of the research itself. Many of the critiques that have long been applied to quantitative research are now being

exercised on ethnography. It is argued that these issues occur in more subtle forms of control, as there is opportunity to get closer to the people studied, to discover details of their behaviour and a more inward perspective of experience (Atkinson and Hammersley, 1994 252). As the researcher offers a specific tone to the research, they have to be transparent and explicit for the work to be trustworthy (Henning, 2004: 39).

3.2 Reliability and Validity

Le Compte and Goetz (1982: 32) define reliability and validity in the following ways:

Reliability is concerned with the replicability of scientific findings.

Validity is the accuracy of scientific findings in terms of empirical reality.

Hensen (1979 in Le Compte and Preissle Goetz, 1982: 32) reviews both the internal and external factors of each:

External reliability is whether an independent researcher would discover the same phenomena or generate similar constructs in a similar setting.

Internal reliability relates to the degree in which other researchers, if given a set of previously created constructs, would match them with the data in the same way as the researcher in question.

Internal validity relates to the extent to which scientific observations and measurements are a true measurement of reality.

External validity responds to the degree of these representations, and how they may be compared across other social groups.

Ethnography outlines the interplay amongst these variables within a natural context. The credibility is established by systematically identifying and interrogating all causal and consequential factors within this environment (Goetz

and Le Compte, 1981: in Le Compte and Goetz, 1982: 33). The natural setting facilitates the on-the-scene analysis of causes and precludes precise control of extraneous factors. Rather, the interrelationships are of the primary concern.

Usually, findings from experiments and surveys are intended as a generalization from the subjects in question to a wider population, and therefore only validated when the researched group is randomly selected from an entire population to which the findings will be applied. In ethnography, the aim is the application for comparability and translatability of findings, rather than outright transference to groups not actually investigated (Le Compte and Goetz, 1982: 34). The comparability requires that the ethnographer delineate the traits of the group studied or the constructs which have been generated so clearly that a comparison can be made with other similar or dissimilar groups (Wolcott, 1973 in Le Compte and Goetz, 1982: 34). The translatability assumes that the research methods, analytic categories, and characteristics of phenomena are so explicitly identified that comparisons can be conducted. In the case of comparisons, ethnographers may choose phenomena for investigation because they are similar or due to their systematic differences along particular dimensions.

The fact that studies are conducted in natural settings, often recording a process of change, and unique situations cannot be reproduced, means that it becomes unlikely for an ethnographic study to be replicated (Le Compte and Geotz, 1982: 35). Although the findings may be only a facet of reality, influenced by the eyes of the researcher, they are still considered legitimate perspectives into a reality that may not have occurred otherwise. These "slices of data" taken together, contribute to a more complete picture of a group of life (Glaser and Strauss, 1967, in Le Compte and Goetz, 1982: 37).

3.3 Self-reflexivity

I, the researcher, am a Waldorf kindergarten teacher, interested in the workings of Grade 1 as a follow up of what I teach in kindergarten. Therefore my observations and insights in this study would be influenced by these experiences in the philosophy and practice of Waldorf education. While initially this was a reason not to include Waldorf in the study, my readings and experiences in brain-based education urged me to revise the study to make a comparison, as opposed to using Steiner/ Waldorf only as a theoretical underpinning. I wanted to get first hand experience of both systems of education, and then do a comparison. This is also because very few Waldorf teachers contribute to the academic community, so if I were only to use it as a theoretical underpinning to the project, I would not have had an adequate supply of academically written material on Waldorf education.

One of the dangers of being affiliated to a system of thinking is that a study becomes its advocacy rather than objective research. I therefore have to be careful and diligent not to become an advocate of Waldorf education, but rather an observer and bring in as much critique as understanding. This requires me to hold what ethnographic research advises - to not have prior assumptions of what the research environment will reveal. It is for that reason that I have chosen to research an age group which I do not teach.

This study interested me for its use in both analysing the techniques of Waldorf Grade 1 literacy and in comparing Waldorf practice with neuroscience. The language in Steiner/ Waldorf education is often very thick in its spiritual content, and has a semantic style of the early 1900s. This differs from the language of research in recent studies of the brain and theories derived from the scientific studies of human neurology. Yet I was also delving into different formations of a

logical system: Waldorf looks into the spiritual content of the child awakening in its individuality and destiny. The brain-based system developed around a logic of utilizing the rules of the brain in its ability to best assimilate information. I wondered if there was a bridge between the two.

During my research period I have also had the opportunity to observe my own son enter into Grade 1 in Waldorf education, as a parent from the outside. This has offered me much insight into the readings and observations that I conducted. My observation schedule occurred a year before he entered Grade 1, but the writing of the findings has synchronized with that time. I have then had the opportunity to observe the content of the lessons he brought home with him as well as the progress of his own writing. This has been a privilege to combine theory and practice.

Rudolf Steiner has a perspective on methodology that is not outlined in ethnography, but rather inherent in the training of a Waldorf teacher. This is described as Goethianistic observation. This term is fashioned from the theories of Goethe, on whom Rudolf Steiner did his own PHD thesis (Blunt, 1995:6). It involves the internalization of physical sensation and theory into one's imaginative world, and then finding a feeling or gesture that is inspired within from it. This is something I practiced both with the information derived for the literature review and practical experiences. I would take concepts, be they neurological information or those of Waldorf education, and walking and thinking to explore how those concepts lived inside me, reflected on my observations of the world around me. From this, greater theoretical connections were derived. For this reason, perhaps the thesis took me a greater length of time, for I had to live the ideas before I could write them with any authority to fit into my study. I let the ideas live in my body and see where they took me. It was almost like putting on a coat of the concept and wearing it; very experiential.

How this correlates with ethnography is interesting, as the idea around ethnography is not to have brought preconceived ideas into the research field. It is then important to clear those understandings when in the research site, and simply observe before coming to conclusions of results or concepts. This is challenging, but directly what the art of academic research requires in ethnographic methodology. Perhaps one day practitioners of Steiner education will find a way to add some research techniques involving intuition and imagination, not only to their own teaching practices, but to a scientific research method in an academic framework.

3.4 The Research Questions

The following research questions were asked in the study:

1) How does a brain-based curriculum stimulate literacy in a Grade 1 environment?
2) How does a Waldorf curriculum stimulate literacy in a Grade 1 environment?
3) What similarities and differences are there in the two systems, and what insights into early literacy development can be gained from comparing them?

An ethnographic methodology was chosen for the study, as the purpose was to capture the nature of the environment in which learners are exposed to literacy in both systems of education. The methods of research utilized were observation, open-ended interviews and document analysis.

3.5 Data Collection

Ethnographic research typically employs three types of data collection: interviews, observation and document analysis. This in turn produced three kinds of data: quotations, descriptions, and excerpts of documents (Genzuk, 2003:2) Triangulation allows for greater validity in the study with the theory that by coming from various angles towards a measured position, a greater potential for the true position can be gained (Henning, 2004: 6). The result of this is one product: narrative description, along with charts, diagrams and additional artefacts which assist to tell the 'story' of the studied field (Hammersley, 1990 in Genzuk, 2003: 2). The observer is seen as a meaning maker of an inquiry, and tries to create a balance between the reality 'out there' with the narrative of his or her own knowledge of this reality (Alvesson and Sköldberg, 2000 in Henning, 2004: 39).

In this study I used three methods of data collection: observation, loosely structured interviews and document analysis. Instruments included thick description recorded in a journal of observation; a schedule of interview prompts, and an analytic framework for the document analysis, using the children's books as the documents.

Observations occurred for three days in the Waldorf school and five days in brain-based classrooms. Since the brain-based school divided the classes in foundation phase by gender, I observed two days in the boys', two days in the girls' classroom, and one day in combined activities. I also attended an assembly of the foundation phase students at the brain-based school, and an end of year festival at the Waldorf school. These experiences allowed for a deeper insight

into the daily life of the children in their classes. The brain-based school will be discussed as School A, with Classes X (boys) and Y (girls). The Waldorf class will be discussed as School B.

3.5.1 Observation

Observational research is not a singular form, and making the choice to employ field methods involves a commitment to get close to the subjects in a natural setting, and to be factual and descriptive in the reporting of what is observed (Genzuk, 2003: 2). There are distinctions between the observation approaches which lie on a continuum from complete immersion in the program as a full participant to a complete separation from the activities observed. There is also a great variation in between these two extremes (Genzuk, 2003: 3).

Participant observation is a field strategy that simultaneously combines document analysis, interviewing of respondents, direct participation, observation and introspection. The purpose of this is to develop an insider's view of what is happening, and while the researcher is observing the outside occurrences, they are also 'feeling' what it is to be part of the group (Genzuk, 2003: 3). Observation is to be comprehensive, continuous and a complete record of all relevant information in an unobtrusive way. There is no inventory of points, it is rather unstructured, and requires a careful listening to pick up subtle cues and nuances (Wiersna and Jurs, 2005: 253).

Wolcott (1998 in Wiersna and Jurs, 2005: 252) describes three types of observer- participant roles. The first is an active participant, where the observer assumes the role as a participant, as another teacher. The second is a privileged observer, which is the method often employed in the study of schools, where the observer does assume the role of an observer but has access to relevant activity

for the study. For example, in the lessons the researcher will take notes and watch, but they may help the teacher in a game or activity. The third style of observation is the limited observer, when opportunities for observation are restricted and other data collection techniques take precedence. This last method is not advised for the study of schools (Wiersna and Jurs, 2005: 253).

A fourfold typology has also been put forward to clarify the level of participation: complete observer, observer as a participant, participant as an observer, and complete participant (Junker, 1960 in Atkinson and Hammersley, 1994: 248). It has also been argued that all social research is a form of participant observation, as we cannot truly study the social world without being part of it (Hammersley and Atkinson, 1982, in 1994: 249).

While I was compiling my methodology framework I had some difficulty understanding whether I would be a participant as a student or a teacher. My assumption to begin with was that I would observe as a student, and be exposed to the teaching methods and practices, as a student would receive them. This was altered as it was pointed out to me that I could never assume the same position as a student of six or seven years old, and that my participation would be more as a teacher. In fact, in practice that was true, for although for the most part I had my place to take notes of my observations and thoughts in the back of the room, when I did participate it was to assist the teacher, such as helping the children with their spelling. At those times I could observe the reactions to the work from the students, but in the role of a teacher.

My intention in the observations was to observe all the events and qualities of the Grade 1 environment that might influence literacy. This included the classroom and school environment, subject matter, teaching styles, school rhythm of the day, and practices that came into that rhythm. The important aspect of

ethnographic research is not to bring any preconceived ideas into the observations, but to make a separate space in the journal for personal responses and perceptions that may add to the thick description.

3.5.1.1 Unbiased observations

One of the claims of ethnographic research is that it is a requirement to go into the situation without pre-determined theories and expectations, contrary to a positivist study outlining what it hopes to prove. Yet it is difficult as a human being to be entirely without bias. The specificity towards the research question is an excellent barometer of what to look at, but even then what determines what I, as a researcher, see? I was thinking after the research was conducted, that what I would like to see is a tally of how many incidents of physical, affective and cognitive activities occurred within a school day, within each system. But that counting would have required a pre-determined list of what I was looking for, and therefore not what I did during the actual research and this type of research would not be ethnographic in nature, although such incidents, with special attention, could be ticked off during an ethnographic study. It made the image arise of ethnographic studies as a primary 'field visit' into a space, mine being classrooms, which once those notes were analysed might bring further questions. And these further questions might require a different kind of methodology.

3.5.1.2 What to observe

Ethnographic methodology outlines that observations occur without a preconceived checklist of qualities of the classroom environment in which to observe. Yet due to the large amount of information, it is helpful to have some guidelines to categorize it. I have utilized those listed by Jensen (2005: 81), as some of the important environmental qualities in a classroom. They are seating, temperature, lighting, noise, and building design.

3.5.2 Interviews

Interviews in ethnographic research assume that an individual's perspectives are an important part of the fabric of that society, and of the joint knowledge of social processes and the human condition (Henning, 2004: 50). Interviewing can be open-ended and casual or can be structured, although keeping to the phenomenological approach at least some of it should be informal and unstructured (Wiersna and Jurs, 2005: 255).

Henning (2004: 50) outlines two types of interviews within ethnographic research: standardized and constructionist. Standardized interviews are where the interviewer controls the process, limiting the deviation from the subject by the interviewee, making sure no leading questions are asked and no contamination occurs of any kind. Then content can be taken at face value, and believed to be 'true' or real, in terms of a subjective version of the facts, opinions, and feelings experienced and expressed (Henning, 2004: 53).

There are critiques of this method, and the assumption that if data is elicited in a non-biased way, will be considered 'pure' information. This ignores the interviewer herself as a site for knowledge making and the interview as a discursive event (Henning, 2004: 54). The conclusion for this distrust is that the interview should not only be analysed for content but also include some aspect of discourse analysis to highlight the opportunities for hidden meanings created within the interview process to be recognized (Henning, 2004: 55).

Discourse analysis views the formation of modes of symbolizing reality, such as language and in pictures, as a strong determinant of meaning which can be constructed by groups or individuals. It does not bypass the content of the data,

but rather views data as socially constructed information that has been considered important both because of the data itself as well as the broader social and historical context and conventions within how the text or wording of an interview has been created (Henning, 2004: 45). The ways that interviewers construct their speech, how they say what they say and how they sequence this are all important discursive qualities which can bring enlightenment to the researcher's quest for understanding and interpretation (Alvesson and Skökdberg, 2000 in Henning, 2004: 54).

The interviews occurred within an informal conversation format to allow for perceptions and ideas to be explored with those being interviewed. These interviews were taped and later transcribed.

3.5.3 Document analysis

Looking at documents can be a valuable source of information in ethnographic research (Henning, 2004: 99). The documents that I chose instead were the books of the children, to show their levels of writing and reading. These included both the books that they were reading (readers), but mostly the books that they themselves were creating for their work.

3.6 Ethical clearance

A letter was written to the Department of Education (Appendix 10) in order to get permission to study at the brain-based school, as it fell under the Western Cape Department of Education. Permission was granted. As the Waldorf school is private, I had to get permission from their own internal College of Teachers in

order to conduct the study there (Appendix 11). I explained to both the administration and teachers the purpose of the research. There was no deception or manipulation involved in the observation of children, and confidentiality about the subjects' identities would be maintained.

3.7 Limitations of the study

Although both brain-based education and Waldorf schools are world-wide movements, my study has been limited to two particular schools. Therefore, the study is a small representative of the educational movements as a whole. I only spent a small amount of time (2-3 days) with each class, so there is no way to fully comprehend all the practices within the schools themselves. Also, because of my own belief that filming children changes their experience, I did not choose to film, and therefore limitations are also on account of my own observation abilities at the time of the study. I also did my observation times at the end of the year, when the learning of reading and writing had already occurred. I therefore was able to observe established routines and outcomes of classroom practices, but it would have been good to observe some of the beginning classes as well, to see how these practices were introduced.

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF FINDINGS

This chapter presents both the findings and discussion on the findings from the research. The chapter outlines the sites and samples, and revisits the research question. It then reviews the procedure and data from the three research methods: observations, interviews and document analysis. The main themes are presented in order to answer the research question, categorized in the domains of psycho-motor, affective and cognitive.

4.1 Sites and sample

Two schools in the Cape Town south peninsula area were chosen for this study. School A is a brain-based school running from Grades 1-7, and where classes are divided between genders in the foundation phase. Two classes were observed, both Grade 1, and one of each gender. Class X is the boy's class and Class Y the girls.

School B is a Waldorf school and only has one Grade 1 class, with mixed gender. Table 4 shows the class sizes and distribution between second language speakers and boy/ girl ratio.

Table 7: Class sizes and distribution

School	Class	Total Number Children	Boy/ Girl ratio	Second language speakers (home languages in brackets)
School A	Class X	31	Boys: 31	1 (isiXhosa) and 1 (Afrikaans)
School A	Class Y	30	Girls: 30	2 (isiXhosa)
School B	Class 1	18	7 boys/ 11 girls	4 (isiXhosa) and 1 (German)

4.1.1 Learner's hours

School A

School runs from 8:30 to 2:00 pm, except on Tuesdays when it ends at 1:00 pm. Most students participate in extra curricular sports after school, or attend aftercare on the property.

School B

School runs from 8:00am to 12:30 pm. No extra curricular activities or aftercare is provided on the school grounds.

4.1.2 School uniforms

School A

There was a prescribed set of comfortable school uniforms worn by all students.

School B

There were no uniforms.

4.1.3 Language of instruction

School A

All classes were conducted in English. There were no second language classes in Class 1.

School B

All classes were conducted in English, although the teacher was Xhosa and could speak to the Xhosa students in their mother tongue for further understanding. Some songs were in Xhosa and Afrikaans. The students had both Xhosa and Afrikaans lessons.

4.1.4 School structure

School A

There were four Grade 1 classes in the brain based school, two of boys and two of girls. Each had their own classroom, and for some events, such as music, they all participated together. The teacher utilized a specific rhythm for the day, including the one kilometre walking circuit, although both teachers seemed to have some freedom as to how to structure that day. There was also a fruit time, a lunch, playtime and specific time structures for teaching.

There were 11 student teachers who were circulated through the classes to help the teachers. There was also a strong program of involving the parents to volunteer to be class helpers during the classroom day, conduct assessments, and other tasks for the teachers. There was an assembly each week to which those class parents were invited, as some learning of the school's motives went on in the assembly. There was a separate assembly given for the full foundation phase.

Leading the organizational structure of the school was the principal, who was very involved in the programming of the school. A few years previously the school had been structured around the theory of a different philosopher, Eduard de Bono, who had worked on brain programs but not in the same way as practised when the study was conducted. The system of brain-based teaching observed in the study came from work studied by the headmaster in the United

States. During the period of my study I attended a conference in Cape Town on brain-based education, at which he spoke (May, 2008). The primary subject of his paper was the differences between boys and girls in learning, validating why the classes should be separated.

The Grade 1 teachers met every Friday morning to plan the week ahead, and discuss any issues in the classroom. At this time, the students of their classes were at art class or library.

A large range of extra mural sports was offered after school, as well as aftercare. There was no pre-school linked to the school, although one was planned to commence the following year.

School B

There were two classes of playgroup (ages 3-4), three kindergarten (ages 4-6), and one class of each grade from grades 1 to 7. In the ideal situation in Waldorf school the primary school teachers stay with their children all the way from grades 1 to 7. There is no formal principal of a Waldorf school, although there is administrative help. The teachers meet on a weekly basis to discuss running the school. Any portfolios, such as the school environment, fundraising, and others are the responsibility of the teachers. A smaller group of teachers make up what is called the College of Teachers, where pedagogical and foundational issues are discussed. This occurs in a separate meeting, after the full teachers meeting each week. This College of Teachers changes according to which teachers are asked to participate each year. It is a voluntary effort, and a foundation of the school's decision making. There is also a Board made up of teachers and parents, which make final decisions on school issues.

4.1.5 Literacy acquisition

School A follows the national curriculum standards for Grade 1, outlining 40% of the school day is dedicated to literacy practices. Time percentages are allocated to each learning area, with literacy taking 40% of curriculum time, numeracy 35% and life skills 25% (DOE, 2002: 17). The teachers were involved in constant assessment contributing to the needs outlined in the Outcomes based education system. Meanwhile they were also acting in accordance with the outlines of the brain-based system, involving time management, food, water, exercise and movements in order to enhance the literacy practices. They were also practicing learning styles and multiple intelligences through the presentation of the material in varied ways. As well, the genders were divided in the foundation phase classes, which correlated from some of their beliefs of enhancing learning. A large gymnasium was used weekly to do exercises which enhanced right/left brain coordination, then relating back into their experience of reading and writing. A large walking circuit of 1km was used daily by all students of the school during the learning day, weather permitting. This allowed for movement during the day to distress the brain and body. As well, exercises were done in class every 17 minutes to relax the brain and body and enhance learning. Room parents assisted in the morning literacy classes with the boys, sitting with them separately with numbered readers and assessing.

School B is a private independent school under the curriculum outlined by Walodrf education. This postulates that children are not taught to read in Grade 1, but rather write first. Teachers are creative in their storytelling to introduce each letter through a picture in which also looks like the letter (ie King for K, where the king is found inside the letter). As well, fairy tales are used as a form of rich storytelling as well as introducing separate letters (ie the G in Golden Goose). Stories such as fairy tales always have a good ending, which to the young child is seen necessary as teaching that the good always prevails, and

give them confidence in life. Stories are seen as the nourishment of the primary grade, and used throughout until Grade 7.

In the classroom, art done by the teacher on the blackboard representing the day's story. Paintings also done by the teacher of each letter within a picture were on the wall. Students create their own books of blank paper, and rather than working from a text book or worksheet they listen to a story and use their books for drawing and doing letters. All letters are presented as pictures, first as characters in the stories and then leading into letters. Letters are also moved by walking or done in the air, to bring them into the body. Reading is not taught in Grade 1, rather only the writing which Waldorf says is the natural space for the young child who needs to be moving. A lot of movement is done daily with verses and songs. Numbers and arithmetic are moved in rhythm (ie 2,4,6,8). Writing is copied from the board, in the literacy books it is sentences from the stories which have meaning, therefore asking the child to write sentences with affective connections and learning reading through their own writing. The books are filled with colour and pictures, and since it is blank paper, the boundaries are found by the student. Only capital letters are learned in Grade 1, and all writing uses capitals only until Grade 2. Pictures from stories are drawn at first freely by the students, and then the next day a specific one drawn by the teacher on the board is copied. On the third day, the letter would be found in the picture, and then practiced. Form drawings are also used to help the child orientate themselves above and below, curves and lines.

4.2 Research question revisited

The focus of the study was to observe similarities and differences in the literacy environments in the school systems. The research questions were as follows:

1) How does a brain-based curriculum stimulate literacy in a Grade 1 environment?
2) How does a Waldorf curriculum stimulate literacy in a Grade 1 environment?
3) What similarities and differences are there in the two systems and what insights into early literacy development can be gained from them?

Both schools were chosen for their holistic child-centered approaches to education.

Grade 1 was chosen because it is the interface, often, between orality and literacy, the grade where reading and/or writing is introduced formally into the curriculum. The brain-based schooling combines the state school curriculum with techniques derived from neuroscience and brain-gym exercises, to relax and stimulate the brain for higher cognition and better working conditions for the child. The Waldorf School looks developmentally at a child in its stages towards adulthood, and formulates a curriculum to meet those developmental phases, physically, emotionally and cognitively.

Both brain-based and Waldorf schooling acknowledge that the three domains of physicality, affect and cognition need to be integrated in the learning process. Therefore the findings will be classified in these three categories, to see how each aspect of learning and development is handled in these schooling systems. In Waldorf schools they outline these three aspects as willing, feeling and thinking. In brain-based education they are listed as physical, emotional and thinking operations to the brain, and are linked to the reptilian, limbic and cognitive brain structures. In this thesis I will classify them as 1) psycho-motor, 2) affective, and 3) cognitive domains.

4.3 Observations

Observations occurred in the classrooms, using an observation journal. Days were spent in the classroom, watching the rhythm of the day, and taking notes. On one side of the journal were all my observations; while on the other page was a commentary of my own internal thoughts and processes. Although I did not come in with a set list of preconceived factors to check off, I did have some guidance from the literature on important aspects of the classroom environment I knew I must observe, such as Jensen's (2005) environmental factors which influence learning.

4.3.1 Observation schedule

My observation schedule occurred over a three-week period, as follows:

Table 8: Observation schedule

School A

Days	Week Number	Class
Monday, Tuesday	Week 1	1, boys- Class X
Wednesday, Thursday	Week 1	1, girls- Class Y
Friday	Week 1	Extra activities (art, gym, computer, library)

School B

Days	Week Number	Class
Tuesday	Week 2	Class 1
Wednesday	Week 2	Class 1
Thursday	Week 3	Class 1

In school A I attended one consecutive week as there were two classes to attend and I was able to see the full school week. In School B I attended two consecutive days and then a different day in an alternate week.

In school A there were four classes, two of boys and two of girls. I only attended one of each because the second boys' class teacher was not yet experienced enough to be observed, and the amount of time I could spend with the classes made me realize it was better to spend the time with one class of each gender. I have listed the boys' class as Class X, and the girls as Class Y.

School B only had one Class 1, which I observed for three days and was then invited to participate in their end year festival by playing music for their nativity play.
I took some pictures in the classrooms, and asked permission of the teacher before I did so.

4.4 Interviews

4.4.1 Interview Schedule

Table 9: Interview schedule

School A

Interview time	People attending	Interview site	Recording
Friday am, during their Class 1 combined meeting. Week 1	All four Class 1 teachers: 2 from the boys' classes and 2 from the girls.	Staff room	Writing, tape recording.

School B

Interview time	People attending	Interview site	Recording
After school, different week	Class 1 teacher, Class 2 teacher	Class 2 classroom	Writing, tape recording

In school A, I had the opportunity to join the teachers planning meeting, so I could interview all four Grade 1 teachers, even though I had only observed two. This took place in their staff room. In school B I interviewed the Grade 1 and 2 teachers. Since the Grade 2 teacher had taught his group in Grade 1 the year before, I decided that his observations and insights would also be worthy of the interview process, which is why I included him. See Appendix 12 for questions to school A, and Appendix 13 for questions for school B.

Both interviews started with a set of questions, but also allowed for conversations that explored the content of the questions, eliciting sharing of experiences and ideas. These interviews were taped and later transcribed.

4.5 Document analysis

For document analysis I looked at the books of the children, both the ones they were reading and the ones they worked in, to see what work they were doing, with specificity to literacy. I asked the questions:

1. What is the quality of work towards the learning of reading and writing.
2. How are the letters practiced and learned?
3. How do they use writing in their work?
4. What is the relationship to aesthetics in their own books? In what ways are they expressing creativity as well as learning of the letters.
5. What are their reading levels?

4.6 Findings from Observations

4.6.1 Classroom environment

The following factors outlined by Jensen (2005) as important to the school environment will be discussed in relation to the classes studied: seating, temperature, noise, and lighting, building design.

4.6.1.1 School A, Class X (boys)

4.6.1.1.1 Seating

There was a teacher's desk, by the entrance of the classroom, on the front left side (facing the front). Sometimes the seating arrangement altered during the day depending on the tasks, going into groups of two desks with four children, or all in rows facing the front. There was a blackboard in the front of the room. The desks consisted of tables that seated two people, with a separate chair. When they were working in groups of four, the four students faced each other, two of which had their backs to the board at the front. Appendix 14 shows a photograph taken from the front of the classroom.

4.6.1.1.2 Temperature

The days in this class were cold and rainy. The children were wearing their winter uniforms. It was a pleasant to cold temperature, with no extra heating needed in the classrooms. Only one of the days did the children achieve walking the circuit and playing outside; the other day was too wet.

4.6.1.1.3 Lighting

The classroom was light, airy, and had big sliding windows leading to a courtyard on one side and high windows with curtains on the other. The room was painted blue with grey floors and white ceilings. Fluorescent lighting made the room well

lit, but there was also adequate sunlight from both the windows to the one side and the glass patio doors and windows to the other.

4.6.1.1.4 Noise

The classroom was enclosed, and had a small patio outside. Little noise from other classrooms or outside could be heard.

4.6.1.1.5 Building design

School A is an ex model C school, with large grounds. Model C schools were previously the white schools under Apartheid, and therefore had more money and resources to develop them (My Cape Town South Africa, 2010). The school is a large concrete building, housing grades 1 to 7. It has large playing fields on one section which houses a one kilometre walking circuit which all the students walk each day. There are stops within that kilometre where equipment, such as monkey bars, steps, and obstacle jumps, is situated. There are also sports fields, a concrete playing area, a parking area in the front, an administrative area, and a large gymnasium. The hallways are decorated with the learners' art and there is a welcoming and pleasant atmosphere. This is a school with a high level of facilities for the learners.

The classrooms were large and spacious. The room was divided in three, with the section of desks in the middle. In the front there was a carpeted area for group reading and activities, and a larger area in the back with carpets, piano and a video screen.

Sometimes the video machine was used for dancing to a specific song, or watching movies during lunchtime. In the back were shelves of graded readers and other books. On the side of the classroom, under the windows, were shelves with books and some toys. On the walls were numbers with pictures of amounts, sentences written that that they had practised, and their own paintings. There

was also the alphabet with pictures, and disciplinary posters such as "No swearing on the boat."

4.6.1.1.6 Other observations of School A, Class X

They had a music class that all the classes did together. The boys' teacher I was observing played the piano, and the children sang songs: 5 little speckled frogs, and one about flying with birds. Then they sang 'Alice the Camel' and played the game. This they enjoyed all together.

The teacher specifically told me that she felt the days were very long for such young children, and that they don't get enough time to play. There was a time when toys came out and they could play, but this was short. They also had recess time outside.

I was there for a writing class, where she was helping them do their letters correctly. The teacher was very good at stating words that the children could then say for themselves. She said, "My writing sits on the line," and "there is a magnet on the line that pulls." Each letter she wrote on the blackboard and then spoke them through.

p- she showed it first with her hands in the air, and then on the board. Make a stick up, leave a little window, turn and stop

t- the terrible teenager with pimples on his nose- taller than...but shorter than...

b- where you crook and cheat, down, back on same line, and turn around making a window.

r- there are 3 types of r. er, ir, and ur. You will know by looking.

She also focused on their posture, and stated, "The way you sit shows me the way you are going to be writing." They also were doing wave patterns to help with the shapes and forms of writing.

The teacher said that on Tuesdays and Wednesday mornings, the boys did literacy as their first period, as their focus was best then and literacy was more challenging for them.

I also observed a reading unit, where the children were divided into 3 groups according to reading abilities. She gave them readers, and spent some time with each group, then allowing them to read on their own. When some had finished, they went on to do work cards which were available for them. It was well organized and the children were focused on their reading activity.

4.6.1.2 School A, Class Y

Class Y is the girl's classroom, which was smaller than the boys', painted beige pink. The desks were in groups of 2 or 4, depending on the work being done, and faced the front of the class. Each group had a basket for pencils, crayons, and markers. There were water bottles on the desks that the children could drink at any time. The room was colourful, with windows at the top. The room was decorated with art made of feathers and colours. The children had done full-body self-portraits, where the drawings of the body were pre-done but they filled them in. As did the boys, they had casual uniforms with the same bags behind each desk. There was fluorescent lighting but some natural light came in, although the room was not as light as the boys'. Pretty purple curtains were on the windows. The day was rainy and the class felt cold. There were many words on the wall, and a sign saying:

I promise to:	Be proud Be conscientious Be friendly Be polite Be wise Be an advert for my school Be self-controlled Be peace loving

There was a dripping sound from the basin, which they called 'the frog in the basin' which distracted me. On the side, under the blackboard, was a carpet where they could do group work and movement.

I observed the girls doing a similar exercise as the boys, with money and counting, but they did not do it creatively. They simply did the worksheets. There was a lot more time given to the girls for colouring in the drawings on their worksheets, or draw boundaries around their work.

The girls did the same exercises in literacy with the waves and shapes. They also added letters, such as c, e and s, into the wave pictures. The girl's class did literacy later in the day, after lunch. They read their books all together and then in groups of 2. They read everything, from the title and the back of the book, and were told to hold their reading finger to the words. When they worked in groups of 2, one held the reading finger and the other read. In between they did a breathing exercise to relax their brain, which included clapping, then silently imitating the teacher, and then rubbing their ears.

4.6.1.3 School B

4.6.1.3.1 Seating

The desks were in rows facing the front, where there was a blackboard, but the desk arrangement did change into a circle at certain times. For instance, when the children did knitting, the desks were made into a circle, as well as during certain movement lessons.

4.6.1.3.2 Temperature

The room had a comfortable temperature, as it was a warm spring day.

4.6.1.3.3 Lighting

The room was painted a marbled yellow and orange, which was warm and soft. There were windows along all the sides, which brought in a certain amount of sunlight, which was the only light the classroom had.

4.6.1.3.4 Noise

The classroom was quite small and could become noisy if the children were finished with their work. A certain amount of sound could be heard from the outside- other children playing and some sounds of the farm, such as peacocks. The noise was not overbearing.

4.6.1.3.5 Building design

The classroom was a large prefabricated 'Wendy house' which comfortably accommodated all 18 children. There were hooks on the side where the students put their bags, but also hung craft bags made of hessian and sewing which the children had made themselves. There was a carpet at the back, where children played when they had finished their work.

On the walls were hand-drawn letters of the alphabet, each with a picture of a landscape. There were paintings and drawings done by the children on the walls. On the shelves were their own books, made of A3 paper, and stapled. Each child's books had on top a set of crayons and pencil crayons. On the board was drawn an angel. There were blocks in a basket for the children to build with in free time. On the side was a nature table filled with objects of nature that the children had brought and collected, displayed on a cloth.

4.6.1.3.6 Other observations

I observed in one of the second language speakers, that he was always writing his letters backwards, and struggling much more to finish his work. When asked to write his name, he wrote many of the letters backwards. It was here that I asked him to crawl, and realized that he was crawling with the same leg and arm, instead of opposite. He seemed to really struggle, and then enjoyed the crawling so much when I had corrected him, that he did not want to stop doing it right. This is something I had learned from brain-based education and was able to bring into the class. Again it pointed to the link between movement and literacy, and that possibly there had been constricted movement in early childhood that was influencing his struggles in the class.

Table 7 outlines the comparative features of the environmental factors in each school. Some extra factors are also compared, which I felt were relevant in relation to literacy within the classroom environment.

Table 10: Comparison of classroom environments in School A and B

	School A, Class X	School A, Class Y	School B
Classroom space	Large classroom within public school	Large classroom within public school	Wooden hut within private school
Lighting	Fluorescent lights, windows and glass doors onto patio	Fluorescent lights and high windows	Windows in hut, no electric lighting only candles
Temperature	Class was cool in rainy weather, but not cold	Class was cool in rainy weather, but not cold	Class was cool, but more influenced by weather than School A
Seating arrangements	Desks faced blackboard in rows, but changeable to groups of 4 desks in group time. Carpet area in front and back of desks.	Desks faced front of classroom, blackboard on side with carpet area, and desks moveable in group work.	Desks faced board in front but moved into a circle during craft and other times. Carpet area in back.
Noise	Class was quiet, had its own cemented garden area and large room.	Class was quiet, in own section, although there was a dripping tap.	Noises of school around, as well as farm, but not impeding.
Colour of room	Light blue	Beige pink	Marbling of orange and yellow.
Art and posters on the walls/ blackboard	Positive discipline posters i.e. No swearing on the Boat. Pictures of amounts with numbers, letters, sentences, poems, and their own paintings.	Large size self-portraits they had coloured, mobiles, letters with pictures, and cards with words.	Well drawn and coloured chalk drawing on blackboard, paintings and drawings by children on walls, hand made pictures of landscapes with the letters.
Hooks, storage, shelves	Bags went on back of chairs, bookshelves and shelves for workbooks, worksheets, materials, and some toys.	Bags on back of chairs, bookshelves and shelves for workbooks, sheets materials and toys.	Nature table with pinecones and objects of nature. Hooks for bags and learners had their own craft bags out of hessian which they sewed and embroidered. Shelves for their workbooks and materials.
Area for movement	Used whole class, but also carpet at back with television screen.	Used classroom and space by the board	Used the whole class, often circling around the desks.
Outside and p lay area	Large gym, grass and tarmac area, also 1 km walking circuit done daily.	Large gym, grass and tarmac, as well as 1km walking circuit done daily.	Sandy soccer field, trees, jungle gyms, large gum tree for swinging on.

4.7 Comparing school environments

The following is a comparison and discussion of the school environments, under the categories discussed.

4.7.1 Seating

Both schools had similar situations with seating, in that desks could move and face the front or be put in groups. School B often put their desks in a circle so that all the students faced each other, whereas School A prioritized groups of four to do group work.

4.7.2 Temperature

School A was visited during the rainy time in the winter, but the classrooms were a perfect temperature. The literature says that the cooler the brain, the more relaxed and cognitively sharp the child is (Harner, 1974 in Jensen, 2005: 84). There were no heaters on and it was a cool space to learn.

School B was in spring and a lovely temperature, but the classrooms were much more susceptible to temperature changes of the weather as it was a lightweight wooden structure as compared to a cement building. There was no electricity so even in winter heating is not possible. It was a pleasant temperature at that time for learning, but it could get cold or hot in extreme temperatures.

4.7.3 Lighting

School A had fluorescent lighting, which can have a flickering quality and emit a subtle humming noise, having an effect on concentration (Jensen, 2005: 85). They also had a considerable amount of sunlight, especially in the boys'

classroom, which kept the classroom light, even during a rainy day. Natural sunlight is seen as the best for learning.

School B had no electricity which made for natural light that can be both healthy and perhaps dark at times, for example wintery rainy days. When they needed extra light they would use candles, but this did not happen when I was there. The school rents the property and does not have electricity because of the financial costs and possibility of needing to move locations, but the teachers also stated that they prefer to have no electricity. There was a solar panel to supply electricity to the office computer, but no lighting in the classrooms. School B classroom was darker, with only windows for light. There seemed to be no effect on the concentration, but this would need to be studied in greater detail.

4.7.4 Noise

Neither school environment seemed negatively affected by external noise, except within the classroom. It was noisier within the Waldorf classroom, especially when some children had finished work, and sometimes the activity of the children who had finished their work distracted those still working on it. Many of the children were happy to draw freely when they were done their work, but some others chose to play, and it was a bit disruptive. There was a drip in the tap in the classroom sink of School A Class Y, which had been going on for a few days. The teacher stated they called it the "toad in the tap". Although it bothered me the students and teacher seemed not to notice it.

4.7.5 Building design

It would be difficult for me to say how this factor influences literacy. The two buildings definitely had different designs - one a 15 x 10m Wendy house in large grounds, and the other a classroom within a larger school building. School A

Class X had a very large, airy and sunny classroom, and I would say the best quality learning room. The fact that School A had a gymnasium, walking circuit and large fields could also ensure that the children had adequate movement to stimulate learning. The environment of the building within the larger school environment in School B meant that children left the classroom to be in a larger garden with trees and a very sandy soccer field. It was a natural environment that promoted a sense of freedom.

4.8 Findings from interviews

4.8.1 School A

The interview at School A was conducted with the four grade 1 teachers, during their weekly Friday planning time. It was conducted in the staff room. See appendix 12 for the interview questions. Although I had a specific set of questions, the conversation was open ended, which allowed for other questions to emerge.

A lot of the discussion was centred on their own perceptions of what brain-based education involved, and how they felt as teachers within it. As three of the four teachers had taught prior to the changeover into brain-based education, they had perspective of the before and after. They spoke positively on their learning of teaching styles such as multiple intelligences. All of them enjoyed the reduced emphasis on marks, lowering the stress levels as a whole in the classroom. The boys' teacher gave the example of one of the struggling children during the test a few days before. He did not feel ready, and so he was not forced to do the test. The other children had requested a test. In this way, the child's self-esteem was not lowered in doing badly; he could work at his pace and comfort level. They felt that this reduction of stress was the most important facet of brain-based

education in comparison to how they taught before, and also resulted in their own stress being reduced.

The aspect of brain-based education which they did not agree with was in the separation of the genders. They said the classes had lost a great deal of positive social interaction that way, but they did comment that the boys were much more willing to share and be open when doing their sharing circles by having no girls in the class.

The teachers in the interview expressed a great deal of excitement and enthusiasm for the potential of brain-based education. They spoke on the role of movement during the classroom, and the weekly activity of cross-brain gym work showed children improving in the movements and at the same time literacy. In the movements done during gym time, an example was given of the tennis ball hanging on the roof. The child must sit and follow it with their eyes, even as it goes behind them. The Grade 1 teacher of the boys said that many of the children had improved in following the letters after this. Also with crawling exercises, many did not cross crawl and had to relearn how to. The movement sequences during the classroom also helped to release energy and gain a further focus during the study time.

Also the implementation of the multiple intelligences theory meant that many children were met with different teaching styles and use of various senses. The teacher of the girls' class said that even knowing that these different intelligences were important strengthened her teaching to all the children, as it made it more interesting. They commented that in Grade 2, a special test was done to see which intelligences each child was stronger and weaker at, in order to understand them more and know what techniques to utilize in the classroom. My feeling is that these teachers were still quite new at this practice and

understanding, but that it inspired them to think differently. It also seemed to depend on the teaching abilities of the teachers before they changed to brain-based. The teacher of the boys, which I had observed, commented that she had been teaching for so long that many of these techniques had come naturally before; it was just that she now had a name for them. Whereas the teacher for the girls, the one I did not observe, was new in the teaching profession and therefore had to think more of how she could utilize multiple intelligences for her class.

It was unfortunate that at first, the school had promised me an interview with the principal, but when I made that request again, he was too busy and would not do the interview. I feel I lost a lot of insights into brain-based education and the working of that particular school by not having that interview.

4.8.2 School B

I interviewed the Grade 1 and 2 teachers (Appendix 13). The interviews took place in the Grade one classroom. They said the essence of Waldorf education is the principle of child development and that stories can allow a child to bring forth their own developing self. Waldorf education acknowledges that each child has a destiny, and that it is less about imparting information, but more about helping them find a creative way to take in and express knowledge.

They spoke about the three-fold rhythm, and how each day has a component of thinking, feeling and willing. The day starts with movement, rhythm, singing, clapping games and verses. The children eventually learn the verses by heart. Then they have the main lesson, which is the thinking part. After that, play time and then something to integrate the lesson with artistic expression- either

drawing, painting or craft. This they found created a balance in the children's attention and work ability, as well as integration of the material.
We looked at the progression from writing to reading, and why that is done. The teachers stated that this is because of the child still needing movement, and movement is connected to writing. The children do not only write, they walk the letters, move them with their hands, and even write with their fingers on each other's backs. They want the children to immerse themselves in the letters through their body before they begin the small motor act of writing. Form drawing also helps to get the curves and lines in patterns that writing then brings out.

We spoke about the roles of storytelling and creativity in learning to read and write. The Grade 1 child is still in a pictorial imagination, and therefore to learn the letters from pictures is the way that it enters deeply into their imagination. Each letter is taught with a story, often a fairy tale or other story that the teacher creates. Characters of the story become the letters, and usually these will be characters that look like the letters- for example F for an upright fish or K for king. Then a picture is drawn from the story of the letter, so as to really allow for the picture to enter the child. First they will draw their own picture, and then the teacher will draw one on the board for them to copy. Then there is a verse for every letter, so the oral speaking of the letter in words becomes something that the child repeats and is able to use the letter in verse. Only afterward, when the child has moved the letter as mentioned above, is the letter written.

Form drawing is a rhythmic movement involving lines and curves that imitate but are not letters. They are a preparation not only for writing, by moving in the directions that writing occurs. As they get older they get more complex ss, and geometrical, and they become linked to number learning as well. As all writing involves spatial awareness, these help in that.

I asked about the crossing of the midline and purpose for movement. They did not feel that true crossing of the midline in actions needed to occur before Grade 4, but the form drawings, such as was shown in Figure 2 in the literature review, and is also shown in the actual classroom blackboard in Appendix 17, help to cross the midline in their drawings.

They said that second language speakers learn English quickly as there is so much storytelling, but they can also struggle in the beginning. By the later grades they balance out, and since there is a lot of movement and art, they are participating all the time. There were a few second language speakers in the class, and most of them had spent at least a year in kindergarten before Grade 1.

The reason for teaching writing first and then reading is that the child is in the willing forces, and they felt it is important not to tax the intellect by reading, but rather find sentences in their own stories that have meaning. It is important, they said, that the child starts writing with words and sentences that have meaning, not just abstract. Then it inspires the children to want to read.

4.9 Findings from document analysis

I looked at the books that the children were working on, as well as those on the shelves. I would have liked to have taken more photos of the books, but instead copied the exercises into my own notes. I asked the following questions while observing the books:

1. What is the work done?
2. How are the letters practiced and learned?
3. How do they use writing in their work?

4. What is the relationship to aesthetics in their books? In what ways are they expressing creativity as well as learning of the letters.
5. How are the second language speakers coping with the work?

4.9.1 School A

4.9.1.1 Class X (boys)

The first day I observed boys' class, and because it was Monday, the first period is writing news in their news books. This constituted the literacy class for the morning. I looked at entries starting the beginning of the year. They started with only drawing pictures, and the parents would write the sentences for them to describe the pictures as their news. Either the parents wrote the sentences on a separate paper, and the children copied, or directly into the books.

As the year progressed, they started writing their own, with one line and then into a few sentences. They always had the opportunity to draw a picture with the news. When I was there, which was in September, they would write a few sentences. The room parents were helping them with words they did not know, and when they needed a word, they would check their dictionary notebook. This was an alphabetized notebook which would have usually been used as a telephone book, with a page or two for each letter. If they needed, they checked their dictionary, and if it was a new word, they would write it down in there for future use.

They also had a literacy book where they wrote poems, and then found the words they did not know and put them in their dictionary. One was:

> Two little birds sitting on a wall
> One is Peter, One is Paul

Fly away Peter, Fly away Paul
Come back Peter, come back Paul.

There was a collection of these poems in this book. When they worked with the poem, a helper parent would work with children struggling with the words. They also did comprehension from this, where the teacher would ask "how many birds?" and work with rhyming of different words in the poem.

There was a story about a ginger cat which the children read together, and then the teacher asked them to write the answers for comprehension. What colour is ginger? What did the cat want? How did he try and catch the birds? The children had to write the answers.

There were books, where they glued their worksheets into it. One was for life skills, and they were studying pets. There was a worksheet with words of animals and on the other side their babies. They had to colour the line between the animal and their babies, for instance a horse and a foal. Previous entries inlcuded a food pyramid, a picture of the human body with parts to be labelled, and a page on household dangers.

In their writing books they created patterns that helped them with writing. See appendix 15 for one example from the books. Others, which I copied in my own notebook included:

Figure 4: Wave drawing copied from notebooks of students

With this were the instructions of "bunny hop, bunny hop, don't you stop, on the line."

They also had graded readers, which they read in groups. For instance, she would have all the strong readers at the front carpet in a circle. The teacher started by looking at the front and back covers, and then gave turns to the children to read. Meanwhile the other groups were working on their own, and then would have their turn to come to the carpet. There were bookshelves of graded readers, and room parents came at times to do assessments of their reading levels.

4.9.1.2 School A, Class Y

The girls' books had similar assignments with their life skills books, a news book, spelling and writing, and numeracy. They did the same exercise with the coins, but did not do the creative introduction that the girls did. They also practiced wave patterns. The content of the classes was exactly the same, but the introduction differed depending on the teacher.

I was interested in if there was a difference in the books between the boys and girls. The girls had more of their work sheets coloured, or borders around their work. I did observe more time was given for this in class.

There were two African girls in the class, and I wanted to see their books as an indicator of how well they were doing in language and literacy. I presumed they were both Xhosa speakers as mother tongue, but one of them had been adopted by an English family at an early age. She had a number of the letters switched direction, more than other children. Other than that, both of their work was equal with the other children.

I was not present in their class for a reading session where they used readers, but there were books in graded readers on the shelves.

4.9.2 School B

In Waldorf schools, the children do not use textbooks or work sheets, but make their own books out of large pieces of paper. Since I was there near the end of the year, some of those books were being bound. The paper has no lines so that the children can find their own writing, and draw big. All writing in Grade 1 is done in capital letters.

Appendix 18 shows work done prior to my visit, where the students listened to a story, drew a picture from a story, and then did writing in capital letters from the board, utilizing one of the pertinent sentences from the story. This activity is reflective of the belief that each sentence written must have meaning, and that reading then is learned from their own writing. Appendix 16 shows a drawing on the blackboard done by the teacher, which would be reproduced after one of the stories.

When they were writing words from the board, they used various colours. For instance in the words:

DAT E

GAT E

PLAT E

They were learning about the silent E and did the first part of the word in the colour blue, and the E in red. Then they worked with more colours, where the foundation word had blue for the consonants and yellow for the vowel. Then the silent E was still red.

SIT E had s and t as blue, I as yellow, and then E as red.

When they write sentences off the blackboard, they put stars in between the words to learn the spacing. For example:

A*BIG*MAN*CAN*DIG*A*PIT

The same patterns of colouring happened here, with the consonants and vowels different colours, but they could write it however they wanted, and some used even more colours.

They had a form-drawing book. By the end of the year when I did my research, the children were doing progressively more complex drawings. The following is an example which I drew in my own book and then reproduced on the computer.

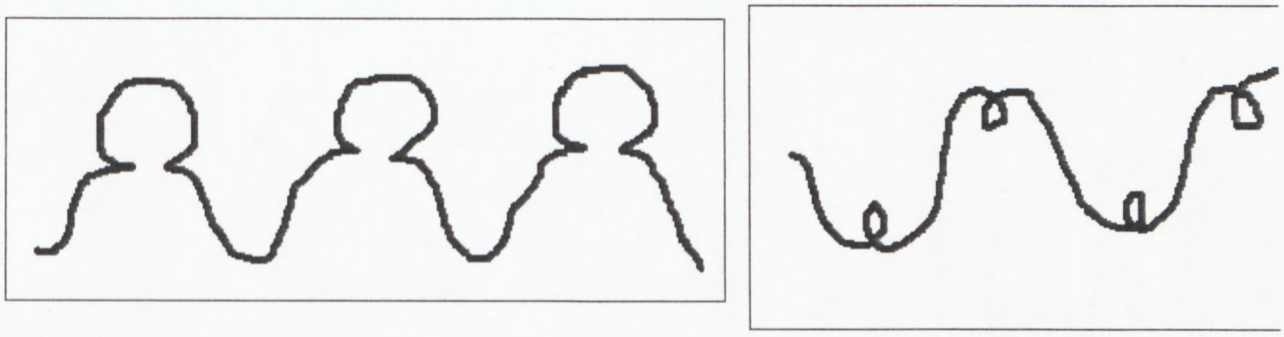

Figure 5: Examples of form drawing patterns in the books of School B

They did a form drawing from the blackboard where the teacher had drawn it. See appendix 17.

Their books of art were also important to them, both drawings and paintings. Whenever work was finished, they would be able to draw pictures. I noticed the girls did this more often than the boys. The pictures were from their own imagination, and often used a whole page.

4.10 Gender division

School A divides their children in classes of boys and girls in the foundation phase. This is due to the research showing different strengths and weaknesses, generally in boys and girls, and how to nurture these effectively. For instance, if girls tend to be weaker in mathematics, and a child's attention is stronger in the early part of the morning, then they teach this subject at that time. The same would occur for boys, in terms of literacy. The teachers also said that girls would spend more time colouring in and drawing on a worksheet, where the boys would be keener to move on to the next activity.

Although the director of the brain-based school had given a lecture at the Brain-based classroom conference (May, 2008) on the differences between boys and girls, validating separate classrooms in the foundation phase, the teachers did not seem convinced. They admitted that the separate classes gave a feeling of safety for the gender to relax. This seemed stronger from the boys' side, in that they were more open to admit to their emotions in sharing time, and less afraid to read out loud. Yet the teachers stated that their classes missed the creative variation of the two genders learning together.

Part of the rationale for separate genders, according to the lecture (May, 2008) was that the eyes of boys were different, as well as the correlation of information between the left and right brain, across the corpus collosum. Boys, he claimed, should be learning through having to focus on something moving, for instance ball throwing to do math questions. The girls, on the other hand, prefer to quietly decorate their work, and are more able to focus in a cognitive way without accompanying action.

I found that both the boys and girls were focused in their work, participating, and well mannered. I could not say what it was like before the split of gender, but the pace did seem to go well in the classrooms.

School B had mixed classes in all the grades, and it appeared that during artistic activities there was an equal focus of boys and girls on the activity. Children could draw or play when they were finished their writing tasks, and more girls decided to draw.

In the Waldorf classroom, the personalities of the children seemed to come out a lot as the teacher was very animated and the focus on storytelling brought many emotions into the content of the class. There was a lot of rhythm, singing, and movement. The drawings and paintings of both boys and girls had great amount of effort, colour and detail, and in a painting session I was amazed that the boys took so much time painting their stars. Although there were differences in the quality of drawings, this was more individual than based on gender.

4.11 Rhythm of the day

For me, it was important to discuss with the teachers the meanings of their rhythms of the day, as well as observe them. Rhythm had to do with what they did at certain times and why the day was structured as it was. It was necessary to speak about them in the interviews, as both schools saw relevance in their specific rhythm of the day, and therefore the teachers could elaborate on them.

Both systems acknowledged that the early morning was the prime time for learning. For both schooling systems, the rhythm of the day was featured, and incorporated the qualities of psycho-motor, affective and cognitive learning into the day.

4.11.1 School A

The rhythm of brain-based schooling is set out to meet the needs of the brain when in learning. Physical needs encompass nutrition, movements, and exercise. Water bottles are on the desks at all times, so that the children can keep hydrated, which according to the teachers, enhances the brain's capacity for learning, keeps the body hydrated and the body temperature lower. Early morning snack consists only of fresh fruit and vegetables, which offer enzymes and healthy food for the brain.

Rhythm also involves the stopping of activities to do physical movements. This is done every 17 minutes as this is the time, as the teachers stated, that the brain needs relaxation for more learning to occur. I did see this in practice done more with the boys than the girls, possibly because they start to act up more in its absence.

The brain-based rhythm was structured around the psycho-motor importance of eating fruit, walking the circuit, doing movements during class time, and the structure of when certain cognitive learning activities (literacy and numeracy) occurred according to the needs of the gender of the class.

Their rhythm also included an understanding that a child can focus more clearly earlier in the morning, and therefore offering the subject which was that gender was more challenged by. Boys began with literacy while girls with numeracy, based on this assumption. It would be an interesting follow up study, to see if this difference in schedules made significant differences to the quality of work and grades of these children.

4.11.2 School B

The rhythm of Waldorf is specifically set out to encompass the qualities of psycho-motor, affective and cognitive, or what they term willing, feeling and thinking. The morning rhythm must contain all three of these. The children began every morning with a verse. By October, when my research was conducted, they knew the verse by heart and said it without the teacher's help. Verses are used to encompass rhythm, language, and meaning.

Rhythm to a Waldorf school is linked also to the breathing system of the body, which goes in and out. It is very important in their rhythm that for every focused activity, there is some kind of 'breathing out.' This is done by movement, artistic expression, and play.

Each morning has a long lesson, which is usually continued for about three weeks. That can be mathematics or literacy. Literacy involves a story told, each day and then remembered the following day and continued, and from there the letters are learned. Pictures are drawn from the story and letters practiced. Around each lesson, there was also artistic activity and movement, in order to incorporate the affective and psycho-motor qualities into the cognitive learning.

Rhythm is seen as a means of giving structure to the day and is specific to both schools. Brain-based has rhythms around movement, exercise and nutrition, as well as the times they place classes. Waldorf divides each day into a time for thinking, feeling (affective) and willing (psycho-motor).

Table 11: Comparison the rhythm of the day in school A and B

	School A	School B
Hours of School Day	8:30am -2:00 pm except Tues ends 1:00 pm. Most children do extra curricular sport until 4:00	8:00am to 12:30 pm No extra curricular activities after school.
Rhythm of the day	Day starts with literacy or numeracy. Activities of 20 minutes each in literacy, numeracy and life skills. Fresh food snack at 9:30 Walking circuit at 10/10:30 Movements and clapping in between sessions.	Day starts with rhythm, verses and movement. Long lesson of writing or mathematics. Songs, drawings, crafts in between. Lunch break 10-10:30 Day divided into thinking (long lesson) feeling (drawing, painting, storytelling) and willing (crafts, movement).

4.12 Three domains

Each of these rhythms acknowledges the division, and necessary integration in the classroom environment, of the psycho-motor, affective and cognitive domains. These will now be discussed in detail. This information comes from both the interviews and the observations.

4.12.1 Pyscho-motor domain

4.12.1.1 School A

The physical domain of the brain-based method was addressed in a combination of foci on nutrition and movement. Each child had water at their desk the whole

day, and was free and encouraged to drink as needed. At 9:30am there was a fresh food snack, which also brought in enzymes through live food to the body, for brain capacity. And sometime in the morning, each child in the school walked the one kilometre circuit, incorporating other physical activities such as stairs, monkey bars, and jumping hurdles into the circuit. It was raining on some of the days I was there, so they had to cancel it twice. There were also special movements conducted within the class, with the intention to have some movement every 17 minutes to keep the brain functioning effectively. Within the school week there was an entire period dedicated to exercises which integrate the brain hemispheres, alongside the movements done in the class. In addition, gym class and extra mural sports keep the level of exercise high.

Between activities, and every 17 minutes during, the children did a set of movements. For instance, all the boys were to stand on their chairs and copy a clapping of rhythms. Then they took a deep breath with arm movements, and sighed out. Then they stood behind their chairs, made a pretzel-shape with their hands, turned their hands down, and tickled their upper lip. The teacher explained that these exercises helped to relax and balance the brain hemispheres, and that children of this age need to move every 17 minutes.

Each week, a 45-minute period was dedicated to hand-eye motor and coordination movements, which helped to integrate the left and right hemispheres of the brain. This took place in the gymnasium (or outside weather permitting) and involved various stations of activities. The children were divided into groups of four and spent 5 minutes at each station. Appendix 14 shows one of the examples of a station, where the children watched tennis balls hung on a string in order to improve their visual motor skills.

They also moved to a special song that had been pre-recorded for the brain-based schooling. It was an adaptation of "Singing in the Rain" but with specific

movements: "Thumbs up, shoulders back, knees together, bums out, tongue down, eyes closed, shake and sway". This was repeated many times.

All these activities focused on the needs of the body to keep hydrated, healthy and moving for the brain to be able to think properly. The attention to the physical domain in School A can be summarized in Table 12.

Table12: Psychomotor domain in School A

1) **Nutrition:** • Water bottles on desks for continuous hydration • Fresh food snack in the morning 2) **Movement:** • Movements every 17 minutes, between activities, or when teacher finds appropriate. These are special movements to balance the brain and body. • Walking circuit every day for 1km. • Sports program after school • 45-minute class of brain integration coordination exercises each week.

4.12.1.2 School B

The physical domain was attended to through the amount of movement during class. There was no specific policy regarding food and water, although all parents were asked not to send any sweets in the children's school lunches, and water was preferred to juice. Although there was lots of free time for the children, there were no organized competitive sports programs in the school, as the Waldorf schools do not believe that competition is beneficial at this age. Movement is however brought into the schooling day during the class, and in play time. Children are encouraged to climb trees, jungle gyms, and run quite free in a forested area. There is also a sandy soccer pitch.

First thing in the morning there was a long movement time. The teacher and children sang the attendance sheet, so the teacher sang the name of the child, and the child sang back that they were here. For example, "Acacia, Acacia, are

you here today?" and the child responded: "Yes I am here, and I am doing fine." When a child was not there, the class all responded, "He is not here, and I hope he is doing fine." When one child had a sore leg, he answered, "Yes I am here, and I have a sore leg."

Then the children all walked around the desks in a circle, using a short-short-long rhythm of stepping, and the teacher beat the rhythm with a stick while they walked. Once they had the rhythm of the walk, he put words of a verse to it, and they walked the verse.

The children then stood all around the desks with their hands together, and put their arms down. They counted to 50 together. Then they clapped on every two, above their heads, and stayed quieter for the in-between numbers. Interestingly, the same activity was done at School A, but the teacher took one child in front and did it for the child (holding his hands) while the children clapped. In School B, all the children did the same activity together. Then they moved onto counting in threes.

Now the children did a complete movement, with the movement listed on the left, and the numbers counted with the movement on the right.

Above head	2	12
In front	4	14
Behind	6	16
Under L leg	8	18
Under R leg	10	20

The teacher himself was an isiXhosa speaker and sang quite a few Xhosa songs with clapping, stomping and movements. The children all enjoyed this. During the day there was a break at 10am when the children were free to climb the trees, run in the field, play soccer or on the jungle gym. The small motor movements

are also exercised through crafts. When I was there they were knitting their recorder bags. Attention to the physical domain in School B are summarized in Table 13.

Table 13: Psychomotor domain in School B

• Parents were asked to keep lunches healthy and without sweets. Water is recommended not juice. • All lessons were introduced through movement. • Verses, maths, songs and language were all done through movement. • Crafts provide small motor movement, such as knitting. • Free play is encouraged.

4.12.2 Affective domain

The affective domain is related to the emotional component or feeling realm of the learning process. In both of the schools there was an acknowledgement that emotions play an important role in education.

The emotional or affective domain relates to the aesthetic aspects of the learning process, which include 1) emotional expression and 2) emotional stimulation. It is related to the limbic system, where neurological reactions occur according to various emotional states. This has been linked to aspects of the learning process such as focus, integration of material, and memory retention. Artistic expression can provide a means for enhancing and expressing the material learned, and the feelings invoked from it. It also helps the student find interest in the material and bond to it.

4.12.2.1 School A

From the brain based perspective, the intention is to create an environment where emotions can be regulated and stimulated through group work, and expressed at times such as the sharing circle. There is the understanding that stress blocks learning by closing off access to the cognitive areas through the limbic system: therefore experiences of learning are given more priority than results. The neurological information regarding the limbic system and its relation to learning has been informative in understanding the role of emotions in education. Information on the affective realm was presented at the brain-based assembly I attended during my research week (September, 2009) around the three brains.

It follows: our reptilian brain is tuned to perform well when feeling safe, and reacts to stress through fight or flight. This means that within the classroom, unless a child feels safe, they are not going to open up to the higher capabilities of learning. If punishment is being used as a stimulus for learning, according to the theory, technically the brain would be tenser, and not open to the higher cognitive levels as easily. Only if the student is relaxed and interested are they going to open the channels for the limbic system to provide the correct neurological components to learn and retain. And if the child feels both safe (reptilian), loved and interested in the presentation of the material (limbic), then the cognitive realms can open up to think, and the memory retention enhanced.

The reduction of emphasis on the marking or testing of material in the brain-based school ensures that children feel less stress and can be more interested in the process of the work. It was noteworthy that at the spelling lesson, the boys begged for a test, so the teacher gave it to them. It was seen as something challenging and fun, not stressful. The teachers stated that this shift of focus, from emphasis on marks to one on process, was one of the greatest alterations to their teaching styles. They could put less pressure on the children, and therefore get to know the children's abilities in a more comfortable manner.

During the day of the 'requested' test, one child did not feel he could cope, so he did another activity with a room parent at the same time.

In the later grades, the brain-based school does increase its emphasis on testing, and has examinations. What they do, according to the teachers, is provide on request a parent to help them as a support, in case they do not understand the question or feel nervous to tackle it alone. The helpers do not, of course, help them answer the questions.

Another aspect of the affective domain in brain-based education was the sharing circle. The children had the opportunity to share with the others about how they were feeling, at home and at school, giving a number rating for each. They also had a chance to talk about something if they felt they wanted to, as long as it was about their feelings. I watched this sharing in the boys' class, where they gave a number out of 3 for their feeling of wellbeing at home and at school. Some did share stories of why they were feeling that way. And as mentioned above, this is one of the main shifts that the Grade 1 boy's teacher admitted to the benefits of single-gender classrooms is that the boys share much more openly when there are no girls present.

The theory of Howard Gardner's multiple intelligences (MI) are utilized in a brain-based teaching environment. The teachers stated that it was up to them to find techniques that would engage the children's strengths in different ways. There is an assessment conducted in Grade 2, to evaluate which intelligences in a learner are potentially weak or strong. This has the potential of giving the teacher insight into how the child would best learn, and where they need to nurture improvement. This theory could provide opportunities for teachers to practice engaging different senses (hearing, seeing, kinaesthetic) and the other intelligences such as those attributed to music, interpersonal relationships, intra-

personal (meaning with oneself) relationships, and others. But it did depend on the creativity of the teacher to implement the ideas.

I observed that the teacher of class X, who had been a teacher for longer than the others, who was much more apt at creating multiple experiences for the children. Since she was a teacher of boys, and seemed very successful at engaging them. Whereas I found that the teacher of the girls' class could get away with doing little or no movement within the lessons as the girls were more controlled. The fact remained that fewer of the brain- based exercises were done with the girls in their normal classroom environment, while the structure of the curriculum remained the same in the boys' and girls' classes.

An example of how the boys' teacher utilized a more creative and multi-sensory approach than the girls' teacher did was in a mathematics lesson involving money. I was present for the introduction in both class X and Y of a worksheet on learning about coins. The teacher of class X presented the class with a bag of coins and bank notes. A child pulled out one item, observed it and spoke about their observations. The teacher used scaffolding to bridge the child's understanding with questions, deepening the observation. Then she gave that child a jellybean, so that I supposed the experience registered as a positive one, and moved onto another child. The children passed these items along for all to feel and see, and then another was introduced. One could not deny that the experience of each coin or note made more of an impact on the children when they saw them on the worksheet and began to do mathematic problem-solving with them. The picture on a worksheet was now associated with a memory that made it more alive in its real form.

In the example of the girls' class, they just got the worksheet and began working on the equations, which were related to real life in some ways because they involved using money and buying objects, and finding how much was left over.

But in this assignment their teacher did not use the same techniques as the boys' teacher did, to allow the children to feel, see and observe. I questioned whether the higher creativity came from the teacher, or the need in boys' classes to hold their attention with interesting presentations, or from the difficulty of disciplining boys, therefore resulting in more creative procedures for teaching. Table 9 lists the affective features in the routines of School A.

Table 14: Assessment of the affective features of routines in School A

Aspect of Classroom conduct	Effect on the affective realm
Group work	Regulating and stimulating emotional bonds
Less emphasis on tests (although assessments of the process are done constantly, as per outcomes based education)	Children more open to process of learning, instead of focusing on results
Group sharing of feelings	Ability to express and connect with emotions with self (intrapersonal) and others (interpersonal)
Variation of presentation of material, utilizing learning styles and multiple intelligences	Enhanced interest in material

4.12.2.2 School B

Waldorf schooling seemed to give a high priority to the affective domain. The classroom itself had an aesthetic quality, with a table of natural items laid on a table cloth with a candle, a chalk drawing on the blackboard, artistically drawn letters, pictures and paintings on the wall, and craft bags that the children had embroidered themselves, to hold their knitting.

The Waldorf perspective on the affective domain is very crucial to the age being studied. For a Steiner teacher, the start of primary school indicates the

changeover for the developing awareness that prior was mostly residing in the will, to awakening in the affective realm. The will resides within the body, in the limbs and digestive realm, whereas the affective domain is linked to the heart and breathing system (Harwood, 1967:14).

This awakening, in Waldorf education, is supported by rhythm, storytelling and artistic expression. The clapping of songs, verses, and even mathematics, helps to bring that rhythm to the body. Stories, immersed in rich pictures and feelings, help the child to follow the pathway of their own emotional development. In Waldorf education they attempt to meet the awakening of emotions that occurs through the ages of 7-14 years old, with stories that meet this same level of development. For instance, the younger child in Grade 1 is given fairy tales, whereas the Grade 3 child the biblical stories.

At the same time, there is a great deal of artistic expression in arts and crafts. The class at the time of my research was knitting. They kept the knitting in bags made of hessian that they had embroidered with wool themselves. The painting, drawing, and craftwork are a regular part of the daily and weekly curriculum, as a way often to express the content of the story or lesson. While craft is a form of emotional expression, it is also a small motor activity.

The Waldorf systems values the presentation of work in a creative and aesthetic manner. According to the Waldorf teachers, it is the emotions that help integrate the physical will of the body, with the thinking in the head. Anything with rhythm and beauty allows for the development of the affective realm. Rhythm, storytelling, and creative expression through crafts and art are some techniques to access the affective domain. Waldorf schooling acknowledges that the experience of the affective domain has a processing and purpose on its own, not only to enhance the cognitive realm. Furthermore, the vision is that by allowing

the child to fully experience their emotions, this will lead to a greater capacity for cognitive development later.

When the Waldorf teacher told a story, it was a complete episode of a story, even if the characters and adventures continued from the day before. The teacher took the students through a revision of the story the day before, and then he told the story. He did not read it, but rather it was told in an animated fashion, using different voices for the temperaments of the characters. The students were totally engaged. Afterwards a drawing was done from the story, which came from their own experience of the story done on blank paper in their books. In this way, the child listened and then processed artistically what they had listened to and learned.

Aesthetic abilities are also enhanced by the quality of language given in Waldorf education. Verses are said daily, and memorized due to the constant rhythm of telling it. The act of consistently saying a verse seemed to me strengthening to them, and by the time I did my research in October, the children knew them off by heart. For example, each morning began with this verse by Rudolf Steiner:

> The sun with loving light
> Makes bright for me each day
> The soul with spirit power
> Gives strength into my limbs
> The sunlight shining clear
> I reveal, oh God
> The strength of human kind
> That thou so graciously
> Have planted in my soul
> That I with all my might
> May love to work and learn

From the beginning of the year, each letter was learned through a story. Then a character of the story would be found inside that letter, for instance the King in

the K with an arm and leg as the arms of the K. This would have been drawn, walked, experienced in the body. Then a verse including words starting with that letter would be recited each morning. By October, they knew quite a lot of verses, and repeated them as part of their morning rhythm. The teacher either gave the letter and the class gave the verse, or opposite. Examples of some of the verses were:

C Come caring into the crystal cave and there you will find a calmness in you.

D Do you dare to dance open the door?

E My dog Jet, he runs through the wet, he's the best pet I'll ever get

F Fine friendly farmer, fighting the fiery feisty horse, will you guide us friendly folk into the valley of darkness?

The difference between the content offered in the Waldorf and the brain-based classrooms seemed to be that the use of the affective domain had a developmental, not only experiential intention in the Waldorf program. The speed of attaining the literacy skills of reading and writing appeared to be quicker in the brain-based classroom, as the children were reading as well as writing. But the Waldorf classroom was so filled with rhythm, singing, artistic expression, crafts and storytelling that I could say the oral-linguistic content was much higher. It would take an assessment of a higher grade in each school to know the true impact of each system of education on the skills of reading and writing, as well as the love of doing them.

The children did not have any homework or tests. The teachers stated that homework only started in Grade 2, and that exams were not done until high school in the Waldorf system. There was much more emphasis on the experience and repetition of material than being tested on it. There were children working at many different paces, and although they were not divided into groups

according to strengths, there was enough time given to finish the work. The children who did finish earlier had the potential to become quite wild in their play, and I did wonder whether they should have been given more work. They had the opportunity to draw, knit or play when finished.

The looping of teachers, who stay with a class for a whole 7 or 8 years also contributes to the affective realm, as the class becomes a strong unit and the teacher gets to know the students very well over the years. Table 10 lists the affective features in School B.

Table 15: Assessment of the affective features of routines in School B

Aspect of Classroom conduct	Effect on the affective realm
a. Students speaking verses in day and for each letter	Rich poetic language use, stimulation of the appreciation for language and meaning
b. Aesthetic integration of material through arts and crafts	Bringing work into a feeling and rhythmic realm, through drawing, painting and crafts.
c. Looping of teachers	Class becomes a family and teacher knows students well. Familiarity over the years brings a sense of security.
d. Storytelling with the temperaments	Students are exposed to many stories to stimulate their emotions, and the temperaments allow them to identify with the characters.
e. No homework, tests or marks	A focus on the process rather than the mark.

4.12.3 Cognitive Domain

The cognitive domain has to do with the brain's ability to process information and for that information to find its place within the learner.

4.12.3.1 School A

In the brain-based program, the cognitive development followed a National Curriculum (NCS) outcomes-based curriculum for academic development in Grade 1, but with the added extra of understandings of how the brain works in learning. This was supplemented with movements to balance the brain, and a set of requirements which met both the physical and affective domains.

In terms of actual literacy practices, the brain-based school was advanced in the decoding and encoding skills of reading and writing. The children were all reading and writing by the end of the year when I was observing, and were divided into groups according to their competence levels. On the Monday morning they wrote in a news book a few sentences of what they had done over the weekend, and could supplement it with a picture. During the Monday morning, a few of the room helpers (parents) helped the children with their news books. Children could get help spelling the word they wanted to use, but they wrote it themselves.

Reading occurred on three levels, working with graded readers. According to the teacher, the exercises that helped to integrate right and left brain hemispheric functioning, dramatically improved focus and reading skills.

All mathematics and literacy lessons were done with the cognitive outcomes in mind, and were assessed by the teacher. At the same time, these teachers were able to combine the rules about the brain in learning, to make it more accessible and interesting. Theoretically this would enhance the memory of the material. Possibly the only way to truly assess the effects of the two education systems on the cognitive realm is to do a follow up study in Grades 3 or 4, when literacy skills have taken shape, as well as the interest and meaning attained from reading and writing. As Grade 1 is a beginning stage, it is more about building the foundation to the cognitive. Table ..outlines the cognitive features of School A.

Table 16 Cognitive features of School A

• Educational outcomes are related to the National Curriculum Statement (NCS) • Assessment standards are set by the NCS • Brain and body exercises done throughout the day in order to balance hemispheres and relax the mind, for greater learning potential. • Integrating learning styles and multiple intelligences in presentation of material for greater comprehension and interest. • Integration of the psycho-motor and affective realm into the cognitive domain of learning.

4.12.3.2 School B

The role of the cognitive in a Grade 1 child was seen very differently in the Waldorf program, resulting in what could appear to be delayed cognitive development in the Grade 1 class. For instance, by the end of Grade 1, the children were only writing where the teacher would take sentences from the stories and put them on the board and then the children would copy them, and read their own writing. They were not reading books as in the brain-based school: this only began in Grade 2. The focus seemed to be more on the preparatory stages, the basis of language through movement and artistic integration leading to writing. For instance a lesson on writing was accompanied by a story, a movement of the letters, and a painting or drawing experience. The idea seemed to be that these were not separated activities, but that somehow the children used them to integrate what was learned.

It would be good to do further research on the reading abilities in the Grade 3 or 4 children through this system in comparison with brain-based, to see if the preparatory stages truly did launch these children into literacy.

The aesthetic value of language itself, integrating words, meaning, and rhythm, seemed to take precedence, with verses, songs and stories as central to the curriculum for the day. This approach was definitely a slowed down, but colourful experience of literacy. The children focused on their own writing, learning reading through what they had written. Pre-skills to writing also included form drawings, which are repetitive patterns similar to letter writing but more intended to enable the children to get the feeling of the curve and the line in pattern.

According to the interviews with the teachers, the reason for teaching writing before reading is because the children are still connected to their bodies in movement. Since writing involves more physical movement than reading, it is taught first. When a story is read, a pertinent sentence from it is written, and the children copy the writing and learn to read their own writing. Reading, which requires many small muscles, is seen as a more intellectual and passive process that only comes later in the grades.

Imagination, according to the teachers, is a precursor to intellectual thinking. Therefore if a story is told in an imaginative way, these pictures become part of the child's experience. The next day that story would be reviewed, and then an artistic activity would occur to integrate it, such as drawing a picture. In this way the students develop their own imaginative pictures as well as externalizing them. This, according to the Waldorf belief, is a means of preparing the mind for thinking. Cognitive features of School B are listed in Table 17.

Table 17: Cognitive features of School

• A focus on the preparatory aspects of reading through movements and writing, as well as the use of rich language • The principle that reading comes from writing, and that children learn to read by reading their own writing • Making space for the affective domain through artistic expression • A belief that imagination leads to thinking

4.13 The research question: Comparing similarities and differences in the literacy environments of the two schooling systems

Both school systems give interesting insights into how to work with the psycho-motor, affective and cognitive domains. Table .. shows the similarities and differences which have been compiled from the data.

4.13.1 Similarities

Similarities will be listed in general and then discussed in accordance to the three domains of psycho-motor, affective and cognitive. Similarities between the two systems include factors such as:

- Both promote the integration of the physical, affective and cognitive domains within the education system and the rhythm of the day.
- Both strive for a healthy diet, with vegetables and fresh foods.

- They both include movement, to a higher degree than traditional schools, within their learning day.
- Rhythmic movement is an important tool for bringing the class into unison and to practice movement. Clapping games, verses, and songs with movements all strengthen this rhythm.
- Exercises to strengthen the integration between the right and left brain such as cross crawling and other movements are conducted in the brain-based system, while form drawing and specific movements are conducted for crossing the hemispheres in the Waldorf system.
- Each seeks to strengthen the utilization of the left and right brains through mixing cognitive with creative work.
- Each raises the interest level of the work presented by giving attention to different emotional temperaments or learning styles.
- Each sees the decrease in stress caused by routines such as tests, homework and exams as a positive principle for enhancing the emotional engagement for learning.
- Exercise and movement is essential for learning.
- Each has a rhythm of the day designed around their view of the needs of a child.

4.13.1.1 Psychomotor domain

The physical aspect of the child and education is considered relevant in both systems of education.

This includes the rhythm of the day, exercises for crossing the brain hemispheres; focus on nutrition, and large and small motor movement. For Waldorf the daily rhythm incorporates activities nourishing the thinking, feeling

and willing aspects of the child. For brain-based education, the rhythm is designed around the benefits for the brain of nutrition and movement.

The left and right brain are both involved in literacy and both of these education systems acknowledge through movement, the potential to help balance the two hemispheres for greater focus and balance. In the brain-based school, many of the movements done during the school day cross across the body, such as touching the left elbow to the right knee, and vice versa. This is seen as helping to balance the two hemispheres. A 40-minute period a week is dedicated to only exercise which stimulate cross hemispheric movements. In Waldorf education, form drawings are done prior and alongside the learning of the letters. Letters are walked and moved so that they imprint deep into the physical body. And a form of movement called eurhythmy, where the letters and sounds are put into a specific set of movements are done in class, which also involve a great deal of cross-hemispheric patterns.

4.13.1.2 Affective domain

Emotional integration and expression of the material are considered important in both of these systems. For the brain-based system, the use of multiple intelligence theory (MI) is a teaching to reach and inspire the various learning types in the learning experience. The working in groups stimulates some of the more social intelligences, such as intra- and interpersonal, in learning together. Affective expression is also provided by the emotional sharing circles, where children are given the opportunity to place a number grade on their feelings. The children sat in a circle and had to give a number out of 3 for how they felt at school and at home. The brain-based teachers did all conclude that the one benefit to the sole-gender classes was an easier and deeper expression of their feelings, especially the boys.

The understanding of the different learning styles helps to ensure that children who specialize in different ways of learning can also be met. This can also inspire the teacher to be more creative, thus making the lessons more interesting. The relaxation on the emphasis of test marks reduces stress, thus in theory allowing for a greater feeling of safety in the child, and interest in the process of their work.

For the Waldorf class, the use of storytelling as a means of learning literacy, as well as other subjects, shows a priority given to the affective realm. In addition, artistic expression of the material learned is an integral part of the day, as well as doing crafts such as knitting. The aesthetic quality of the classroom is important, and there is an emphasis on all writing being of meaningful and beautiful expression, such as a pertinent line of a story that has been told. In this way, the affective realm is integrated into all the work that the children conduct. Lastly, because the teacher stays with the class for a full 7 years of primary school (in ideal and most cases) there is a connection between student and teacher that can develop over time. In addition, the class has the potential to become a coagulated group since it continues over time.

4.13.1.3 Cognitive domain

While the multiple intelligence theory (MI) is opening a way for accessing intelligences other than the cognitive ones, such as interpersonal, musical, or kinaesthetic, the senses are used as a means of accessing intelligence, such as touching the money for a maths lesson, and can contribute to the whole classes' experience of the lesson. All of the above factors of psycho-motor and affective realms allow for greater integration of cognitive material and memory retention. In addition, the movement exercises, both during the day, and the one week 40 minute period of cross-hemisphere exercises, have the potential to help the

student balance the brain and have greater access to learning. Since the reptilian brain responds to stress in a flight/fight manner, they lower focus on the results and reduce homework, so that the Grade 1 student can have a more relaxed approach to learning. From the brain-based theory point of view, this enhances their ability to learn and their use of the cognitive realms.

In Waldorf, there is a similar reduction of stress level by not having tests, exams or homework in Grade 1. The classes are made interesting through storytelling and creative expression, which enhance the integration of the work done as well as open up the child's experience of their own affective realm. The form drawing, where patterns are drawn as a precursor to learning letters, also helps to cross the hemispheres for balancing the brain. The belief is that the primary school child integrates the cognitive through the affective realm in the foundation phase.

Table 18 lists the similarities found in the two schooling systems, as an answer to the research question.

Table 18: Comparison of the similarities in the learning environment of Waldorf and brain-based education

Aspect	Waldorf	Brain-based
1. Psycho-motor domain a. Rhythm of the day	a. Daily rhythm incorporating activities of thinking, feeling and willing	a. Daily rhythm to incorporate good nutrition and exercise.
b. Rhythm in learning	b. Clapping rhythms to introduce and incorporate in lesson.	b. Clapping games to bring focus and attention to class.
c. Crossing the hemispheres and relaxing the brain	c. Form drawing, walking the letters, and eurhythmy to promote the crossing of the hemispheres and bodily experience of the letters.	c. Songs or movements that encourage certain movements, crossing of the midline and relaxing the brain.
d. Nutrition	d. Promotion of healthy diet, a lot of play and movement.	d. Fresh food snack every morning and water bottles allowed on tables at all times.

e. Movement of the large and small motor	e. Crafts such as knitting are done by the children for small motor development, as well as strong emphasis for free and outdoor play to utilize large motor development.	e. Extensive sports program and a walking circuit of 1km every day to promote the value of exercise.
2. Affective domain a. Expression and exploration of feelings	a. Exploration of the affective realm through storytelling and artistic expression.	a. Exploring the feeling realm through sharing circles weekly to express feelings, and teaching through multiple intelligence perspectives in social recognition.
b. Learning as a process	b. The belief that learning is a process, not about results or tests.	b. Less focus on results and more on the process of learning.
c. Group experience in the classroom environment	c. Class stays with the teacher 7 years to increase feeling of family in the group and trust of the teacher.	c. Group work to experience working together.
3. Cognitive domain a. Acknowledging other forms of intelligence	a. Imagination and movement seen as precursors to thinking.	a. A multiple intelligence approach to allow for different learning styles.
b. Crossing the midline	b. Crossing of the midline in form drawing and morning rhythm time.	b. Movements using brain gym to keep the brain relaxed and the hemispheres in balance.
c. Reduction of s tress	c. Stress is not seen as an important aspect to education. No homework in Grade 1.	c. Little or no homework in Grade 1.

4.13.2 Differences

The differences between the learning environments of the two schools are shown in terms of their fundamentals in education and theories, and then as differences in terms of literacy environments.

The following categories were fundamental differences between the two systems of education:

4.13.2.1 Pedagogical epistemology

- Brain-based education focuses on the findings of the brain, combined with a national curriculum schooling system, with no pedagogical epistemology of its own, but rather a set of techniques to enhance the learning process.
- Waldorf education is based on a century old philosophical and psychological epistemology designed around a developmental perspective of the child in the world.

4.13.2.2. Science versus spirituality

- Brain-based schooling is more scientifically based in the modern semantics of neurological research.
- Waldorf schooling is spiritually based, which views the child as having its own destiny which must unfold within developmental stages. Its language is derived from the early 1900's.

4.13.2.3 Focus of education

- The brain-based system puts more focus on the physical body, nutrition, exercises and sports for raising receptivity towards learning.
- The Waldorf system emphasizes the positive value of aesthetics, seen as the realm of beauty and goodness, in developing emotional awareness and empathy.

4.13.2.4 Timing for literacy

- The Waldorf system begins as an oral-based system and slowly brings in the skills of writing and reading, with writing occurring first. Reading proper only comes in Grade 3, after they have learned to read their own writing.

- The brain-based schooling begins with reading and writing in Grade 1.

Although both schools consider the role of the psychomotor, affective and cognitive realms as important, they also have differences in their approaches and priorities. Waldorf puts great emphasis on the storytelling, as an artistic, emotionally based and oral preparation for the child to develop and assist in literacy skills. Storytelling is the basis of the primary school curriculum. In the brain-based school, there is a set story time but it does not have such an emphasis within the curriculum.

The progression of teaching literacy is a large difference between the two systems. The brain-based school is a public school and follows the national curriculum statement (NCS) of South Africa, and meets those criteria. Both reading and writing skills begin in Grade 1, and by the time I observed in October, the skills were quite developed in the students in both. There were three groups of different skill levels, but in general all the students had acquired some skills in both.

For Waldorf, children are taught writing before reading, and in Grade 1 there is no reading instruction. Students write and then read their own writing. At the same time, they learn their letters through story, and express them in pictures. They walk the letters, move them and do form drawing to practice the angles and movements of writing. Each letter is learned through a different story, has a corresponding picture where the subject looks like the letter, as well as a verse using a large amount of words with that letter. This is seen as building the foundations towards literacy in a creative way.

Table 19 lists the differences noted between Waldorf and brain-based learning environments, in answer to the research question.

Table 19: Differences between Waldorf and Brain-based literacy environments

Aspect	Waldorf	Brain-based
a. Role of storytelling	a. This is the most important part of the primary school curriculum.	a. This is a supplement to other activities.
b. Progression of teaching literacy	b. Writing is taught in the first 2 grades. Reading only comes later.	b. Writing is taught first, but reading is also taught in Grade 1.
c. Role of arts and crafts	c. Artistic expression and crafts are a very important part of the curriculum.	c. Art classş is a 45 min period once a fortnight but colouring of work is allowed.
d. Underlying philosophy	d. Based on Rudolf Steiner's theories on the development of the child, developed in the early 1920's.Taught as a private schooling system.	d. An amalgamation of educational neuroscience, psychology, education, and more. Taught within a public schooling system.

4.14 Conclusion

This study has aimed to compare the literacy environments of two educational systems: Waldorf and brain-based. It was an ethnographic study looking at the two schooling systems in Grade 1, with a focus on literacy. It aimed to assess the school environment, rhythm of the day, and role of the psycho-motor, affective and cognitive domains. It then aimed to find similarities and differences between the systems, with the hope of shedding light on literacy from a holistic perspective.

These two systems differ in that Waldorf education has been a working system for the last near century while the brain-based system is a contemporary addition to public schooling. Where the insights of the brain that have reached the brain-based schooling system are interesting and very useful in their application, the brain-based system does not have a specific epistemology in itself. In much of

my research it was difficult to discern what neurological studies that can relate to education are, and what has actually been incorporated into an educational epistemology called 'brain-based'.

There is no specific brain-based policy, possibly because the implications of the techniques are still being studied. It takes great commitment from teachers to turn public education schooling into a full brain-based school, and the one I researched was putting a great amount of energy into it. Much of the critique of brain-based education comes more from the commercializing of brain-based education as a system. For instance, Bruer (2008:43) criticizes the notion that people use the theory that children learn best in critical age periods, therefore attempting to teach even the youngest child higher skills such as algebra. Yet the theory of critical periods was not a principle behind the brain-based education system that I studied. I think at times there is a vague distinction between neurological findings, and those practically used for education. It is uncertain to me if there is a standard system that one could call 'brain-based education' or if each school finds their own system that works. Certainly there is very little reflection published on the experiences of different schools or research into their successes. Most of the material available on brain-based education was theoretical.

In terms of literacy, the brain-based school I studied utilized a phonics-based system that any national curriculum school has access to, and followed the current public school curriculum. This outcomes-based curriculum required constant assessment, so while the focus of brain-based education was not on results, the teachers themselves were always engaged in assessing the children.

The special movements used during the classroom time, and in their own gym period seemed to stand out as the most vital part of the education which could be taken into other schooling systems. The acknowledgement that children need a

break from cognitive activity in order for movement is the first step. The second is specific movements that balance the brain. I feel this is the greatest contribution of brain-based education, alongside the reduction of stress and creative approach to teaching through multiple learning styles and intelligences. But while these systems of teaching seemed to work well in the practical classroom, they do not base themselves in deeper theories of child development, nor have they created a specific pedagogy.

The epistemology of Waldorf education has depth and coherence, but it does require the teacher to understand the system as a whole. Critics of the Waldorf system viewed at it as unscientific and overly creative; it is often seen as a place to send problem children. Yet the actual pedagogy, inclusive of the knowledge of child development, movement, storytelling, aesthetics and creativity has the potential to unlock the individuality in the child. This can eventually enhance the cognitive realm alongside enhancing personal skills in the child. From a literacy skills perspective, such as reading, it does take longer.

The value of orality and right-brained creative stimulation in the learning environment is what I feel is paramount to what Waldorf has to offer. Not only is this an education system teaching the skills of literacy, but also hoping to inspire a love of literacy in itself. The system of literacy is indeed much slower, with teaching of writing first, and then reading of their writing. Children are only formally reading books by Grade 3. It would require some research to study these classes in future grades, to compare with brain-based, to see how the uptake of literacy practices have been incorporated once the full process is completed. By Grade 1, it is certain that they appear behind the brain-based students, but the question of integration is important.

One of the questions around Waldorf education was a lack of assessment on progress, and the question of what happens to struggling children? Do they get

noticed in time, do they lag behind? There is room for research in this regard. In trusting a slower path to reading and writing, does this ensure that all learners make it at the same pace, or do some never take up those practices? And especially with second language speakers, who are also trying to manage in a system that relies a lot on the oral understanding of stories for the teachings.

The system of writing before reading, I feel, has great validity to consider in this country. Since the child is still in need of movement and activity, and writing puts less pressure on remembering than reading, it can be an inspired method for children who are even struggling with a second language. My own perspective is that many children, especially those learning in a second language, can reach a learning block when skills such as reading are taught too early, or in a grades-oriented way, and this can allow a child to freeze in their abilities. But if language is taught in a way full of wonderment, art and movement, then the child can feel motivated to read, even if it takes longer. My greatest interest is to study the love of reading for students in the later grades in a Waldorf school and see how this compares to the brain-based or any other national curriculum school, as a question of the medium of storytelling and art integrated into the literacy lesson. As well, the moving of the letters with their bodies, such as walking them allows for the large motor exploration, bringing literacy into the psycho-motor realm.

The concluding comparisons of the school systems will now be divided according to the three domains of learning, in relationship to the literacy environments.

Psycho-motor domain

The psycho-motor domain included the use of movement, attention to the physical life of the child, exercise and nutrition. While both of the schools acknowledged the importance of this domain, they did integrate it in different ways.

Literacy education cannot be separated by the child's need for movement, especially in the foundational ages. Movement is the direct sensory awakening that the developing child requires to develop brain function. The potential for bringing the physical and mind together in learning allows for many teaching options. Movement occurs mostly in the limbs, affecting the proprioceptive system through the muscles, and thus balancing the brain hemispheres. Movement enhances the spatial skills needed as a foundation for reading and writing.

For a child to walk and move the letters allows literacy to reach into their physical memory even beyond the movement of the hand in writing. The specific brain-based exercises conducted in the brain-based school to balance the brain hemispheres and relax the brain can also enhance a child's focus, interest and stamina in the work, as well as enhancing learning potential through balancing the brain centres. This can be revolutionary in terms of teaching, and they integrate the child's needs for movement into a curriculum.

The psychomotor domain also included nutrition, exercise and water. Therefore forming specific rhythms for eating fresh foods, drinking water, and exercise could be very important in the raising of concentration which may impact the ability to take on the skills and focus required for reading and writing.

Affective domain

Both schooling systems studies place importance on the role of the affective domain in the child. This is seen as important as a means of accessing the child's higher learning, as well as the affective realm having value in itself, for enhancing the child's sense of well-being and enjoyment.

The reduction of stress is seen as a way of allowing children to be less focused on results and more relaxed in the activity. From the brain-based perspective,

stress inhibits a child from feeling safe; therefore they are stuck in the reptilian fight/flight brain, and cannot enter the limbic system. The limbic system thrives on the affective domain, allowing a child to feel loved, and therefore also find affection for the content of the material being learned. As well, the limbic system produces hormones, such as dopamine (Willis, 2008:2010) which enhances memory retention when a child is interested and emotionally involved in the learning.

For brain-based education, this requires the teachers to use theories such as multiple intelligences, as well as understanding learning styles to reach as many learners as possible. The students participated in sharing circles to acknowledge their emotional wellbeing at that time, with the understanding that cognitive learning is not the only outcome of school and a child's affective domain can influence their ability to learn and therefore has to be attended to.

For the Waldorf schooling, the affective realm is connected to the body, in the area of the lungs and chest, and the activity of breathing. This corresponds to the child's need for rhythm. Therefore all the lessons start rhythmically, and the learning of letters is put to movement and rhythmic verses. Language and rhythm are integrated into the curriculum.

This involves both the psychomotor and affective realm as a foundation for the pedagogy of learning. The hope is that this also inspires the learning to have a love of language and therefore pursue a life of reading and writing through their will and desire.

Stories are also told in an order according to the Waldorf understanding of child development, therefore stories from the world of the past (fairy tales, animal legends, bible stories, Norse myths, Greek myths, as an example of the progression from grades 1-5) meet the developmental pathway of a child through those grades. According to Rudolf Steiner, a child in primary school is primarily

awakening their feeling, or affective realm. Therefore the storytelling as a means of learning is fundamental to the curriculum meeting their development.

Stories are also told in a way that expresses each of the temperaments, as the example given in Winnie the Poo (Milne, 1956). The understanding is that in exploring these temperaments gives them more self-reflexivity into themselves. This corresponds to the inter-personal and intrapersonal intelligences in the MI theory.

Waldorf used artistic expression in all their main lessons to integrate the work and allow the child to develop their aesthetic abilities. To have a time for the affective domain is part of the rhythm of the day; involving an aspect of thinking, feeling and willing in each school day.

Cognitive domain

In order to attain high cognition, the psycho-motor and affective realms must be engaged according to both schooling systems. For brain-based education they apply the theories of learning styles and multiple intelligences (MI) so that a learner feels confident and the material is presented in a way they feel acknowledged.

Focus is one of the essential ingredients in education, and all the teachers are involved in finding conditions that enhance this. Both Waldorf and brain-based, as far as my study goes, are proponents of accessing the highest form of participation in the education experience starting with senses and moving up to higher levels of emotional intelligence. In acknowledging the affective realm, good feelings are created and therefore stimulate hormones such as dopamine to enhance focus and memory.

Through the awareness that blocks in literacy can exist in the imbalance of the right and left brain hemispheres, specific exercises can help to balance and relax the brain. Drawings such as in the form drawings of the Waldorf school also do this, as does any movements which cross the midline of the body. Many of the exercises in the brain based were simple, such as touching the left knee to the right elbow. Even crawling, which is the basis of our hemispheric balancing, can be used to do this. Many children do not crawl enough, either due to a lack of space or a rush into walking. Yet a child can begin to crawl at grade 1 to work on balancing the hemispheres.

The techniques in these systems are reproducible, and could be taken up by any primary school teacher. By acknowledging the three levels of psycho-motor, affective and cognitive domains in the needs of the child, the teacher can access that child, and education can be more participatory.

Most of those needs are results of the simple needs of the three levels of the brain: to be safe, to be loved, and to have space to grow in capacity, ideas and forms of expression.

This statement made by Valerie Kohler (2008, i) commenting on the state of literacy in South African schools, points out many of the issues discussed in this thesis.

> The provincial and national systemic evaluation results (2003, 2005) for reading showed that at least 40% of Grade 3 and 6 learners were reading below grade level. In January 2005, in the present study, 50 % of the Grade 7 learners were reading below Grade 7 level. Many learners were discouraged because they could not master the reading tasks set to them. Others responded to the task with boredom and disdain. The learners who could read seem to be the only ones who were enthusiastic about starting and completing the reading tasks.

Involving the psychomotor, affective and cognitive realms in learning allows for greater interest and less stress in taking up skills such as reading. Exercises to relax and stimulate the brain can add to the enthusiasm rather than discouragement, as the hemispheric balance makes a difference in their feeling of their reading skills. Bringing in a love of language and stories can add excitement and emotional bridging into the material, and artistic expression can help even the struggling learners express themselves and integrate the material from a more right brained, or artistic perspective.

Environmental conditions can also affect literacy, such as lighting, warmth, noise levels, seating arrangements and building design. These factors are aside from teaching techniques and can have impact on the teaching environment. Both the schools studied were in wealthier neighbourhoods and therefore did not struggle with very basic needs, such as chairs and desks, room to play, and sizes of the classrooms. These factors go even more deeply into the socio-economic issues arising in terms of literacy environments. And with the need for feeling safe, this goes far beyond whether the subjects have examinations or tests, but into how a child feels at home, walking to and from school and even in the playground. These are factors I did not touch on in the thesis, but have huge relevance when understanding that when the brain is in stress, learning cannot occur.

The influence of electronic media is huge in the uptake of literacy skills these days. When in the past children would come home and read or play, today they are in front of screens either in gaming or viewing. Both of these are not activities that enhance imagination, movement (except small movements of a game) or even language. Parents need to be concerned about these influences as it makes it harder to inspire a child to practice at home the reading skills they learned at school. This makes a higher reliance on homework, which has an aspect of pressure to it, rather than simply reading a book in a relaxed way.

Literacy, once mastered, can be a journey towards sharing of individuality, gaining new ideas, and expression. Grade 1 is building the foundations of this, and the attempt is to inspire not only the skills but also the desire to experience life through reading and writing. It is possible that learning as humanity learned thousands of years ago, from gesture to picture to sound and then to writing and reading might shed some light on how to do this.

CHAPTER FIVE

RECOMMENDATIONS

5.1 Limitations of the study

There are many questions that cannot be answered in this study. For one - can we guarantee that children would learn literacy by these methods? We need further study of the same children after the foundation phase, to see how their levels and interests in the skills of literacy have grown. More neuro-scientific attempts need to be made to explain why some educational methods work, so that greater understanding may be attained by those directing educational programs and policies that claim to protect and understand children. These insights can also be helpful in the debates about correct exposure to the use of media, effective routines and rhythms, appropriate behavioural programs, and skills development.

5.2 Recommendations

The following recommendations for practice are gained from this investigative study and are my recommendations for teachers of foundation phase literacy. They reflect a combination of the two systems that were studied, in their approaches for integrating psychomotor, affective and cognitive domains of learning:

1. Look up some of the exercises which integrate the brain hemispheres. They can be found in any book or study that includes 'brain gym'[1]. The book "Mind moves: removing barriers to learning" (2006) by Melodie de

[1] Brain gym is a registered company, but as a set of movements, it describes specific movements, processes, programs, materials and educational philosophy which recall movements from the early stages of life when the eyes, ears, brain, and whole body were being coordinated. (Brain Gym International, 2011)

Jaguar, is considered an excellent resource for teachers as she is a South African proponent of brain-based education who has compiled many useful exercises. Suggested activities include crawling, or standing and touching the right knee to the left elbow, and then changing, or walking that way. These balance the brain and will create ease in the reading process, which requires working both right and left brain hemispheres. Many more exercises are listed in websites such as www.mindmoves.co.za or www.braingym.org, as well as the recommended book.

2. The teacher should bring in storytelling as a means of inspiring language in children. It is so important for both teacher and student to tell the story from heart, not just read it. For teachers, learn to speak the stories you tell, and tell them in an animated way, so that the child can watch your facial expressions, listen to tones, and feel each temperament of the characters. Let these stories be as close to the original if they are older tales. Do not take away the rich language and be sure that each word is helping to 'paint' an inner picture for the child's imagination. Imagination leads to thinking.
3. Allow movement in the exploration of forms of letters. Let the children walk them, move them with their hands, draw them on each others backs. Let writing become something experienced within the body, not just the brain.
4. Introduce letters through stories. Find characters that start with the letter, but also look like the letter, for instance King (K) with its arm and leg up; T for tree. Allow the children to draw creatively the letters within the characters representing them as well as practicing them on their own.
5. Bring in rhythmical, meaningful verses. Make verses which explore the use of the letters, and that the children can play with so that every time they draw the letter, they can think of the verse. This brings poetry, a right brain stimulus, into the writing process.

6. Keep children healthy with fresh water and fresh fruit and vegetable snacks.
7. Try letting children write before they read. Then they are in the physical domain of literacy, where it is fun and explorative. When they have written sufficiently, have them write sentences from the stories you tell, which have meaning and strength to them. Let them copy the sentences and read their own writing. In this way, their right brain, which works on familiarity, becomes accustomed to the recognition of textual features in the process of reading.
8. Tell stories in mother tongue languages, using the best quality grammar and oldest versions of the stories available.
9. Give children a rhythm where they are able to utilize their physical bodies, their emotions and their minds in the school day.
10. Take away the heavy stress on testing and results, and allow children to enjoy and learn from the processes until old enough to be stimulated by more stress.

These insights are related to the two systems studied, but can be implemented in any system, if teachers are creative in their approaches. My intention was to extract these procedures and practices which may be of relevance and inspiration to any teacher working with literacy in education. There also needs to be more academic writing on the successes of brain-based and Waldorf education, however, this kind of impact study is beyond the scope of the present project.

5.3 Conclusion

As I complete this thesis, the report of the Annual National Assessments of 2011 (South Africa. Department of Basic Education, 2010) has been released, continuing to show low literacy rates across the country. I am inspired to bring some of these insights into the practical field, where struggling readers can be exposed to techniques for relaxing the brain and opening to creative potentials to improve literacy.

This thesis has been a comparison of two literacy environments in Grade 1 classrooms. The first was a brain-based school where they incorporate research around what the brain needs in order to learn best. This includes the needs of movement during lessons as well as special movements to help balance and relax the brain hemispheres. It also considers proper nutrition and hydration as necessary for focus, as well as investigating the role of emotions and multiple intelligences in the presentation of school material. In the school studied, girls and boys were taught in separate classes in the foundation phase in order to enhance a feeling of safety and optimize learning. Brain-based is an exploratory system, with no official pedagogy or perspective on literacy, but rather enhancing the learning environment and learner through the recommended techniques.

The other school was an independent school system entitled Waldorf education, which is now the largest independent school movement worldwide. Waldorf places emphasis on imaginative and aesthetic means of exploring literacy, through movement, storytelling and artistic expression. It focuses on the role of oral language through storytelling, and considers a slow route towards learning to read and write, beginning with writing. The children are then encouraged to learn to read from their own writing, while also using their bodies to move the letters and artistically drawing them. Waldorf schools have a strong pedagogical

movement, initiated by Rudolf Steiner in the 1920's, involving a spiritual understanding of child development.

In the thesis we found the similarities between the two systems revolved around the role of movement, nutrition, and emotions within learning. The differences included the separation of genders in the foundation phase, the role of storytelling, the means of teaching reading, and the importance of artistic expression and aesthetic appreciation in the work. The two systems differ in their pedagogical basis, where brain-based does not have a specific pedagogy on its own as Waldorf does.

The study has offered many opportunities to investigate ideas and techniques in regard to literacy. Through it I derived my own picture of the right and left brain in the process of learning literacy, and how children need to stimulate holistically for the student to acquire literacy skills and develop a love of language. Where Waldorf looks at the historical pathway to attaining literacy, taking thousands of years to incorporate into the human mind-set, neurology understands the wiring that this came about. My picture is that in childhood, in the foundation phase, the child goes through the same neurological wiring to incorporate literacy and this can be supported by understanding the needs of the psycho-motor, affective and cognitive realms. My hope is that some of the techniques and ideas could be incorporated into public education to support a growth in literacy skills in South Africa.

> South Africa is a country where poor nutrition, restricted areas for movement and play, and high stress levels are prevalent; my desire is that some of the exercises and concepts could contribute to providing fertile ground for literacy skills to develop. In addition, where many of the emergent literacy practices are not introduced prior to formal schooling, artistic expression, movement in learning

the letters and the role of storytelling could contribute to higher comprehension and emotional involvement in the literacy process. Through stories teachers could potentially entice children into the love of reading and writing instead of just the act of it. Literacy goes beyond survival, into the aesthetic appreciation of life, and the hope is that more children are inspired that way. For, to declare it once and for all, Man plays only

> When he is, in the full meaning of the word, Man,
> And is only wholly Man, when at play.

(Schiller 1967, in Nobel, 1991:14)

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APPENDICES

Appendix 1:

Brain structure

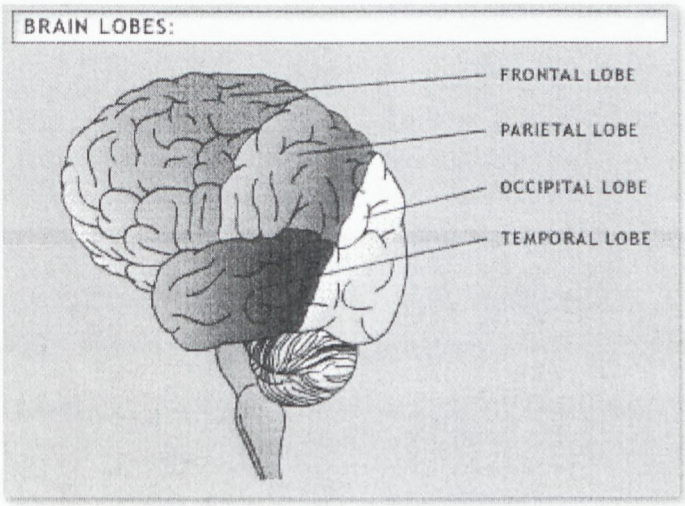
In order to form a concept of what the brain looks like, you can hold your fists together, with the folded fingers touching. The fingers give an indication of the folds of the cerebral cortex, which is folded to fit in the human skull (Grové, 1995:13) If the cortex were not folded it would cover an area of 0.77 square meters. If human babies were born at the developmental stage that an animal is (where it can stand up in a few minutes or hours) then the birth canal would have to be considerably larger. Over the millions of years of evolution, the brain has had to fold upon itself. The **cerebral cortex** is what separates human from lower animals on the evolutionary ladder. It is the most recently evolved part of the brain (Christie, 2000: 327).

The outer covering of the cortex is like an orange peel (Jensen, 2005: 8). It is divided into four lobal regions: occipital, parietal, frontal, and temporal. It is also separated into two hemispheres, with a group of nerve fibers interconnecting them called the corpus collosum. Signals cross over the corpus collosum from one hemisphere to the other (Christie, 2000: 327).

Although brain processing is not always site specific, there are localized functions which include:

1. The frontal lobe is where speech and smell (olfactory) centers are located.
2. The occipital lobe houses the main location for vision.
3. Sensory areas are located in a fissure between the lobal regions. Perceptions of hot, cold, pitch, timbre and intensity are found here.

4. The temporal lobe controls memory (Christie, 2000: 328).



Cross view of the lobes of the brain (Mobbs, R., 2003)

The brain is divided along the vertical axis into three sections: the hindbrain, midbrain, and forebrain. It is now understood that as we ascend from the hindbrain to the forebrain, the functions represented go from physiologically primitive to elaborate (Le Doux, 1998: 82).

Although the brain works in systems, it is not exact to say that functions are specifically located. Studies with brain-damaged people have given many insights into how this works. For instance, if the visual cortex, which is a region in the back of the cerebral cortex, is linked to seeing, and if that area is damaged, that person will be blind. But that does not mean that vision is located in the visual cortex. It does mean, though, that the visual cortex is a necessary part of the system in which seeing is accomplished (Le Doux, 1998: 76).

Appendix 2:

The triune brain model

It was C. Judson Herrick (1933 in Le Doux, 1998:85) an anatomist specializing in brain evolution, who distinguished between the two parts of the cortex- the lateral and medial. He gave the example of a hot dog bun, with the two halves being the two cerebral hemispheres. The brownish toasted part on the outside controls the higher thinking processes, including lateral-sensory and motor functions, and is called the neocortex. If the hot dog bun is pulled apart, the white part inside is considered an evolutionarily older part of the brain. In Herrick's hot dog model, this middle portion, the white of the hot dog, had been labelled by Pierre Broca as the grand lobe limbique. Limbique comes from the Latin word *limbus*, which means rim, and describes its shape. But later this was changed to rhinincephalon, meaning the 'smell brain' to account for its perception of odours and controlling behaviours by smell (Le Doux, 1998: 87). In primitive animals, smell plays a central feature in sexuality, feeding and defensive behaviours. He proposed that higher intellectual functions mediated from the lateral neocortex evolved from the sense of smell and that the lateral cortex itself is an evolution from the smell brain. This part of the brain is often termed as the limbic system. Figure 2 is a true picture of the two hemispheres of the brain.

The mammalian brain, which consists of the limbic system, is draped around the earlier, reptilian brain. Mammals such as the dog, horse and cat, egg laying animals such as chickens, and marsupials such as the kangaroo, all share this brain with us (Grové, 1995: 17). The nurturing qualities of mammary glands and emotional attachment to our young is then represented in the limbic system, which is made up of the thalamus, hypothalamus, basal ganglia, amygdala and hippocampus. While these organs are rooted in the physical space, located in the valley between the two brain hemispheres (Grové, 1995: 16) (or two hot dog

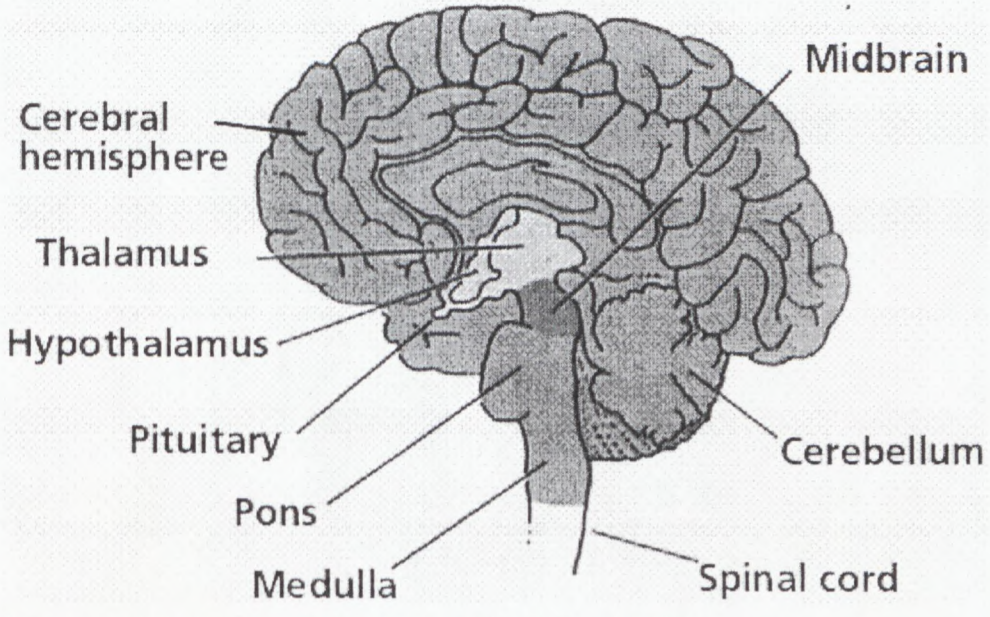
buns), they are also emotional circuits key to the understanding of learning and behaviour (Whittle, 2004: 21).

The mammalian brain is largely concerned with self-preservation, as well as relating to others. It is a pre-language brain, but sounds and gestures such as 'sure', 'ahah' or 'um' are often linked to this brain. It is a special tone of language linked to the animal, and can be automatic rather than thinking, in a conversational use. Other sounds from the limbic brain are groans, sighs, grunts. This system has been described as the gatekeeper to the mind, with less discernment and control than the thinking mind. While it has little logical thinking or speech connected with it, visualization, music and symbolism can influence the limbic system directly (Grové1995: 18).

The third part of the brain is the cerebrum, the largest part of the brain, covered by the neocortex, which is a thin layer of little grey cells, about 2 to 5mm thick. Although the neocrotex makes up only one quarter of the brain's total volume, it has 85% of the total neurons (Hannaford, 1995 in Whittle, 2004: 23). Under a microscope the cortex is seen to consist of many cell bodies, arranged in six layers. These cell bodies are actually the heads of the neurons, or nerve cells. Each of these continues as a narrow long wire, or axon, into the substance of the brain (Strauss, S., Goodman, K., and Paulson, E. 2009: 28). These neurons have the unlimited ability to organize and reorganize neural pathways from new experiences.

The cerebral brain envelopes the mammalian brain, and is the initiator of our voluntary movements, and means of coping with the complexities of the external and environmental stimulus (Grové, 1995: 21). The **cerebral cortex** is divided into the left and right hemispheres, formed as four main lobes and joined by a tissue called the **corpus collosum**. This facilitates cross-over connections

between sensory perceptions from the right side of the body to the left hemisphere, and the left sided sensory input to the right hemisphere. This is where language, self-expression, rational thought, motivations and ambitions came into being, in the evolutionary model (Whittle, 2004:23). This is the realm that is considered to be the cognitive domain.



Important features of the brain (Farabee, 2010)

Understanding this brain division can offer insights into the brain's workings in order to enhance the learning process, as well providing greater understanding of the combination of physical, affective and cognitive realms as they are possibly controlled by different, but always corresponding, layers of the brain. In the model of the three levels of brain, representing consecutive evolutionary stages, these biological brains are superimposed upon one another, distinct in their structure and chemistry, and differ in their style of expression and computation (Grové, 1995: 24). Many of the insights into learning come from understanding how these brains work simultaneously, and how to allow the student to feel

safety (reptilian) and emotional stability or pleasure (mammalian brain or limbic system) in order to activate the cortex, or thinking brain.

Appendix 3:

Principles of brain-based education outlined by Jensen (2008b) and expanded by other theorists.

1. Conventional neuroscience held that the mammalian brain does not grow new neurons in adulthood, but this is now being questioned (Begley, 2009: 4). **The human brain can, and does grow new neurons.** These have a correlation to memory, mood and learning. (Jensen, 2008b: 409). This process can also be regulated through influences such as thoughts and attitude, exercise, nutrition, low levels of stress (Jensen, 2005: 3; Jensen, 2008b: 409; Grové, 1995: 13) Schools can and should influence these variables (Jensen, 2008b: 409).

2. **Learning changes the human brain. The term neuroplasticity** is used to represent the brain's capacity to change itself through learning (Millar and Tallal, 2006: 19) It was first introduced to the science of the brain by William James, a father of experimental psychology in the United States, in 1890, where he posited that "organic matter, especially nervous tissue, seems endowed with a very extraordinary degree of plasticity (Begley, 2009: 4)." From the time of birth, the brain is neurally coded, in response to experiences: to what is the immediate priority and going to matter in terms of survival and enjoyment. Soon it begins to predict what is going to happen. This is termed as experience-dependent learning, or neuroplasticity. The brain can be rewired, create new connections, and retains much of the plasticity of the developing brain (Begley, 2009: 7). *The Journal of Neuroplasticity* looks at these issues. At a physiological level, the brain's neurons look for consistency in experiences. It learns to attend to, and map those patterns and experiences, made up of sensory input, that repeat themselves frequently. This is the working of neurons, summed up by the maxim "Cells that fire together wire together" (Begley, 2009: 34). In this way, if we don't

like what our life is attracting, we can also look at our neural maps and make attempts to create changes. Schools can influence the students' experiences and therefore the their neural maps, through skill-building, reading, mediation, arts, career and technical education, remedial work, and thinking skills (Jensen, 2008b: 409).

Our brains are being constantly rewired, and physiologically remodeled. This creates clusters of brain cells, or neuronal cell assemblies (Millar and Tallal, 2006: 22). As time progresses, they respond more automatically and synchronously in time with events that come together or follow each other in time. This neuronal patterning can be seen like a pathway developing in a forest where people are daily walking it. Ruts develop in the path, making it easier to stay on track on following trips, and therefore stimulate the same chain of neurons over time (Begley, 2009: 35). The more often a pattern occurs, for example acoustic changes in speech, the more likely the pattern will be neurally encoded or represented for more efficient access at a later time. This puts a large responsibility on the teacher, who spends more time with the children than other adults.

3. **Stress effects brain development.** Unlike other parts of the body which revert to a prior healthy state after a trauma, the brain is constantly adjusting its baseline to the amount of stress it copes with (Jensen, 2005: 3). Homeostasis is no longer a guaranteed 'set point,' and chronic stress is a real issue for both staff and students at schools (Jensen, 2008b: 411). Neuroscientists such as Bruce McEwen labelled the revised metabolic state as 'allostasis', the baseline for stress in the brains of those with anxiety and stress disorders (McEwen, 1998: 171). These high levels of stress are becoming more common and have serious health, learning and behaviour risks. Acute and chronic stress issues are explored in journals such as *The International Journal of Stress Management,*

The Journal of Anxiety, The Journal of Traumatic Stress, and *Stress* (Jensen, 2008b: 411). Stress in children is influenced by factors such as exposure, constant sensory overload, a focus on results in the school achievements, high stress in the parent's schedules, and also the lack of true rest (Caine and Caine, 1991: 30).

Teacher and student relationships are one source of stress within the classroom. When they are not bound in trust and respect, but rather utilize punitive or threatening measures to achieve for success, this can actually inhibit learning (Conant, 1998 in Wilmes., et al., 2008: 260). This stress has the potential to cause a "fight or flight" syndrome for many students. Glucose, the fuel of the brain, travels from the centre of the brain where reasoning and thought occur and goes to the muscles during stressful situations. In the instance of an instructor reprimanding a student in front of the class, this action may trigger the "fight or flight" syndrome."

> Once stress or fright develops, it may take some time for the body to recover, making it difficult to breathe normally, much less to learn. While humans use this defence mechanism in life-threatening situations, it can be counterproductive when used in the classroom. (Wilmes et al. 2008: 260).

Once this trigger is stimulated, it makes it difficult for the person in stress to breath properly, as well as to learn, and may take quite a while for the body to recover (Wilmes, Harrington, Kohler-Evans, and Sumpter, 2008: 660). These stress hormones can remain in the body at high levels for several days, depending on the severity of the situation. Over time, altered stress conditions, which effect stress levels, literally change the brain (Jensen, 2008a: 430).

4.**Social conditions influence the brain.** The discoveries of mirror neurons by Giacomo Rizzolatti at the university of Parma suggest that in our neurons are a

vehicle for imitating each other. The mirror neurons translate an observed action, such as a facial expression, into an internally experience of feeling (Goswami, 2006: 6). This has also been linked with empathy, and related to the importance of social conditions in schools, both with teachers and other pupils. School behaviours are highly social experiences which become encoded through the sense of reward, acceptance, pain and pleasure, coherence, affinity and stress (Jensen 2008b: 409). Often the school systems are exactly what conditioned the parents to act as they do, so the cycle becomes continuous. The discovery of mirror neurons suggest that schools should not rely on random social groupings but work together to make pro-social conditions (Jensen, 2008b:409).

5. In the past, discussion of influences on a child was between environment and genetic inheritance. The third option now is **gene expression** (Jensen, 2008b: 411). This is the capacity for the **genes to respond to chronic or acute environmental input**. Journals looking exploring the mechanisms for epigenic changes include *Gene Expression, Gene Expression Patterns, Nature Genetics.* There is evidence that the relationships created at schools can enhance or harm long term change prospects. These relationships become the decisive factor that creates the opportunities for both negative or positive influences. If a child feels understood in their personality, the possibility for better 'neuronal pathways' are much stronger. As well, traumas that occur in early childhood, before the child has the ability to cognitively debrief the situation and the frontal lobes are not fully developed for critical analysis of a situation can create automatic behaviours from the trauma. A teacher must take the time to get to know a student personally, their life history, possibly direct the student to counseling, and infuse better social skills if needed (Jensen, 2005: 154).

6.The role of nutrition in schools is becoming more relevant and understood. Journals such as *Nutritional Neuroscience,* and *European Journal of Clinical*

Nutrition explore the **effects of nutrition on the brain**. This influences cognition, memory, attention, stress, intelligence (Jensen, 2008b: 411) Children with iron deficiencies are twice as likely to score below average in math compared with children with normal levels (Halterman, 2001 in Jensen, 2005: 30). Vitamin A supports learning and memory, which can be found in sweet potatoes and orange vegetables. And the myelin is a fatty coating that makes the brain work. Deficiencies in protein, iron and selenium impair the myelination of aons, which also can reduce the mental efficiency. And hydration levels are very important to the brain's normal development and functioning (Jensen, 2005: 30).

7. While many educational facilities are eliminating their recesses, play areas, or physical education in trade for intellectual pursuits, **the value of exercise and movement to brain development** is coming to the forefront. Evidence is showing the correlation between exercise and the brain result in better cognition, mood regulation and new cell production (Jensen, 2008b: 411) The sensory motor development in the brain is associated with the vestibular system in the inner ear, which influences the sense of movement and balance. A lack of vestibular stimulation is associated with learning problems in reading, writing and math (Jensen, 2005: 23). The cerebellum is the area of the brain most associated with motor control, and takes up one tenth of the brain in volume. It is densely packed with neurons and has over forty million fibers, which send messages to the cerebellum and back to the brain cortex (Greenleaf, 2003: 17). This message pathway has been seen to influence memory, attention and spatial development (Jensen, 2005: 61). Exercise has also proven to have an impact on the managing of children with ADD and ADHD allowing them to be more focused and remain on a task for longer periods of time (Mulrine, Prater, and Jenkins, 2008: 16). Journals that report on this relationship between exercise and the brain include *Paediatric Exercise Science* and *The Journal of Exercise Physiology Online* (Jensen, 2008b: 411).

8. University research is now studying **the role of arts at schools**- the neuroscience departments of University of Oregon, Harvard University, Dartmouth College, and Stanford University have projects investigating the impacts of arts on the brain (Jensen, 2008b: 411). The journal *Arts and Neuroscience* is documenting these connections. Issues arise such as developmentally sensitive periods for arts instruction, and the transfer value of arts are being looked at.

9. **The effects of our environment on the brain** is stimulating a conversation between neurologists and architects. Many researchers are now considering the environmental influences more significant than hereditary factors (Wilmes, et al., 2008: 659) The Academy of Neuroscience for Architecture promotes and advances the knowledge linking neuroscience to the effects of the built environment on human responses. Physical environments influence how we feel, hear and see, and these in turn affect cognitive abilities (Jensen, 2005: 81). Jensen lists five important environmental factors about schools to consider: seating, temperature, lighting, noise, and building design. Research has shown the effect of colour and lighting in the classroom effecting learning, as over 80% of the information absorbed by the brain is visual in nature (Wilmes, et al. 2008: 660). These issues become relevant for policy makers and administrators responsible for building designs (Jensen, 2008b: 411) as well as the teachers who make the decisions in their own classrooms.

10. There have been great strides in the brain-based disorders such as fetal alcohol syndrome, autism, retardation, strokes and spinal cord injuries. Working with the sense pathways of sight, sound, touch, taste and hearing, many cases of brain damage can have excellent results. "Brain growth and development is a dynamic and ever-changing process. It can be stopped; it can be slowed; it can

be speeded (Warren, 2008: 38). The *Journal of Rehabilitation Research* provides information on special education that is able to improve these conditions far more than was once perceived (Jensen, 2008b: 411).

Appendix 4:

Learning styles

1. **Visual learners** have a good spatial awareness, and like to work with charts, pictures, maps and graphs. They like neat surroundings and have a sense for colour and style. In their language, they often use visual terms, such as 'do you see what I mean?' Physiologically they hold their body upright, and when asked questions would move their eyes up to the ceiling or out the window (Whittle, 2004: 27).

2. Auditory learners tend to talk a lot, love music, songs, stories and reading out loud. Their sense of hearing and language is highly tuned, including the innuendos of voice, tempo, volume and rhythm. They are good at languages and very apt mimics. Since they may hear the answers to questions in their middle ear, they may turn their head to hear the answer, and offer their dominant ear to the teacher's voice (Whittle, 2004: 27). They may also turn their eyes towards their ears when thinking, and speak in the auditory language of "I hear you (De Jager, 2008, brain-based conference)."

3. Kinaesthetic or tactile learners want to touch, feel, manipulate objects and often they suck their pencils. Physical movement is important to them and they are sensitive to their own bodies' feelings and sensations, such as the clothes touching their skin or the feeling of the chair. Physiologically they often sit in a bent manner so that they can access their solar plexus to find answers in, also called the 'abdominal brain' or gut feeling. They work from a knowing sense, and will speak in measured tones as they tend to speak what they know is important. They are able to share their feelings in language, but may not be the first to put their hands up as they can be shy about disclosing themselves (Whittle, 2004:27).

4 Digital learners

Whittle (2004:27) also outlines a fourth type of learner, the digital learner. They like rational clear explanations and sufficient time to complete the tasks. They feel secure in rules and follow them, and don't necessarily work well in groups as they like to go at their own pace and have peace to think through answers. Often they relate to non-sensory words such as 'think, explain, understand, remember, and recognize'. They tend to find answers through logical processes and are only satisfied when they can perceive the whole answer through to the result. These learning styles can come in useful when teaching a class, in deciding how the teacher presents the information and to understand children who may be struggling with traditional forms of lesson planning.

Appendix 5:

Criteria for intelligence in Howard Gardner's Multiple Intelligence theory

This is the criteria for an intelligence to be considered:

1. Can be isolated in that that faculty can be destroyed or spared as a result of brain damage. Therefore it has to have relative autonomy from other human faculties.
2. There is the existence of idiots, savants, prodigies, and other exceptional individuals representing in one or more of the intelligences. This allows the intelligence to be observed in isolation.
3. Identifiable core operation or set of operations. Central to the notion of intelligences is the existence of one or more basic information processing mechanisms to deal with the input.
4. There is a distinctive developmental history and definable set of expert 'end-state' performances which normal and gifted persons pass through.
5. Evolutionary history and plausibility and the possibility that mutations in pre-history caused special advantage for this trait.
6. Support from experimental psychological tasks.
7. Support from psychometric findings.
8. Susceptibility to encoding a symbol system. (Gardner, 1993: 61-64)

Appendix 6:

Listing environmental factors of the classroom influencing the students' ability to learn

1. Seating:

The position in which a student sits will affect their cognitive abilities. This position influence's the learner's access to resources, such as lighting, the teacher, warmth, fresh air, bathrooms, materials, and quiet. The position and seating arrangements can also affect stress levels (Jensen, 2005:82). The height of the desks and whether they are attached or separated from the chairs also affects the ability to hold a specific posture, which is necessary for the correct positioning for writing (McAllen, 1977: 25).

The old-fashioned desk-chair combination pushes the learner's weight straight down, increasing pressure on the lower back and forcing student to sit on the chair rather than in it (Jensen, 2005: 83). Cranz (1998, in Jensen, 2005: 83) says that a good chair should keep shoulders back and chin up, and arm rests to minimize strain on upper body

The seat should not be so long that it digs into the back of students legs, or so high that the students feet don't touch the ground. Chairs which neglect to provide support hamper blood supply to nervous system and disks in vertebral area, causing fatigue and eventually back pain or discomfort, both which impede cognition. (Linton, Hellsing, Halme and Akerstedt, 1994 in Jensen, 2005: 83).

How the seating is arranged can also have an influence. Group seating can foster important social and peer interaction among students, such arrangements

often lead to an increase in chatting and other disturbances that discourage deep concentration (Bennett and Blundell 1983 in Jensen, 2005: 83). Row seating is more structured and allows students to focus more on the task at hand rather than one another. Group seating can have positive effects on learning, but Hastings (1995 in Jensen, 2005:83) noted that seating at tables with four or more learners could be difficult for those who are easily distractible. Marx, Fuhrer and Hartig (1999, in Jensen, 2005: 83) noted that fourth graders ask more questions when seated in a semicircle than in rows. The key is to match appropriate seating for the type of activity and thinking needed (Jensen, 2005: 83).

Unattached chairs and movable desks allow for movement according to activity or needs. It is also recommended for learners to stand occasionally for some of the learning time. They should be encouraged to avoid incorrect posture while sitting. Slumping overstretches muscles and ligaments and puts stress on the back. Poor posture puts the body out of balance and forces a few muscles and joints to do all the work (Jensen, 2005: 84).

2. Temperature

The cooler the brain, the more relaxed, receptive, and cognitively sharp a learner can be. The body can more adjust to a room slightly too cold than too hot, with 68-72 F the best (Harner 1974, in Jensen, 2005: 84). Higher temperatures can influence levels of neurotransmitters, especially norepinephrine and serotonin, associated with moods. Excess levels of neurotransmitters can lead to aggressive behaviour, which can become be an obstacle to learning (Jensen, 2005: 84). Positioning of the classroom to direct sunlight can heat up, and trees can provide shade. Fans can be used to cool down a room, and the colour of the walls also can have a warming or cooling effect. Drinking water often also helps the student to maintain a lower temperature, more suitable for learning (Jensen, 2005:84).

3. Lighting

Although research has shown that the greatest success comes from students learning in full spectrum lighting, still most schools continue to use fluorescent (Wilmes, et al. 2008:661). Henry (1999, in Wilmes et al.2008: 661) studied five Canadian schools and found that natural light was preferable to electric lighting for learning. With the use of daylight, there was improvement in student attendance, a reduction in tooth decay due to Vitamin D exposure, an increase in scholastic performance and even in physical growth in natural light environments. Teachers could increase performance by replacing fluorescent lighting with full spectrum or indirect, and opening the windows to allow the natural light inside (Wilmes, et al. 2008: 661).

There has been a decline in the use of outdoor light in classrooms and homes over last 100 years (Lieberman 1991, in Jensen, 2005: 84). Outdoor light activates the synthesis of Vitamin D, which aids the essential minerals such as calcium (MacLaughlin, Anderson and Holic, 1982, in Jensen, 2005: 84). Insufficient mineral intake has been shown to be a contributing factor in nonverbal cognitive deficiency (Benton and Roberts 1998, in Jensen, 2005: 84).

A 1951 study (Harmon 1951, in Jensen, 2005: 85) examined effects of environmental factors on learning problems and reported that 50% of the 160,000 school children studied, developed academic or heath deficiencies due to insufficient light at school. When the lighting was improved, various problems were dramatically reduced. Visual difficulties declined 65%, nutritional deficiencies by 48%, chronic infections by 43%, postural problems by 26% and chronic fatigue by 56%.

A 1999 study by Heschong Mahone Consulting Group (in Jensen, 2005: 85) in California did study of 21,000 students from 3 states; students with the most sunlight in the classrooms progressed 20% faster on reading tests compared with students exposed to least lighting.

A follow up study (2003) found that sources of glare had negative effect on learning. Learning in classrooms which were exposed to morning sun unfiltered by blinds or tinted windows will underperform compared with north (it would be south here) facing windows.

We are fortunate in South Africa to have adequate sunlight throughout the year. When children are limited to sunlight for extended periods, it suppresses the production of melatonin, a neurotransmitter which plays a key role in setting the boy's time clock or circadian rhythm. Too little sunlight also decreases production of serotonin, which can cause depression (Antoniadis, Ko, Ralph and McDonald 2000, in Jensen, 2005: 85).

Some researchers suggests that long exposure to dim light like in a lecture hall, creates lethargy, sleepiness and less motivation in class (Aoki, Yamada, Ozeki, Yamane and Kato 1998, in Jensen, 2005: 85). Ordinary fluorescent lights have flickering quality and emit a barely audible hum. These can increase cortisol levels which can suppress immune system. The humming noise caused by fluorescent lights has detrimental effect on performance, especially reading. This negative impact on reading scores exceeded construction noise, socioeconomic status, and musty or mouldy classroom air (Heschong Mahone Group 2003, in Jensen, 2005: 85).

In conclusion, indirect, natural sunlight is the best for learning. Skylights, solar panels can realize energy savings to create lit up spaces, and students enrolled

in schools with above average lighting had higher physical growth rates (on average 10 more), attendance, and better academic performance (Jensen, 2005:85).

4. Noise

Our brain typically processes up to 20,000 bits of auditory stimuli every second, which means nearly every sound in the range of 20 to 15,000 cycles per second is available for processing. Getting students to hear what is the priority for them to hear can sometimes be a challenge (Jensen, 2005:87).

A study by Lawrence Feth, professor of speech Ohio University (1999, in Jensen, 2005: 87) where an assessment of the acoustics of classrooms was conducted, found that many classrooms were unsound (no pun intended), making listening and learning difficult. The majority of classrooms studied had enough background noise and echoes to hamper the learning of children with even mild hearing problems.

Noise stress can even affect a child physiologically. Evans, Lercher, Meis, Ising and Kofler (2001, in Jensen, 2005:88) found children in noisier areas had higher blood pressure and heart rates, and elevated stress levels; all of which are not conducive to learning.

Children who are learning in a second language struggle even more in a noisy classroom, and the higher number of children to teacher ratio will always have effect on the noise potential. Scientists are now wondering if noise may prevent children from acquiring speech recognition skills (Jensen, 2005: 87).

Evans and Maxell (1997, Jensen, 2005: 87) compared children in a noisy school of New York, in flight path of airport, with similar children in a quiet school. Both

subjects were tested in quiet conditions, allowing researchers to eliminate this variable. By testing them in a quiet room, they demonstrated that decreased reading scores are due to chronic noise exposure, not noisy episodes that may have occurred during testing sessions. Results indicated that children chronically exposed to airport noise had significant deficits in reading scores.

5. Building design

A new discussion is occurring between the architects and school designers, influenced by discoveries on the effects of our environments on the brain, and an Academy of Neuroscience for architecture has been developed (Jensen, 2008b:4). Their mission is to bring awareness to the neuroscientific study of responses to our built environments. According to the International Forum for Innovative schools (Lackney, 1998), brain-based learning research has come up with twelve building design principles which affect the brain in learning. These include

- creating places where students have connection and ownership to the building, such as areas for displaying their own work;
- places for group learning,
- the link between indoor and outdoor spaces, especially to do with the role of movement within the learning day;
- safe spaces to reduce threat, especially in urban settings,
- resources available in close proximity to learning space,
- active and passive spaces, for both intrapersonal intelligence as well as the social interpersonal interactions,
- the community at large an optimal learning environment.

The importance is that the building design has a coherence and wholeness around the building design, providing flexibility in order to accommodate a variety of learning styles (Lackney, 1998).

Appendix 7:

The development periods of the child according to Waldorf education

There are three capacities of the person, thinking, feeling and willing, which are also mapped out developmentally.

A child from **0-7 years old** is primarily in their willing phase, where the child learns through doing and physical development is the focus (Shmitt-Stegmann, 1997:4). The focus of education in that period is to provide a foundation for the body to develop into a skilful and able instrument for the future unfolding of that person. This is done mostly through movement and imitation. "Happy is the child who is left free to imitate during this time and who is surrounded by activities worthy of imitation (Harwood, 1967: 27)." Therefore the qualities of reverence, rhythm and repetition become very important in their development. Language is inspired through storytelling, verses, acting, puppetry, movement and play.

The next stage, from **7-14 years old** , is marked by the losing of the milk teeth and the entrance of the new ones, and sets off an entire change in the child's body. The losing of the teeth , and gaining of new ones, sheds a sheath that allows for that energy previously utilized for the growth of the body and its organs, to be utilized in the next phase, which includes memory (Steiner, 1982:67).

> Rudolf Steiner was, to my knowledge, the only educator who made the phenomenal discovery that the forces of energy, vitality and health, that have

> been active in the body building and organ forming until approximately age 7, are partially freed from their activity in the body. These forces now become available for the sphere of thought and mental activity (Shmitt- Stegmann, 1997: 7).

The same forces that built up the child's body now are available for their thought life, and they are no longer dependent on outer objects for creative, symbolic activity but can form an independent internal imaging ability (Shmitt-Stegmann, 1997: 7). At this phase, the child no longer wants to imitate what is around them, but develops an inner experience of all that is around them, including their mood and feelings. The actual content and meaning of what is said to them is less important than the sound of the words and the whole way that the speech is formulated. It is at this point that memory is freed from physical functions and into what is termed a 'pictoral consciousness' (Steiner, 1982: 62).

With this shift from functioning from the outer (body) to the inner (soul), the child gains a control over their memory and can recall it at will (Shmitt-Stegmann, 1997: 7). The memory of the early phase is more physical- a habit of brushing teeth, or a skilfulness to cut with scissors. The child is gradually learning how to move their limbs in a particular way, and this becomes a habit or skill (Steiner, 1982: 48). After the change of teeth, a picture can arise in the child's mind which holds a mood and content which are not of bodily nature. What worked in the physical body before seven can now work in the feelings, and these are inspired by the inward pictures. Waldorf methodology suggests that a teacher brings everything into pictorial form in the lessons, as to inspire those faculties to develop in the growing child (Steiner, 1982:62).

One of the vital themes to this time of age 7-14 years is that the heart is responding with feeling to all the learning that is occurring. Therefore a healthy moral foundation can be established which can awaken a sense of wonder and

develop respect and appreciation for each subject that is presented (Shmitt-Stegmann, 1997: 10).

The final phase of childhood is marked by the entry into puberty, between the ages of **12- 14 years old, and lasting until age 21**. This is when the thinking realm is truly awakened and utilized in Waldorf education. This is a shift from the heart intelligence and inner imaging into the abstract cause and effect thinking processes (Schmitt-Stegmann, 1997: 10). The intention is that the reverence and respect for life has been fostered in the previous stage, and this will bring an empathy and self-respect into the thinking phase which will temper the self-serving, consumer attitude towards the outside world. In order to balance the emotionally challenging time of puberty, independent thinking is fostered in all subjects. The teacher is encouraged to develop in the student the ability to arrive at clear discernment rather than remaining in the emotionality which leads to judgmental, uninformed decision-making (Schmitt-Stegmann, 1997: 12).

Appendix 8:

How Mollet (1991) taught a mathematics class at a struggling inner-city school

David Mollet took over a Grade 4 class of 9-10 year old children. The class's teacher had been struggling to teach them the multiplication tables, but he changed the content and taught fractions.

> Waldorf methodology stresses the importance of introducing fractions to 9-to-10 year old children, because at this age they are beginning to lose their holistic and integrated perception of the world (Mollet, 1991: 55).

Fractions, taught from the whole to the part in Waldorf education, relates the slowly fragmenting perceptions of the 9 year old.

Mollet describes his first task to "bring to life the power of imagination. This is best done through the art of storytelling (Mollet, 1991: 55)." The story was about a young man travelling to a new country and receiving a piece of land on which to farm. The farm then needed to be divided into various regions, some divided by rivers others by fences. The story was built up around what occurred in each region of the farm, which animals lived there, and the story was sketched on the board by Mollet. Then the children had the opportunity to draw their own pictures of the story.

> Much of the value of this part of the lesson lay in the children's active creation of their own pictures- had the picture been presented to the children as a page of a textbook or a diagram on a ditto sheet, it would have lost much of its vitality (Mollet, 1991: 56).

Each activity then involved mathematics, such as how much hay to feed the horses, how much pastures were needed, and the fraction of horses housed in each pasture. Soon this picture was put into words and numbers, and the way of reducing fractions was taught. But because the students already had a picture of the land in their imagination, the concepts became easy and interesting. The children were involved and attentive during all the lessons, and when the recess bell rang, nobody moved from their seats, they were so engrossed in their work (Mollet, 1991: 56).

Appendix 9:

Process of learning letters in a Waldorf classroom

Masters (1998: 18-19) offers the outline of teaching letters to Class 1 in a Waldorf school. The schedule for lessons is planned a few days in advance.

1) The teacher (I will call her she) selects a few of the consonants that she is going to teach, and in which sequence this will occur.
2) The teacher works out what are the essential qualities of the sounds of each of these consonants.
3) The teacher formulates an image, which responds to an *inner gesture* of what is in harmony with the sound quality.
4) The teacher creates a story in which the image she has formulated can be personified in the story- for instance a nimbly nymph, that sits with her knees up, in the gesture of an 'N' on top of a mushroom.
5) The teacher tells the story to the class.
6) The children re-tell the story the next day in class.
7) The teacher, then the children, draw a picture, starting with the personified element (i.e. the nymph) fairly well prescribed.
8) The teacher extracts from the picture the letter gesture which teacher and children then draw.
9) The children then familiarize themselves with the letter by moving (walking, hopping, skipping) the form, or coming up with words that start with the same sound.
10) The children discover the sound/ letter and any new letters while writing poetry or passages of literature that they have previously learned orally to recite in chorus.
11) The children read what they have written.

Appendix 10:

Letter of permission to the WCED

PO Box 22760
Scarborough
7975
eland@wam.co.za

Dr. R. Cornelissen
Director Research
Western Cape Education Department
Department of Research

5 August, 2008

Dear Dr. Cornelissen

Consent: M Ed Research Project

Name: Joy Levin
Degree: Masters in Education
Topic: Grade one literacy environments in brain-based and Waldorf schools
Supervisors: Rajendra Chetty and Anne Hill

I would like to do observation at two schools, only one of which is a WCED school- Sunvalley Primary in the South Peninsula. The other is a private Waldorf school.

I have permission from the school Principal to do my observation in the first two weeks of September. I also wish to do interviewing of the teachers involved in the Grade one curriculum. I will be asking the following research question:
How does a brain-based curriculum stimulate literacy in a Grade one environment?

I would appreciate it if permission was granted to conduct this research at this school.
I have attached my Proposal for your perusal.

I thank you sincerely,
Joy Levin

Appendix 11:

Letter to the college of teachers for permission for research at the Waldorf school

Dear College of Teachers, 26-08-08

I want to thank you for allowing me to do my masters research in this school. The Grade 1 teacher, Fezile, has kindly offered that I may observe his class on three occasions (still to be confirmed, but two this term and at least one next term). I also wanted to conduct an informal interview with the teachers.

My research questions for my thesis are:

1) How does a brain-based curriculum stimulate literacy in a Grade 1 environment?
2) How does a Waldorf curriculum stimulate literacy in a Grade 1 environment?
3) What similarities and differences are there in the two systems and what insights into early literacy development can be gained from them?

I thought it would be useful to interview as many teachers as would be willing, as all of you would have gone through Grade one, and had experience in the continuing process. The interview would take about one hour and would be in the format of a conversation.

The purpose of the interview is to allow the teachers to give their points of view and gaining clarity on what occurred in the observation period. Some of the key points I would be interested in is:

- Waldorf methods of teaching literacy, and why
- Rhythms in the day
- Role of senses
- Role of movement
- How the literacy continues from Grade one
- How the second language students are functioning in this system of literacy

I would like to tape record it. I assure that all identities of the children and teachers will remain confidential to my research.

Sincerely,
Joy Levin

Appendix 12

Questions for interviews- School A

Friday, September --, 2008

1. How would you define brain-based education?
2. What is the rhythm of the day in a brain-based.school?
3. How do you view the foundation phase years in terms of literacy?
4. How do you see the gender divisions? What are the positives and negatives?
5. How do you see the idea working that males are better at maths and females at literacy? How are these subjects scheduled, and why?
6. How does brain-based education view the affective realm?
7. How does brain-based teaching see the individual child?
8. How are remedial children worked with in brain-based education?
9. What is the role of crossing the midline in brain-based education, and how is this done?
10. Is there a specific view on literacy and the way it is taught from a brain-based perspective?
11. How does brain-based education view school readiness? What age do you take in children for Grade 1?
12. How do you work with second language speakers?
13. How do learning styles and multiple intelligences come into your teaching?

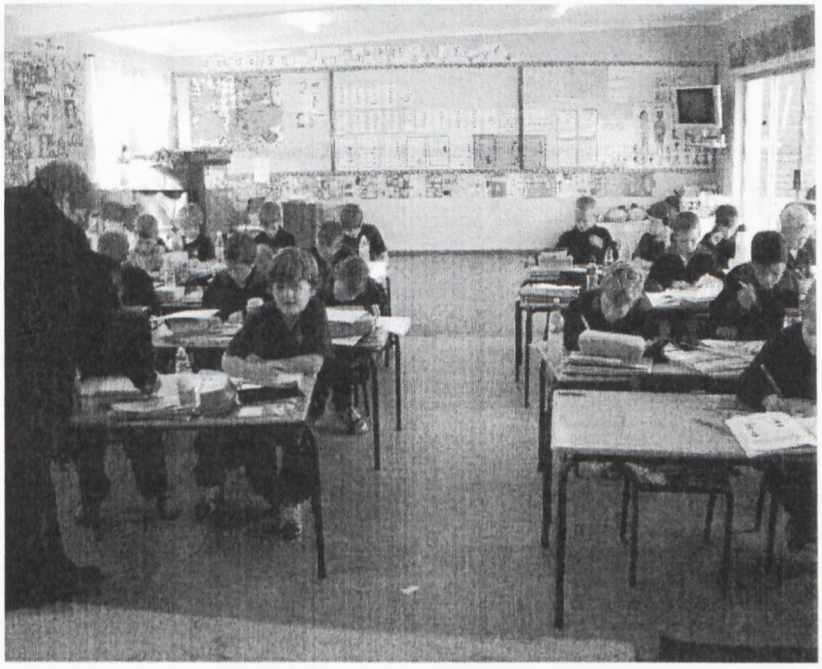
Appendix 13 Questions for interviews- School B

Friday 21 November, 2008

1. What would you describe as the essence of Waldorf education?
2. What is the rhythm of the day in a Waldorf school?
3. Could you give me an overview of the grade one program to teach writing and reading
4. Could you give the reasons for teaching writing first?
5. What is the role of storytelling in the literacy process?
6. How do you deal with children who are not coping with their work?
7. What is the role of 'crossing the midline' and how is it dealt with in the curriculum?
8. What is the role of form drawing?
9. Could you talk on the progression from class one, and into reading. Why is it done this way? What are teachers experience?
10. What is the experience of second language speakers in this environment?
11. What is the role of the physical environment- what are qualities that are of importance for Waldorf education.
12. What is the role of art in the literacy process?
13. What insights into literacy on a larger level do you think Waldorf teaching has to give?

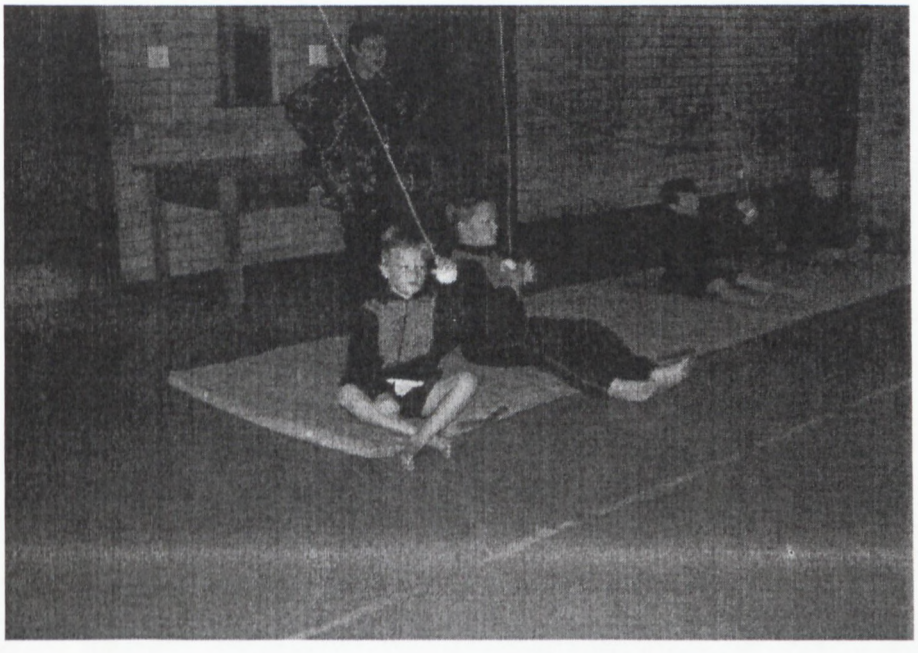
Appendix 14

Photo of School A class X (boys) from the front



Appendix 15

Gymnasium exercises in school A to balance brain hemispheres through movement- watching tennis balls on a string

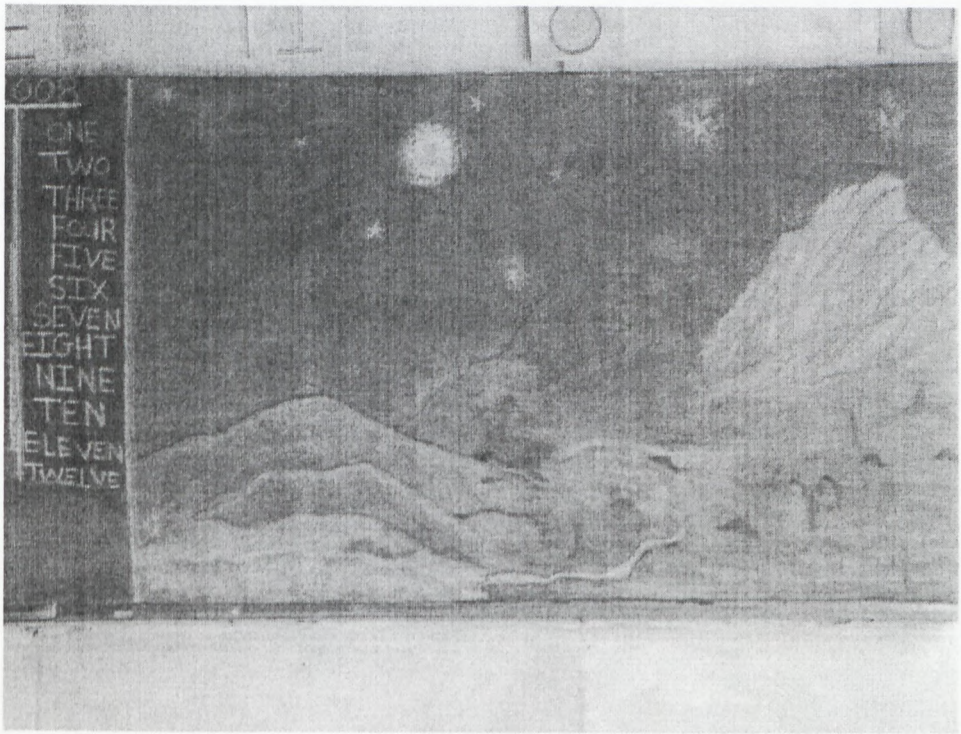


Appendix 16

Wave patterns practiced in student's books to facilitate writing, School A, Class X

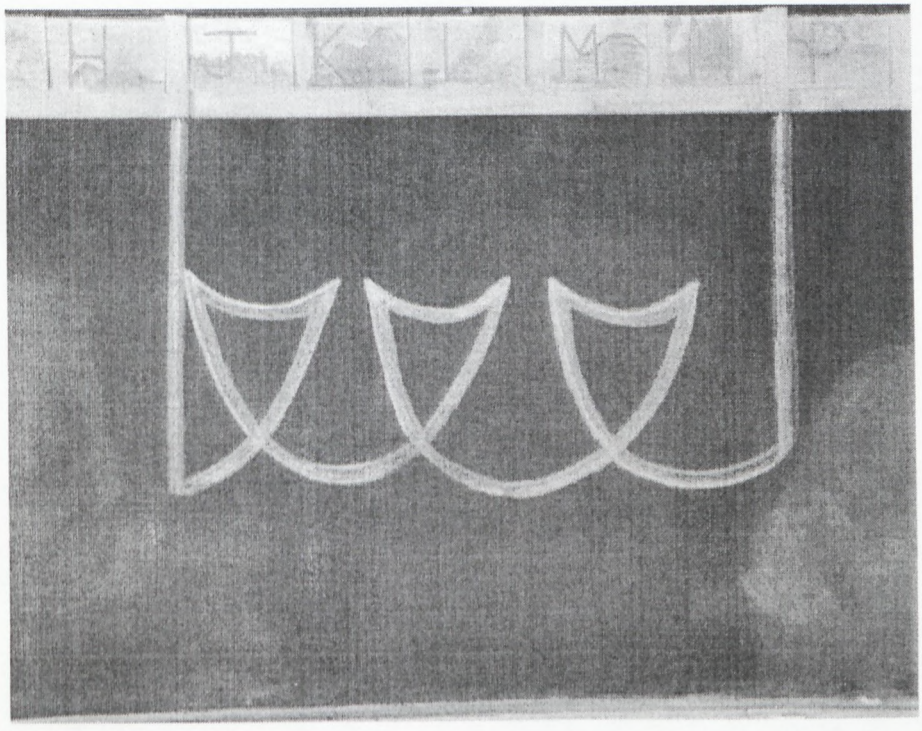
Appendix 17

Blackboard picture to accompany story, School B



Appendix 18

Form drawing on chalk board, School B



Appendix 19

Presentation of book covers, bound books made by students of their work, School B

Appendix 20

Books of students, where sentence is told, picture is drawn from story and accompanying sentence is written from the board. Note all in capital letters, School B.