The Development of Sensory Products to Stimulate Children with Learning Problems (LP)

Dissertation submitted in fulfillment of the requirements for the awarding of the degree

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By

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Declaration

I, the undersigned, hereby declare that the work contained in this dissertation is my own independent work and that this dissertation, or parts thereof, has not previously been submitted by any one or myself to another institution in order to obtain a degree.

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Signature Date

Abstract

Children with Learning Problems (LP) are mostly identified in the primary grades. Early intervention is desirable to remediate LP. One strategy is to use visual aids as a cue during an intervention strategy. A visual aid can be tactile and can appeal to the child's senses, such as hearing and touch. Three main cornerstones which influence Sensory Product Development (SPD) were identified. These are design factors such as illustrations, colour, and book themes, the senses of the children and supporting factors which include therapeutic practices and cultural sensitivity. It is envisaged that if these three cornerstones are integrated into a sensory product such as a book, that it will be able to stimulate a child with LP through play, touch and sound. The aim of the study is the development of a qualitative tool that can be used to asses sensory products and the development of a sensory product that are tested for the specific target group. The sensory product was designed according to the guidelines that were identified in a literature review. This qualitative tool includes the various cornerstones and serves as a checklist that teachers and therapists can use to evaluate a sensory product to establish its suitability for a child with LP. The second article in this study recorded the responses from children with LP towards the sensory product and recommendations for the improvement of the sensory product.

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Definition of Terms

Learning Problems

The term Learning Problems is an umbrella term that for the purpose of this study includes learning restraints, learning disabilities and/or disorders. A learning restraint develops when certain factors cause a child not to achieve his or her potential. A child with a learning disability or disorder has an identifiable deficiency in his or her given potential, such as a sensory, neural, intellectual or physical deficiency. (Kapp, 1991). Some authors within the literature refer to learning disabilities, but it can also include learning restraints.

Sensory Products

Sensory products are defined by a combination of the different sensory actions such as seeing, hearing, smelling, touching and tasting. Qualities that define a sensory product include properties such as interactivity and sensory actions.

List of Abbreviations

ADHD	Attention Deficit Hyperactivity Disorder
CAD	Computer-aided Design
CD	Compact Disc
CP	Categorical Perception
EEG	Electroencephalogram
ID	Intellectual Disabilities
LD	Learning Disabilities / Disorders
LDA	Learning Disabilities Association of America
LP	Learning Problems
MPI	Mathematical Processing Instrument
NHS	National Health Service
PCS	Bannatyne's Psycholinguistic Color System
RIM	Reading to Intervention Model
SCWT	Stroop Color and Word Test
SP	Sensory Product
SPD	Sensory Product Development
UBPCC	Universal Basic Perceptual Colour Categories
WISC	Wechsler Intelligence Scale
WISC-R	Wechsler Intelligence Scale - Revised

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Structure of the Dissertation

This dissertation is submitted via the publication output route in the form of two journal articles of which one was submitted to the *International Journal of Disability, Development and Education* and the other article to the *Journal of Special Education* (see Addendum 1 for the submission confirmation letters). The results of the two articles (Section B and Section C) were presented at the Central University of Technology, Free State's Annual Research Seminars of 2008 and 2009 respectively. The prototype of the developed sensory product was entered into the National Innovation Competition, 2009 and was awarded second prize in the Central University of Technology, Free State's leg of the competition (see Section E for the National Innovation Fund, 2009).

The first article (Section B) outlines a literature review of the different factors that should be taken into consideration when developing a sensory product for children with learning problems. From the literature review a qualitative tool was developed for the assessment of a sensory product. The second article (Section C) documents the responses from children with learning problems interacting with the sensory product which adhered to the developed qualitative tool as well as recommendations for the improvement of the product. Section D contains the sensory product which was developed according to the qualitative tool and includes all drawings, figures and sound that are related to the product's development. This section also includes a mock-up of the sensory product. The sensory product which was adapted according to the qualitative tool is a puzzle booklet which was designed as part of the author's B.Tech. studies. This book was redesigned according to the literature review of the first article and the recommendations from the teachers in the second article.

Both articles were formatted according to the APA style format retrieved from: http://owl.english.purdue.edu/owl/resource/560/01/. This style of formatting was

used because the journal in which the shortened version of the first article was submitted, requested this format. This includes the manner in which the tables and figures are presented, the headings within the articles, citation within text, references, endnotes and overall format.

The term *Learning Problems*, as defined in the section *Definition of Terms*, is used when the author is discussing a subject. It must be noted that the actual terms, such as *Learning Disability and/or Disorder* as well as *Learning Restraints*, which were used by the different authors, were kept for an indication of the groups of the children these authors used within their studies. Some authors' studies were with children with learning disabilities and/or disorders, but it does not necessarily exclude children with Learning Restraints as different authors' definitions of these terms differ.

Figure 1 is a graphic representation that outlines the method that was followed by the author for her dissertation.

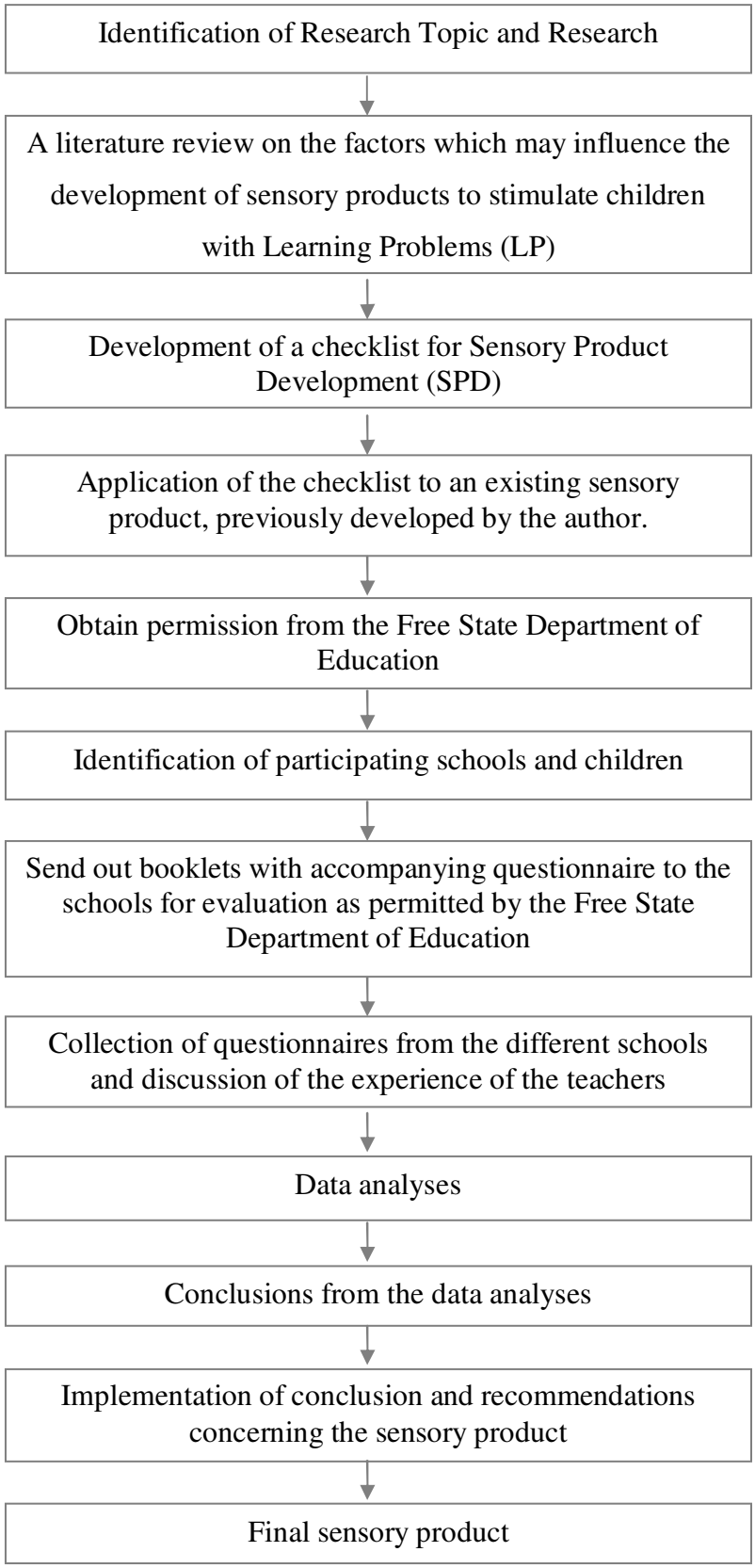

Figure 1. A graphic representation to depict the outline of the study.

Section B

Structure of Section B

A graphic representation to depict the structure of Section B is set out in Figure 2 below.

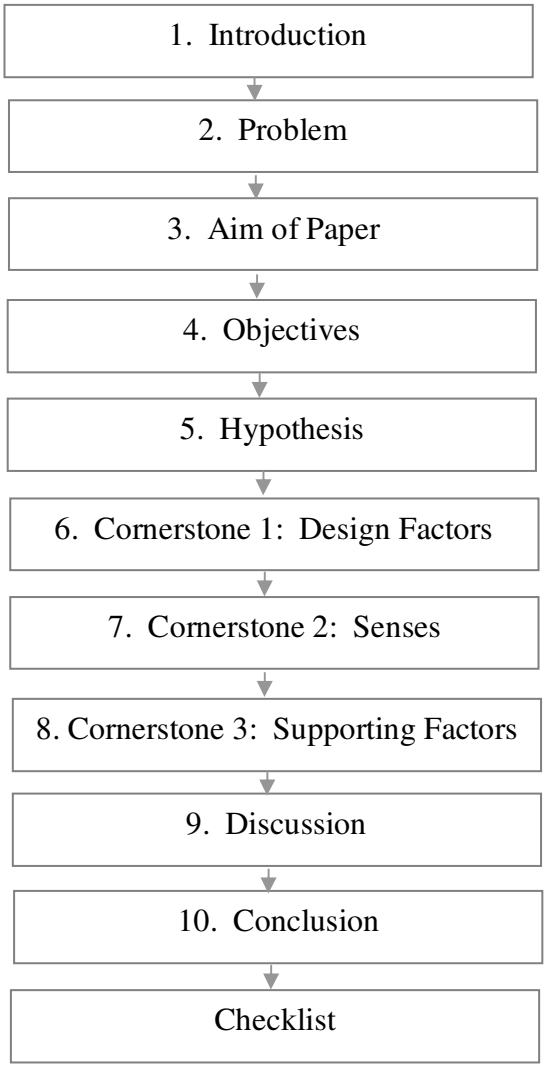

Figure 2. A graphic representation to depict the structure of Section B.

THE DEVELOPMENT OF A QUALITATIVE TOOL FOR THE ASSESSMENT OF SENSORY PRODUCT DEVELOPMENT FOR CHILDREN WITH LEARNING PROBLEMS (A LITERATURE REVIEW)

1. Introduction

This literature review bears reference to forty-four books, three unpublished Ph.D. theses and 205 articles from several journals mostly from the disciplines of design, education, psychology, and occupational therapy.

Play has become an integral part of school curricula and has been integrated into educational efforts in many nations. During play, children often use inanimate objects rather than verbal utterances to project their feelings, beliefs and perceptions about themselves and their world. Play is the mode children can use to better understand their world, the objects in that world, language, social roles, and even feelings in a safe manner without risk (Griffith, 1997). In Child-centred Play Therapy, the use of reflective feedback is a key element. The therapist serves as a facilitator in the child's journey of self-discovery (Landreth, 2002).

Bradley, Danielson and Hallahan (2002) as well as McNamara (2004) advocate the early identification of children with Learning Problems (LP),[1] ideally within the primary grades as this will provide earlier identification and can improve treatment effectiveness. Teachers involved with special education help these children through intervention strategies once they are identified. Intervention strategies use instruments such as scripted and prescribed programmes (Fuchs & Fuchs, 2006), reading aloud by teachers to learners (Fisher, Flood, Lapp & Frey, 2004) and one-on-one instruction as part of the three-tiered reading to intervention model (Scanlon & Sweeny, 2008). Remediation steps may even include frequent feedback from teachers, the use of diagrams, graphics and pictures to provide a key to the meanings

of words, modelled instructional practices, and engaging learners in open-ended questions (Learning Disabilities Association of America [LDA], 2009). Toys that remedial teachers can use in their classrooms may consist of books with tactile properties, puzzles, musical instruments, singalongs and interactive games. Tactile toys are referred to as sensory products (SP) that are defined by a combination of the different sensory actions. These sensory actions include seeing, hearing, smelling, touching and tasting. Qualities defining SP are that they include properties such as interactivity and sensory actions.

In a study of children's interactions with toys incorporating interactive toy technology, it was reported that this type of technology does have potential (Luckin, Connolly, Plowman & Airey, 2003). The shortcomings of Luckin et al.'s (2003) interactive toys, however, were that the toys were not suitable learning aids as the children's responses proved to be inadequate and, in some cases, even inappropriate. In a related study the need for developing interactive toys was highlighted as children with developmental disabilities respond usually better to these types of toys during play sessions (Hsieh, 2008; Bambara, Spiegel-McGill, Shores & Fox, 1984). SP have the potential to assist teachers and learners with LP only if the products are appropriate for the child's developmental level (Oravec, 2000).

Factors which may influence the development of SP to stimulate children with LP are design factors such as illustrations, colour and themes and supporting factors which include therapeutic practices and cultural sensitivity. These factors may be beneficial for text enhancement and reading comprehension within books for children with Learning Disabilities (LD).

Hsieh (2008) as well as Bambara et al. (1984) highlighted the benefits and value of SP, but the shortcomings of the toys developed and used in the study

conducted by Luckin et al. (2003) must be taken into consideration as this study indicated that SP must be appropriate for the child's developmental level (Oravec, 2000). The questions that were identified by the above discussion include how to develop more effective SP, how to rate such a product and how to determine the quality of an SP. One question that this study seeks to answer is how one can initially test a SP apart from experimental work, reverse engineering of existing products or from feedback from users. What makes the testing or development of an SP difficult is the qualitative nature of the testing and evaluation processes. Not a single known quantitative measuring instrument is available for the purpose of evaluating such a product. One way by which teachers can evaluate SP is to make use of a checklist. Such a checklist has to include all factors which may play a contributing role towards the development of such a product such as design factors and supporting factors.

Research indicated that interventive measures employing or making use of pictures and images (Warner & Alley, 1981), spatial organization of text content (Darch & Carnine, 1986; Mastropieri & Scruggs, 1997), mnemonic illustrations (Mastropieri & Scruggs, 1997; Mastropieri, Scruggs & Levin, 1987), adjunct aids[2] (Horton & Lovitt, 1989; Mastropieri & Scruggs, 1997) and semantic feature relationships charts (Bos, Anders, Filip & Jaffe, 1989; Mastropieri & Scruggs, 1997) may be beneficial for text enhancement and reading comprehension within books for learners with Learning Disabilities (LD).

Children with LP differ from other children and are mostly identified in the primary grades. Factors which may influence the development of SP to stimulate children with LP are design factors, such as illustrations, colour, and themes, as well as children's senses and supporting factors which include therapeutic practices and cultural sensitivity. Therapeutic treatment practices may include play material of

various categories that the therapist will use to stimulate a child and by so doing enter the child's world (Schoeman & Van der Merwe, 1996). It is envisaged that if design factors as well as sensory stimulants are integrated into play therapy mediums such as the Sensory Product Development (SPD), these play therapy mediums may be able to stimulate a child with LP through different therapeutic practices such as play therapy, occupational therapy or remediation.

The author identified three cornerstones from the literature, namely (1) Design Factors, (2) Senses and (3) Supporting Factors. Each of these cornerstones consists of several elements with their own sub-categories. These cornerstones are discussed below.

The first cornerstone which influences the development of SP is a design factor that firstly consists of design elements which include illustrations. Studies on the effects of illustrations, as a design factor, on reading comprehension for children with and without LD classified illustrations into four categories, namely: (1) representational illustration, (2) imagery, (3) spatial organization and (4) mnemonic illustrations (Mastropieri, Scruggs, Bakken & Whedon, 1996). Several studies concluded that mnemonic illustrations transform textual information so that it enhances the memory of children with LD by using three strategies, namely the keyword, the pegword and letter strategies (King-Sears, Merces & Sindelar, 1992; Mastropieri, Scruggs & Fulk, 1990; Scruggs & Mastropieri, 1992).

The second design element is colour and can be used as a design element within SPD. Berlin and Kay's (1969) study concluded that colour consists of eleven Universal Basic Perceptual Colour Categories (UBPCC) and can be used as a design element within SPD for children. The UBPCC consists of white, black, red, green, yellow, blue, brown, purple, pink, orange and grey and can be used as a colour-coding

technique for the remediation of children with reversal problems (Bannatyne, 1971; Doyle, 1982; Hammil & Bartel, 1978:82) as well as to establish whether a storyline is positive or negative (Cimbalo, Beck & Sendziak, 1978).

The second design factor is the book element that consists of the different types of books for children which contain enhancement strategies for children with LD. The primary classroom mostly promotes the reading of storybooks (Duke, 2000; Pappas, 1991; Smolkin & Donovon, 2003). Storybooks with a repetitive line or repetitive lines lure learners into reader anticipation (Center for Assistive Technology, 2000) which in its turn promote the function of interactive and read-aloud books which produce greater gains in working with learners in special education (Englert, Tarrant, Mariage & Oxer, 1994; Mariage, 1995). Several Radical Change characteristics must be considered for the designing of children's books (Dresang, 1999) as well as interventions such as representational images and pictures (Warner & Alley, 1981) and mnemonic illustrations (Mastropieri & Scruggs, 1997; Mastropieri, Scruggs & Levin, 1987) which are beneficial for text enhancement and reading comprehension within books for children with LD.

The second cornerstone which influences the development of SP is children's senses. The age of multiliteracy[3] involves the reading of colour, sound, movement and visual representations (Turbill, 2002). A theoretical basis for remediation of LD was developed by Johnson and Myklebust (1967) who discussed LD in terms of disabilities relating to the various processes of learning, namely sensation,[4] perception,[5] imagery,[6] symbolism[7] and conceptualization.[8]

Knowledge about the capacities and limitations of one's different senses may enable perception abilities to be used more effectively (Lempers, Flavell & Flavell, 1977). Young children have some knowledge, as well as misconceptions, about

their senses and could identify the five sensory organs with its associated sensory action (O'Neill & Chong, 2001; Weinberger & Bushnell, 1994). Evidence suggested that children with and without LD and Attention Deficit Hyperactivity Disorder (ADHD) differ in sensory processing (Corbett & Stanczak, 1999; Downey, Stelson, Pomerlaeau & Giordani, 1997; Dunn & Bennet, 2002).

The five senses mentioned previously are sight, hearing, taste, smell and touch. Visual imagery, as an important aspect of sight, has a role in establishing the meaning of a problem, channelling problem-solving approaches and influencing cognitive constructions (Owens & Clements, 1998).

Music, as a manifestation of sound, has qualities that music therapists use to achieve growth towards the individual's therapeutic objectives (Australian Music Therapy Association Incorporated Brochure, 1999). An elementary music programme provides assistance in the perceptual-motor coordination of learners with various LD (Tanner, 2001). This type of coordination area is important for the development of a child with LD. The use of rhythmic instruments such as rhythm sticks or triangles may aid in perceptual-motor coordination (Tanner, 2001).

The third cornerstone is the supporting factors which consist of toys, play, play therapy and cultural sensitivity. Semrud-Clikeman (2005) was of the opinion that a multitier approach to intervention in cases of children with LD has much promise. Hill and Taylor (2001) as well as Lord and Paisley (2000) also recommended a multidisciplinary approach to the management of ADHD of which a stimulant medication is an integral part. A multidisciplinary approach may involve therapeutic treatments such as play therapy, remedial therapy, physiotherapy and occupational therapy. Through play, children can master problem-solving and appropriate social skills, they can acquire the ability to organize, plan and attain self-esteem (Burdette & Whitaker, 2005).

2. Problem

A latent disability or disabilities are most likely to be identified once a child enters primary school level. Children entering primary school level and who are subsequently identified as having learning problems, are at a crucial age as far as the effectiveness of interventive measures is concerned. Early intervention is thus of utmost importance in all cases of children with LP to ensure that they receive the maximum benefit from the treatment and interventive measures. It is envisaged that if the different cornerstones which influence SPD for children with LP are taken into consideration, it can be used to help compile a checklist that can be used for the development of SP for children with LP.

3. Aim of Paper

The aim of this paper is to review publications in order to identify factors which have to be taken into consideration for the development of SPD to stimulate[9] children with LP in Grades 1 and 2. These factors include three cornerstones, namely design factors, the senses, and supporting factors which consist of several elements that contribute towards product development.

4. Objectives

1. To obtain suitable guidelines from the literature review for the development of the SP.
2. The development of a checklist from the guidelines of the literature review that can be used to asses an SP for children in a classroom as well as within a therapeutic practice.

5. Hypothesis

The hypothesis of this study is that the compilation of a checklist may contribute towards a structured assessment of sensory products aimed at children with LP and in so doing contribute towards SPD overall. The compilation of a checklist within this article brings in another dimension in which teachers or qualified personnel can asses an SP in a classroom situation or within a therapeutic practice.

6. Cornerstone 1: Design Factors

The first cornerstone consists of two elements, namely (1) the design element and (2) the book element. Each of these elements has several sub-categories that provide specific information that will contribute to the development of the SP.

6.1 Design element

This section of work relates to (1) illustrations, (2) language, (3) colour and (4) layout, typography and visual appearance which will contribute to design as an element within this article.

6.1.1 Illustrations. Botha (2008) evaluated twenty checklists using Hugo's grading model and identified several key elements regarding illustrations that can form part of an evaluation tool, namely: (1) pictures must be realistic; (2) pictures must agree with the content of the text; (3) text must provide information regarding the illustrations; (4) graphic cues (arrows and lines) can be used within the illustrations to direct attention to a specific item; (5) illustrations that are printed in colour must emphasize importance; (6) pictures must have captions; (7) illustration must have legends that are explanatory, instructive and comprehensible; (8) text may not flow over illustrations and (9) illustrations must be suitable for the specific target group.

Studies on the effects of illustrations on reading comprehension for children with LD and without LD classified illustrations into four categories, namely: (1) representational illustrations, or pictures that show information presented in the accompanying text; (2) imagery or instructions to generate mental pictures to represent what is happening in the text; (3) spatial organizations or pictures that graphically display and organize text material and (4) mnemonic illustrations that are intended to facilitate memory of key vocabulary or important content information from text materials (Mastropieri, Scruggs, Bakken & Whedon, 1996).

Representational Pictures. Representational pictures are thought by Levi (1987) and Paivio (1971) to have a supporting effect on reading comprehension as it provides a "sensory code"[10] for input of text information. Peeck (1987) suggested that illustrations may yield affective-motivational effects during reading. Concern, however, has been expressed that these pictures could distract the attention of learners with LD away from text towards the less specific pictorial information (Rose, 1986). Rose's study (1986) on the effects of illustration on text indicated that learning disabled elementary-age readers comprehended non-illustrated reading passages significantly better than illustrated passages. A possible solution to the concern, which was expressed by Rose, (1986), is that the pictorial information or illustrations must be more explanatory to represent the text; however, this solution yielded less than optimal results as recorded by Haber (1983). In a study conducted by Mastropieri and Scruggs (1997), research on the use of representational pictures and imagery instruction indicated vague results whereas all other strategies (mnemonic illustrations, spatial organization, study guides and semantic feature analysis charts) evoked a positive effect on students with LD.

Imagery. Imagery is a strategy that has been widely taught as a potentially powerful reading comprehension strategy (Sheikh & Sheikh, 1985). Imagery is thought to improve reading comprehension in a manner similar to the "dual coding"[11] effect afforded by representational illustrations (Clark & Paivio, 1987; Suzuki, 1985).

Spatial Organization. Spatial organization interventions include charts, graphs and diagrams that may help organize the content from accompanying text. These illustrations are thought to provide a "visual code"[12] on the organization of information and to present information that can be explained more efficiently visually (Winn, 1987). Visual-spatial organization of a reading passage improved comprehension (Mastropieri & Peters, 1987) through the use of a visual organizer (Darch & Carnine, 1986). It was found in the study of Mastropieri and Scruggs (1997), titled "The Best Practices in Promoting Reading Comprehension in Students with Learning Disabilities", that spatial organization fabricates positive effects among these students.

Mnemonic Illustrations. Mnemonic illustrations are different from other types of illustrations. These illustrations transform textual information so that it enhances memory by using both visual and verbal cues (The Access Center, 2007). Mnemonic principals make use of a linking association (example: A = apple). The three methods for teaching mnemonics are the keyword, the pegword and the letter strategies.

The keyword strategy links new information to keywords that are already encoded to memory. The facilitator may teach a new lexical item by first identifying a keyword that sounds similar and which can be represented by a picture[13] (The Access Center, 2007). According to Scruggs and Mastropieri (2000), this strategy is mostly implemented for the learning of new information. King-Sears, Merces and

Sindelar (1992) as well as Scruggs and Mastropieri (1992) reported that learners with LD could generate their own keyword strategies; however, learners do well when they are provided with the mnemonic illustration.

The pegword strategy uses rhyming words to represent numerical proxies[14] or order. The rhyming words (pegwords) provide visual cues for facts or events (The Access Center, 2007).

Letter strategies involve the use of acronyms and acrostics. Acronyms represent individual letters of words (e.g.: ADHD – Attention Deficit Hyperactivity Disorder) whereas acrostics are sentences whose first letters represent information (e.g.: My Very Educated Mother Just Served Us Nine Pizzas – the nine planets). This strategy can be used to remember a list of information (The Access Center, 2007).

Scruggs, Mastropieri, McLoone, Levin and Morrison (1987) reported an enhanced recall and factual inference when mnemonic illustrations were used versus the same material as descriptive illustrations (Scruggs & Mastropieri, 1989; Scruggs & Mastropieri, 1992; Mastropieri, Sweda & Scruggs, 2000). Learners with LD who use mnemonic strategies have substantially outperformed control learners when it came to the learning of new facts or new vocabulary (Mastropieri & Scruggs, 1989) whereas research by Mastropieri, Scruggs and Fulk (1990) demonstrated that learners with LD do well with the keyword strategy on comprehension and recall tasks. It was found by Mastropieri and Scruggs (1997) that mnemonic illustrations generate positive effects among these students and promote reading comprehension.

The information processing difficulties experienced by children with LD are complex and may be a result of a number of variables (Torgesen & Houck, 1980). However, reading deficits in children with LD have been found to be partly a result of

production deficiency in mnemonic strategies (Morrison, Giordani & Nagy, 1977; Tarver, Hallahan, Kauffman & Ball, 1976). Torgesen (1977a; 1977b) has demonstrated that normal elementary school readers, when compared with LD children, use "verbal rehearsal" strategies which appear to be more efficient. Verbal rehearsal enhances the performance of LD children more effectively than visual imagery (Dawson, Hallahan, Revve & Ball, 1980), especially among younger children with LD (Rose, Cundick & Higbee, 1983).

Adjunct Aids. Adjunct aids can consist of study guides (Horton & Lovitt, 1989; Mastropieri & Scruggs, 1997), audio cassettes (Torgesen, Dahlem & Greenstein, 1987), underlining (Chan & Cole, 1986; Mastropieri & Scruggs, 1997) and semantic feature relationship charts (Bos, Anders, Filip & Jaffe, 1989; Mastropieri & Scruggs, 1997) and are thought to improve comprehension by helping intensify stimuli and by focusing attention on significant facts and relationships (Horton & Lovitt, 1989; Mastropieri & Scruggs, 1997). Learners with reading difficulties will profit from the use of diagrams and clear layout with a reduced amount of text to highlight important concepts and to promote easy navigation through materials (McCann, 1996). Mastropieri and Scruggs' (1997) study indicated that adjunct aids such as study guides, highlighting, underlining, embedded questions and semantic feature analysis charts generate positive effects among students with LD as well as promote reading comprehension.

6.1.2 Language. Language within an SP should be consistent right through the text as this may reduce the chances for confusion and misunderstanding that might occur (Capital Health Patient Education Advisory Committee, n/d; Mencap, n/d).

Botha (2008) evaluated several existing checklists in her study by using Hugo's (2000) grading model.[15] Several key elements regarding language were

identified and can be used as an evaluation tool for the SP, namely: (1) short words, preferably one to two syllables must be used; (2) short sentences with one idea per sentence; (3) simple grammatical structures and punctuation; (4) short paragraphs with only one idea per paragraph; (5) text must be written in the active voice; (6) difficult concepts must be explained by using general everyday words; (7) text must be written in the third person; (8) numbers must be used rather than words and (9) language must be consistent throughout the SPD.

6.1.3 Colour. Colour can be effectively used for the identification of the main points of the contents within a document (Carstens, 2004; Snyman, 2004). According to Petterson (2002), colour is important in a visual when it carries information that is vital to the contents in the visual (example: species of butterflies). Colour is capable of enhancing communication by adding clarity and impact to a message. Three aspects of colour that must be considered within the printing process are (1) the colour of the paper (Morris, 2001); (2) the colour of the typography (Morris, 2001) and

(3) good contrast between the two previously mentioned aspects (Hoffman & Worrall, 2004; Wilson & Williams, 2003). Yellow typography, dark or bright background and reverse typography (white out of a colour) should be avoided according to Botha (2008). It is recommended by Carstens (2004) and Morris (2001) that the chosen colour scheme be pre-tested on the intended audience.

This section of work consists of (1) colour and learning problems,

(2) categorical perception and (3) colour terms.

Colour and Learning Problems. Doyle (1982) explored the effectiveness of the colour-coding technique in remediating the reversals of p, b and d for children with reversal problems. It was found that in this particular experiment by Doyle,

using colour-coded letters as cues in words was less effective than simply practising the same words without colour-coded cues. A colour-coding process may enable learners to retain critical information and disregard redundant and irrelevant information. An effective and systematic colour code with a maximum of four to six colours in a learning material assists the learner in organizing and categorizing stimuli into meaningful patterns (Petterson, 2002). The colour-coding of problem letters, phonemes and words for children with LD has been an accepted axiom in this particular field for several years. Some systems colour code only the vowels (Bannatyne 1971:646), others lean more towards a phonics approach and colour-coded phonemes, such as Bannatyne's Psycholinguistic Color System (PCS)[16] (Hammil & Bartel 1978: 82). The conclusion can be drawn that children with LD who score higher on the Verbal section of the Wechsler Intelligence Scale for Children (WISC)[17] benefit more from the non-colour-coded drill and children with a higher performance score seem to draw much more benefit from colour-coding (Doyle, 1982).

The Stroop Color and Word Test (SCWT)[18] is a qualitative tool that can be used to (1) define the cognitive correlates of ADHD (Carlson, Leahy & Neeper, 1986), (2) prognostic power of the SCWT in ADHD (Perugini, 1999) and (3) assess neuropsychological functioning in non-referred siblings of children diagnosed with ADHD (Seidman, Biederman, Monteaux, Weber & Faraone, 2000). The results from the above-mentioned studies suggest that the SCWT can be used as part of a larger test battery to help classify children being screened for ADHD (Golden & Golden, 2002).

Improved academic attention has been documented for students with ADHD by Swanson, Barlow and Kinsbourne (1979) and Zentall (1985) on simple vigilance

or writing/copying tasks which add colour during the initial training trials as well as on more complex tasks which add colour during later training trials after practise (Zentall, Zentall & Booth, 1978). In as study by Zentall (1989), the conclusion was drawn, with reference to the above-mentioned studies, that colour which were added late to enhance some component of the relevant instructional stimulus improved the more complex performance of students with ADHD. Another finding with regard to this topic concluded that colour did not enhance sight-word learning for longer reading comprehension tasks, but colour had an immediate effect across and within sessions (Belfiore, Grskovic, Murphy & Zentall, 1996) and if a colour or other defect is present, when a child is colour-blind, using the Sheridan-Gardiner Matching Test, then "wrong" letters are chosen (Gardiner, 1973).

Categorical Perception (CP).[19] The effect of colour categorization in visual search[20] was explored by Daoutis et al. (2006). They found that CP in children and adults could be learned and possibly sharpened by the learning of a language.

The following section on CP is divided into (1) language, (2) age, (3) gender and (4) emotions. According to Berlin and Kay (1969), languages vary in how many colour terms they have and the positions of category boundaries. If a language is limited in colour terms, it will have less than eleven basic colour terms[21] which are the maximum found according to Berlin and Kay (1969). The learning of a language takes place between the language ages of two and three years and by a language age of four years, children can name and understand most of the eleven basic colour terms (Daoutis, et al., 2006). A child's ability to understand and name the colour categories increased with language-age (Pitchford & Mullen, 2001a; Pitchford & Mullen, 2001b; Pitchford & Mullen, 2003) and colour discrimination could be improved with practise (Özgen & Davies, 2002). Özgen and Davies (2002) argued that perceptual learning

during the learning of a language could produce CP because language directs attention to the boundary regions between different colour categories, thus the acquisition of CP could be due to colour-naming.

The second section on CP bears reference to the age of a child. It was found in a study by Pitchford and Mullen (2003) that early development in children regarding aspects of the colour system develop before the age of six and protracted development for aspects of the motion processing system after the age of eight. In addition, perceptual colour categorization appears to be invariant across age in partially sighted individuals (Offenbach, 1980) and has also been shown in other primate species (Matsuzawa, 1985).

The third section on CP involves gender. One function of colour is carrying gender-related information (Boyatzis & Varghese, 1993). The adage "pink is for girls and blue is for boys" is reflected in parents' use of colours to distinguish sons' and daughters' early environments and objects (Pomerlau, Bolduc, Malcuit & Cossette, 1990).

The fourth section on CP comprises emotions. The association between colour and emotional symbolism has been established (Burkitt, Barrett & Davis, 2003; Zentner, 2001). A colour-related emotion, which is the emotion with which the colour is associated, can be positive or negative depending on (1) a child's personal experience of a specific colour (Boyatzis & Varghese, 1993); (2) a child's feelings towards the topic of the drawing (Winston, Kenyon, Stewardson & Lepine, 1995); (3) cultural conventions (Zentner, 2001) and (4) gender (Deaver, 2009; White, 1998). In a study by Winston et al. (1995) it was found that children of all ages use black to complete negative characterized topics whereas primary colours were used to complete positive characterized topics; this finding was neither age nor topic specific.

In a study by Cimbalo, Beck and Sendziak (1978), second and third graders were presented with pictures of scenes that were rated as either happy or sad. The children were asked to colour in a shape with a colour of their choice. Their choices reflected strong colour emotion association. When viewing happy scenes, children used orange, yellow, green and blue. When viewing sad scenes, children tended to use brown, black or red[22] which can possibly be explained by the phenomenon that most children experience fear of the dark at an early age. The colour red is also associated with anger, aggression, excitement and generally happiness, green with quietness and with being withdrawn (Boyatzis & Varghese, 1993), black and other dark colours with depression or anxiety (Birren, 1978; Burkitt et al., 2003; Sharpe, 1974; Winston et al., 1995). Boyatzis and Varghese's (1993) study, on the contrary, found that the colour black evoked a positive reaction from almost half of the children they tested. In the previous authors' study, boys had more positive emotional reactions to dark colours than girls. Conclusions drawn from the above-mentioned studies can not be generalized, as the findings are only implicated on the related authors' selected child groups.

Colour Terms. The eleven UBPCC are white, black, red, green, yellow, blue, brown, purple, pink, orange and grey, each of which is defined by a focal region (Berlin & Kay, 1969). Three-year-old children can accurately distinguish between the boundary of warm (red, orange and yellow) and cool (green, blue and purple) colours (Pitchford & Mullen, 2003).

The perceptual focal point of each colour category is consistent across all languages that use particular colour terms, indicating that the underlying internal conceptual representation of focal colour regions is universal in structure (Regier, Kay & Cook, 2005). Children are more likely to select and are better at matching

(Henderson & Pehoski, 2005:68), comprehending and naming (Andrick & Tager-Flushberg, 1986) focal colours than non-focal colours, abilities which are independent from the particular ethnic group or culture the individual belongs to or genetic differences (Uchikawa & Boynton, 1987). The ability to name colours is taken as an indicator of colour cognition, as accurate colour-naming involves the transference of information from conceptual colour-processing mechanisms to stored lexical colour codes (Davidoff, 1991).

Colour terms may not be systematically mapped to colour sensations during the initial stages of colour term acquisition (Nelson, 1991). Young children appear to have difficulty establishing conceptual representations of colour sensations[23] (Pitchford & Mullen, 2001a; Sabbotsky, 1997) as colour terms appear at a later developmental stage than labels for familiar objects (Pitchford & Mullen, 2001a; Pitchford, 2006).

6.1.4 Layout, typography and visual appearance. Other design factors that must be considered for the SPD are layout, typography and the visual appearance of the content of the SPD (Botha, 2008). The cover design, correct use of white space and margins, variation in line length and text justification are part of the necessary elements of layout that attract and capture a reader's attention (Morris, 2001). Carstens (2004) recommends a leading between 1.2 – 1.5 line spacing with margins that are no less than 1.2cm to create a balanced layout of white space. Carstens' (2004) study identified that the typography of headings and sub-headings must be clear, consistent and close to the related text.

Several authors preferred the use of a serif font (Gasser, Boeke, Hafferman & Tan, 2005) whereas others preferred a sans serif font (Mencap, n/d; National Health Service (NHS), n/d; The University of Reading Department of Typography and

Graphic Communication, n/d). The literature can be divided on the different font types; however, it is of more value that most authors agree on the importance of a typeface weight and size (Hartley, 1994; Radmeyer, n/d; Snyman, 2004). The most important aspect of a typeface is that it must be clear and easy to read for the specific target audience. To avoid confusion and cognitive overload, Carstens (2004) recommended that not more than two different typefaces be used in one document.

A bold typeface is recommended for highlighting a specific word or phrase rather than the use of italics, underlining and/or upper case (Mencap, n/d). All caps within text reduce perception, word cognition and reading speed (Carstens, 2004). According to Carstens (2004) and Morris (2001), the typeface, size of the typeface, spacing and margins should limit the general eye span to 60-70 characters for the increase of perception, encoding and subsequent legibility.

Lexia is a free sans serif font that includes a non-symmetrical b and d (i.e. the b does not look like a backwards d), and handwritten forms of a and g, which readers may recognize more easily and which are recommended for children with LP (SchwabLearning.org, 2007).

Botha's (2008) study identified several key elements regarding layout, typography and visual appearance that can be used as an evaluation tool for existing checklists regarding this element, namely: (1) font must be at least 12 points; (2) a clear typeface must be used; (3) sentence case must be used; (4) good contrast between print and paper; (5) pages must appear uncluttered with ample white space; (6) headings must be clear, consistent and close to the related text; (7) general eye span must be less than 60-70 characters; (8) words may not be hyphenated at the end of lines; (9) text must be left aligned; (10) cover must be attractive, indicate the core

content as well as the intended audience and (11) the layout should be consistent throughout the SPD process.

Text is an important element of layout that needs consideration, especially when designing an SP for children. Rowntree (1966) proposed several guidelines that can be used for writing effective text, namely: (1) write as you talk; (2) use the first person; (3) use contractions; (4) talk directly to the reader; (5) write about people, things and facts; (6) use active verbs and personal subjects; (7) use short sentences; (8) use short paragraphs; (9) use rhetorical questions; (10) dramatize whenever possible and (11) use illustrations, examples and case studies. Several of Rowntree's guidelines are, however, in contrast with the Radical Change characteristics which is a more recent set of guidelines.

Petterson (2002) also provided several guidelines for text, namely: (1) the entire piece of work must have a mutual theme running right through; (2) metaphors may be used within text; (3) avoid long sentences; (4) join sentences with conjunctions and verbs; (5) four or more items in a list must be listed in bullet form; (6) sentences must convey only one thought; (7) use short, familiar words and (8) plan for pictures within your text, because these two elements must form a whole.

6.2 Book element

This section of work consists of (1) types of book and (2) book themes which will contribute to the different kinds of children's books as an element within this article.

6.2.1 Different categories of books. Topic choices for children's books are mostly indicated by the gender of the child (Donovan, Smolkin & Lomax, 1999). Donovan et al. (1999) noted in their study on the Self-selection Criteria of First-graders that reading groups consisted of children belonging to the same sex and who

would select multiple books on a single topic. Male gender topic books would most likely be about spiders, snakes and so forth, whereas female gender topic books would most likely be about horses, baby animals, animals in general and so forth. The different types of children's books consist of the sub-categories (1) storybooks, (2) interactive and read-aloud books, (3) information books and (4) picture books.

Storybooks. Most storybooks are designed for young children and are promoted by the primary classroom (Duke, 2000; Pappas, 1991; Smolkin & Donovan, 2003). Storybooks can include a repeating line or lines[24] which children recognize (Center for Assistive Technology, 2000) and lure them to anticipate in the story that is being read. The rewriting of an existing classical story, such as Goldilocks, is a novel way in which children can learn the development of a storyline. Reader-response instruction that is associated with this type of development views reading as a process that engage children in a transactional, aesthetic and emotional relationship with the text (Broad, 2002). The retelling[25] of a story provides teachers with information about children's understanding of important aspects of text, text structure, coherence and opinions (Pearman, 2008).

Interactive[26] ***and Read-aloud Books***. Read-alouds can support children's developing ability to reason for themselves and with others as well as in the event of a discussion of the book being read (Dickinson & Smith, 1994). The interactive approach that teachers use during the reading of a storybook in a classroom situation provides opportunities (1) to gain insight into the connection between the learner and the text (Oyler, 1996:150); (2) for text and information to work together (Pearson, Roehler, Dole & Duffy, 1992); (3) to ascertain children's experiences (Duke, 2000; Pappas 1991); (4) to determine children's reasoning out of new ideas, connections and to pose questions regarding the story being read (Oyler, 1996; Oyler & Barry, 1996;

Pappas & Barry, 1997); (5) for the understanding of a child's world (Pearson, Roehler, Dole & Duffy, 1992) and (6) to support co-construction (Oyler, 1996; Oyler & Barry, 1996; Pappas & Barry, 1997). The type of scaffolding,[27] modelling, reading strategies, supporting risk-taking and sharing control by teachers with interactive and read-aloud books has been found to produce greater gains in work with learners in special education (Englert, Tarrant, Mariage & Oxer, 1994; Mariage, 1995).

Informational Books. The reading of informational texts[28] is mostly neglected in the primary classroom (Duke, 2000; Pappas, 1991; Smolkin & Donovan, 2003), but informational texts may be more likely to hold the attention of boys and struggling readers (Caswell & Duke, 1998).

Picture Books. Research indicated that interventive measures such as representational pictures and images (Warner & Alley, 1981), spatial organization of text content (Darch & Carnine, 1986; Mastropieri & Scruggs, 1997), mnemonic illustrations (Mastropieri & Scruggs, 1997; Mastropieri, Scruggs & Levin, 1987) and adjunct aids[29] (Horton & Lovitt, 1989; Mastropieri & Scruggs, 1997) and semantic relationships charts (Bos, Anders, Filip & Jaffe, 1989; Mastropieri & Scruggs, 1997) may be beneficial for text enhancement and reading comprehension within books for learners with LD.

6.2.2 Different focus areas of books. The different book themes consist of the sub-categories (1) music book, (2) texture book, (3) hand-eye coordination/perceptual-motor coordination book, (4) puzzle book and (5) pop-up book.

Music (see Senses/Sound). Sound and/or music can be incorporated into children's books through (1) a Compact Disc (CD) - which contains a reading of the

story and is played to the "reader" or (2) a reactive book – buttons that can be pressed by the reader to play a specific melody and/or sound.

Kemper and Danhauer (2005) and Kennelly and Brien-Elliot (2001) found that music can be a useful therapeutic medium as music plays an integral role in the stimulation and development of children (Barrickman, 1989; Kennelly, 2000). An elementary music programme has been used as a therapeutic medium in the development of perceptual-motor coordination of learners with various LD (Tanner, 2001).

Songs, rhymes, chants, musical games and lullabies have been used for many years to teach very young children social, language, motor and emotional skills that are required for functioning within a family as well as in their wider environments (Grasso, Allison, Button & Sawyer; 1999). McCann (1996) found that a deep and unhurried voice, male or female, are preferred when creating audio cassettes and video voice-overs.

Texture (see Senses/Touch). Texture and/or tactile stimulation can be incorporated into children's books through (1) pieces of textured material and/or paper rotating wheels, doors, flaps and cut-outs within the book and (2) a book that is completely made out of a textured material and/or paper.[30]

A multi-sensory approach (visual, auditory, kinaesthetic or tactile) provides a chance for all slow readers to acquire information (Haber, 1975). Preschoolers can develop their creative problem-solving skills and increase hand-eye coordination through the use of materials. Tactile materials hold a special appeal for curious preschoolers that are ready for new adventures (Miller & Church, 2003).

In a study by Haber (1975) on the effects of tactile stimulation as a therapeutic medium for children with reading disabilities, it was found that the senses can

strengthen each other and that stronger senses (touch in the case of Haber's study) can be disciplined to perform the function of weak ones (sight in the case of Haber's study).

Hand-eye Coordination/Perceptual-motor Coordination Book (see Senses/Touch and Sound). Children's books can develop hand-eye coordination through the use of different materials such as (1) textured materials, (2) wooden blocks and (3) the movement of solid objects; perceptual-motor coordination exercises can be incorporated through the use of (1) rhythmic instruments such as rhythm sticks and triangle cutting, (2) colouring, (3) writing and (4) the threading of beads.

Preschoolers develop their creative problem-solving skills and increase hand-eye coordination through the use of materials (Miller & Church, 2003). An elementary music programme provides assistance in the perceptual-motor coordination of learners with various LD (Tanner, 2001). This is an important area of development for a child with LD.

Assistive Technology include assistive, adaptive, and rehabilitative devices and can be used for children with disabilities because these children may have difficulty interacting with objects and people (Center for Assistive Technology, 2000). Design factors that need to be taken into consideration with hand-eye coordination are (1) switch characteristics and (2) positioning options of the switch. Switch characteristics consists of: (1) the size of the surface "target" that a child must activate is a primary characteristic, i.e. how large or small does the surface need to be?; (2) the amount of force (pressure) required to activate a switch must be considered, i.e. how sensitive is the switch?; (3) another consideration is the amount of travel that a switch has, in other words, the distance that a switch has to be moved

before it activates; (4) feedback can be tactile and/or auditory - many switches make an audible "click" when activated; (5) the durability of a switch is another important feature as some children may not be able to control the amount of pressure they use to activate a switch and lastly, (6) what does the switch feel like, i.e. does the child prefer a particular texture? (Center for Assistive Technology, 2000). When considering positioning options, the following should be taken into account: (1) the child should be in a comfortable position; (2) the switch should be placed near the child's easiest, most reliable access site; (3) the toy/device that the child is activating should be placed in close proximity to the switch itself and (4) the switch should be secured in a stable position so that it does not move out of place when it is activated (Center for Assistive Technology, 2000).

In their studies on children with ADHD, Hern and Hynd (1992) as well as Reeves and Werry (1987) note that hyperactive children exhibit more neurological aloft signs such as abnormal muscle tone and balance, foot/leg incoordination, hand/arm incoordination and abnormal sensory perception when compared to children without disabilities.

Puzzle Book (see Other Factors/Toys). According to Taylor, Morris and Rogers (1997), puzzles form part of a group of few toys that are appropriate for young, school-age children. Puzzles provide visual discrimination practise as a child can figure out how the different elements fit together to form the visual whole. Puzzles also provide practise in hand-eye control as the pieces are fitted together (Stephenson, 2000).

Pop-up Books. A child's natural curiosity and wonder are clearly evident as he or she interacts with pop-up books that feature sophisticated paper engineering

design and are often like works of art. According to Ball (2003), these books may also provide enticement for reluctant readers.

Pop-ups books consist of movable, three-dimensional illustrations, rotating wheels, doors, flaps and cut-outs. The formats of these books require hands-on interaction and involvement, which can add extent to and develop the theme of the book and can also encourage reading with expression, enthusiasm and physical movement (Kurkjian, Livingston, Henkes, Sabuda & Yee, 2005).

A comprehensive pop-up book may be overwhelming for a learner in the elementary grades (Ball, 2003), so may be books with interacting paper engineering with a complex storyline (Kurkjian, et al., 2005). The format of this type of book limits the number of pages it can consist of due to the bulkiness of these books. Dales (2007) has compiled a criteria checklist that may be used to evaluate a book containing paper engineering, namely: (1) the pop-ups or movable parts should enhance the meaning of the text and assist in helping the reader construct meaning beyond what could be communicated in two dimensions; (2) the paper engineering should be visually appealing; (3) the artistic elements (colour, shape, space, perspective and texture) should represent typically accepted standards of quality; (4) the design elements (rhythm and movement, tension and page layout) should aid in creating a unique coordination between text and visuals; (5) the timing, pacing and animation of the pop-up on a specific page should coordinate with the text; (6) the text should be unobstructed by the mechanical parts; (7) the pop-ups and movable parts must be durable; (8) the pages must open and close with ease; (9) the movable parts should be easy to manipulate and (10) the tabs or other aspects should be obvious to manipulate.

6.2.3 Guidelines for children's books. Dresang (1999) believes that present-day children and young adult's literature "is a changing step with positive changes in the digital world" (p.14). Dresang's Radical Change[31] framework identifies three types of fundamental change in contemporary literature for children and youth, namely: (1) changing forms and formats, (2) changing perspectives and (3) changing boundaries.

Changing forms and formats. Words and pictures are reaching new levels of synergy[32] (Pantaleo, 2004). Several individuals have developed categories to describe the various text and image interactions in picture books (Nikolajeva & Scott, 2001). In many contemporary picture books, the synergism between text and illustrations are becoming more sophisticated as a result of the implementing of (1) non-linear and consequential organization, (2) multiple layers of meaning and (3) interactive formats (Pantaleo, 2004).

The European and North American linear narrative structure of beginning, middle and end is one of a discursive structure (McCabe, 1997), whereas the plot trajectory in many contemporary picture books is not direct or straight.

A multilayered reading experience is created by the use of a number of literary devices including time switches and stories within stories. According to Dresang (1999), two aspects distinguish these techniques as Radical Change, namely: (1) the nonlinearity and (2) the complexity with which they are employed.

Picture books require readers to be interactive as they move back and forth between the visual and verbal text. Radical Change forms and formats demand, however, a greater degree of attentiveness and interaction where children must decide whether to "point and click" here or there with their eyes and their minds (Dresang, 1999:144).

Changing perspectives. Multiple perspectives, visual and verbal - Multiple perspectives can be achieved through multiple voices in one book, multiple voices in more than one book, one character who speaks from a range of life instances, or pictures (Dresang, 1999). Most picture books prior to the digital age were illustrated with midrange illustrations whereas in many contemporary picture books readers view scenes from below, from above, to the side or from within the midst of the action (Pantaleo, 2004).

Several researchers have noted the multiple benefits of using an interactive format when reading aloud to children (Copenhaver, 2001; Sipe, 2000). Classroom teachers in public schools engage in whole-class interactive read-aloud sessions. Research on effective reading instruction found that effective teachers engaged in an interactive style that encouraged active learner involvement (Taylor, Peterson, Pearson & Rodriguez, 2002) and posed more open questions to which multiple responses were appropriate (Allington, 2002).

Radical Change texts are ideal for rereading to children because the polysemous[33] texts afford multiple opportunities for meaning-making, interpretation and interaction (Pantaleo, 2004). Interactivity also refers to the readers exploring, creating or expanding on different sections of the story both on visual and verbal text (Dresang, 1999).

Picture books with Radical Change characteristics provide opportunities for readers to develop their abilities in comprehending text inferentially and critically. In addition to providing pleasurable aesthetic reading experiences, these types of books can teach critical thinking skills, visual-literacy skills and interpretive strategies (Pantaleo, 2004).

7. Cornerstone 2: Senses

The SPD will focus on the stimulation of the senses through the use of the various categories discussed below, namely: vision, colour, sound, touch, odour, taste and differential-sensitivity.

The Greek philosopher Plato (c.428 B.C. – c.348 B.C.) noted: "It would surely be strange that there should be a number of senses ensconced inside use, like the warriors in the Trojan horse, and all these things should not converge and meet in some single nature – a mind, or whatever it is to be called with which we perceive all the objects of perception through the senses as instruments" (Cornford, 2000:103).

O'Neill & Chong's (2001) findings suggest that children become increasingly aware of as well as articulate about their sensory functioning between the ages of four and seven. This observation is confirmed in the literature on sensory functioning.

Three-year-old children can identify the location of perceptually relevant body parts such as the eyes and hands (Johnson & Kendrick, 1984). However, they failed to make appropriate visual appearance-reality distinctions (Flavell, Flavell, Green & Wilcox, 1980) but could accurately use information about visual access to judge object knowledge (Pratt & Bryant, 1990). Three-year-olds that engaged in object identification found it difficult to accurately select their own source of visual or tactile knowledge (O'Neill, Astington & Flavell, 1992; O'Neill & Gopnik, 1991), but could distinguish between seeing and feeling action with experimental dolls (O'Neill & Gopnik, 1991). Fabes and Filsinger (1986) observed that three-year-olds based their preferences in an odour-preference task solely on visual cues until the intensity of the olfactory cues were dramatically increased.

Four-year-olds can use information to judge object knowledge (Flavell et al., 1980) and made appropriate tactile appearance-reality distinctions. They also

demonstrated knowledge about the relationship between visibilities and distance (Flavell et al., 1980). In a study conducted by Fabes and Filsinger (1986), it was found that four-year-olds as well as three-year-olds based their preferences solely on visual cues in an odour preference task. In contrast to the findings of Fabes and Filsinger (1986), Weinberger and Bushnell's (1994) study found that children of the age of four were not aware of their senses and did not employ their senses for obtaining information.

Five-year-olds did not demonstrate surprise at the tactile illusion that took place in a temperature adaptation study by Arnold, Moye and Winer (1986). These children reacted in the same way as the two previous age groups in Fabes and Filsinger's (1986) odour-preference study.

Six-year-olds displayed the same emotions as the five-year-old children in the temperature adaptation study by Arnold et al. (1986).

Seven-year-olds usually have a fairly detailed and accurate reflective knowledge about the functioning of their senses (Weinberger & Bushnell, 1994), but even if they can identify and label perceptually relevant body parts, they may not have a full working understanding of those body parts and their functions (O'Neill & Chong, 2001). Odom (1978) gave children the task of determining whether the mass, weight, or volume of two pieces of clay remained the same following an irrelevant change in the shape of one of the pieces. Seven-year-olds could solve the mass problem while nine-year-olds could solve the mass and weight problem. Eleven-year-old children could solve the mass, weight and volume problem of the above-mentioned study.

7.1 Vision element

Of the five senses, sight is the most commonly used source of information for obtaining knowledge about an environment or object (O'Neill & Chong, 2001). The children's strengths and weaknesses seemed to divide according to the availability and quality of vision in the tasks employed (O'Neill & Chong, 2001).

7.1.1 Spatial Visualization. Van Garderen's (2006) study indicated that above-average students performed better on spatial visualization measures than students with LD as well as average–achieving students. In the field of mathematics, it has been argued that the use of visual imagery can help for different types of problems (Jencks & Peck, 1972; Polya, 1957; Zimmerman & Cunningham, 1991).

In examining the relationship between schematic imagery, pictorial imagery and spatial visualization ability, it was found overall that the use of schematic imagery was positively and significantly correlated with spatial visualization measures (Van Garderen, 2006). Visual imagery, according to Owens and Clements (1998), has a role in establishing the meaning of a problem, channelling problem-solving approaches and influencing cognitive constructions.

Significant and positive correlations have been found between spatial visualization measures and mathematical word problem-solving performance on the Mathematical Processing Instrument (MPI) (Hegarty & Kozhevnikov, 1999; Van Garderen, 2006). Spatial visualization skills, according to Van Garderen (2006), are important in mathematics, in particular for geometry and for solving complex word problems (Brown & Wheatley, 1997; Geary, 1996). Geary's (1996) study found that students with LD and average-achieving students have difficulty solving the mathematical word problems on the MPI. Research on mathematical problem-solving has often demonstrated that students with LD are poor problem solvers (Miller, Butler

& Lee, 1998). It was found that students with LD performed worse on mathematical tasks that involve some spatial component than average and above-average children (Grobecker & De Lisi, 2000; Thornton, Langrall & Jones, 1997; Wansart, 1990).

7.1.2 Visual Process. The use of the visualization process has often been acknowledged as a powerful tool for solving problems (Kosslyn & Koenig, 1992). Visual imagery is highly related to all aspects of visualization ability (Forrest, 1980). To understand the visual process, it is required to go beyond the sensory and motor aspects being the relationship between meaning-getting and performance (Forrest, 1981). Forrest also stated that, in terms of LD, it is important to know whether a child has visual imagery abilities so that it can be utilized as a strategy when it is needed. Visual meaning-getting is the use of vision to understand and to obtain knowledge. Visual performance is the use of vision to complete tasks or solve problems. Two information processing strategies that appear to be of most importance are the pictorial and the linguistic systems (Forrest, 1981). The linguistic system represents the use of verbal language for labelling, categorizing, and communicating. The pictorial system represents the use of visual imagery. Imagery is a form of mental action and is highly related to the emotions.

7.2 Sound element

Sound and/or music can be incorporated into children's books through (1) a CD which retells a story to children with an accompanying book and (2) a reactive book with buttons that can be pressed for reactive sounds and music. McCann (1996) found that a deep, unhurried voice, male or female, is preferred when creating audio cassettes and video voice-overs.

7.2.1 Music. Several studies concluded that music can be useful as a therapeutic medium (Kemper & Danhauer, 2005; Kennelly & Brien-Elliot, 2001).

Music therapy is a systematic process of intervention where the therapist helps the client to achieve better health, using music experiences and the relationship between the therapist and client to develop through them as dynamic forces of change (Bruscia, 1998).

Listening to classical music increases heart rate variability, a measure of cardiac autonomic balance (in which increased levels reflect less stress and greater resilience), whereas listening to noise or rock music decreases heart rate variability (reflecting greater stress) (Umemura & Honda, 1998; White, 1999). Songs, rhymes, chants, musical games and lullabies have been used to teach very young children the social, language, motor and emotional skills required for functioning within, and integration into, their immediate (family) and wider environments (Grasso, et al., 1999:203).

Mostly music effectively reduces anxiety and improves mood in medical and surgical patients, in patients in intensive care units, patients undergoing procedures and children as well as adults (Kemper & Danhauer, 2005). It is well accepted and recognized that music plays an integral role in the stimulation and development of children (Barrickman, 1989; Kennelly, 2000).

Literature identifies several key areas in music therapy rehabilitation: (1) role and models of intervention (Lee & Baker, 1997; Purdie, 1997); (2) speech, language and communication (Baker, 2000); (3) cognitive skills areas (Purdie, 1997).

7.3 Touch element

Dr. Schevil was aware of the relationship between touch, sight and sound in music (Haber, 1975). Children who received tactile instruction with her unique machine[34] learned specific words 20 to 30 per cent faster; only however when a "kinaesthetic" technique is used with the tactile drill. "A multi-sensory approach

provides a chance for all slow readers to acquire information through their major or preferred modality", Dr. Schevil told Haber (1975), "whether it happens to be visual, auditory, kinaesthetic or tactile."

Preschoolers develop their creative problem-solving skills and increase hand-eye coordination through the use of materials. Enjoying repetition, young children experience cause and effect as well as discover how parts relate to the whole. Tactile materials hold a special appeal for curious preschoolers ready for new adventures (Miller & Church, 2003).

7.4 Odour and Taste element

Several enquirers have researched the effects of aromatherapy on mood and Electroencephalogram (EEG) patterns and found that certain aromas can positively influence mood (Maddocks-Jennings & Wilkinson, 2004; Rawlings & Meerabeau, 2003).

7.5 Differential-sensitivity element

Garner (1970) emphasized the importance of the role of stimulus structure in the processing of information. Smith and Kemler (1977) proposed a developmental trend in which integral perceptual structure dominates in early development (before the age of six) and separable structure comes to dominate as maturation and perceptual learning proceed because, in their opinion, young children perceive object characteristics because characteristics are perceptually integrated. In Garner's view, some stimulus characteristics (size and brightness) maintain their individual integrity in perceptual processing and are consequently perceived as "separable structures" whereas other stimulus characteristics (saturation and brightness) are combined or integrated in perception to yield "integral structure". A task employed to distinguish integral and separable perception is the Triad's Classification Task (Cook & Sprague,

1995; Raijmakers, Jansen & Van der Maas, 2004). Cook and Sprague's (1995) study on separable perception with tactile dimensions amongst young children indicated that children have difficulty ignoring irrelevant stimuli and are not selective in how they process information.

Results of a study by Cook and Odom (1992) that examined a differential-sensitivity account of cognitive processing found that stimulus differences are more salient than identities as well as that children are highly selective in their perception and classify stimuli by separate dimensions.

8. Cornerstone 3: Supporting Factors

8.1 Toy element

Toys are mostly learning instruments (Mann, 1996) – objects that should stimulate children's imaginations and help them develop socially and intellectually. The use of toys enables children to project their feelings to objects rather than people (Landreth & Bratton, 1999). Young school-age children should enjoy games with rules and role-playing activities. These games should stimulate their interest in science, art, music, math, social studies, reading and creative endeavours. In a study by Johnson and Smolen (1995) on developmentally appropriate toys, several factors were identified to make a toy developmentally appropriate for young school-age children, namely: (1) toys require involvement, concentration and an element of chance which require a certain skill or certain skills; (2) use some electric current, but not enough to overheat and result in burns; (3) be designed to expand children's school experiences;[35] (4) be suited to the individual child's skills in order to stimulate his or her interest and (5) foster solo and group play (Johnson & Smolen, 1995). Appropriate toys for young school-age children include simple card games, table games (bingo), board games, collector's items (stamps, coins, shells, rocks), sports

equipment (e.g. for playing baseball, football, soccer, etc.), puppets, sand art kits, doll-making kits, puzzles and photographic equipment (Taylor, Morris & Rogers, 1997).

A set of guidelines was developed by Bailey and Wolery (1992) for the selection of toys and play materials specifically with regard to children with special needs, namely: (1) toys and play materials should be responsive (toys that produce sound, movement or light when activated by a child); (2) toys and play materials should be age-appropriate; (3) toys and materials should be adapted if necessary to increase engagement and learning; (4) play materials should include naturally occurring objects (boxes, kitchen utensils and packaging materials) and (5) toys and play materials should be selected to promote learning of important skills.

Consideration must be given when selecting an appropriate toy for a child which can include: (1) whether a toy is safe considering that child's age,[36] well constructed and durable; (2) appealing and interesting to the child; (3) suited to the child's physical capabilities and (4) suited to the child's mental and social development (Consumer Product Safety Commission, 1997).

According to the Consumer Product Safety Commission (1997), toys should consist of the following categories: (1) active play – push and pull toys, ride-on toys, outdoor and gym equipment, sports equipment; (2) manipulative play – construction toys, puzzles, pattern-making toys, manipulative toys, dressing, lacing and stringing toys, sand and water play toys; (3) make-believe play – dolls, stuffed toys, puppets, role play materials, play scenes, transportation toys, projectile toys; (4) creative play – musical instruments, art and craft materials, audio-visual equipment and (5) learning play – games, specific skill development toys, books.

Interactive toys[37] have many aspects that can confuse, frustrate, or mislead children if the toys are not appropriate for the child's developmental level. Some of these aspects include: (1) poor quality of feedback to children, (2) negative effects upon children's imagination, (3) problems in children's socialization and (4) children's concerns about whether the toys are "alive" (Oravec, 2000).

In a study by Clements and Sarama (1997) on the programming software Logo and its spin-off products, an increase was shown in children's creativity, social skills, self-esteem and language/reading ability. The research also shows increases in children's metacognition as a result of using Logo, which seems logical, as the children have to think carefully and repair mistakes if their program is to work.

McCabe (1997) found a direct correspondence between the type of play material and the material which consisted of: (1) functional (goop), (2) constructive (Lego blocks) and (3) dramatic (Fischer-Price toys). The studies by McCabe (1997) and Malone and Langone (1999) represented quasi-naturalistic designs conducted at home and in classroom settings respectively and the work of Bambara et al. (1984) represents single-subject design intended to evaluate the effectiveness of reactive[38] and non-reactive[39] toys in increasing the manipulative activity and visual attention of children with multiple handicaps. Bambara et al. (1984) reported that the reactive toys evoked more manipulative activity and visual attention among children with handicaps than the non-reactive toys.

8.2 Therapy element

Children with developmental concerns may need direct intervention to learn how to play appropriately as they do not acquire skills at the same rate or in the same manner as their typically developing peers (Malone & Langone, 1999). The failure to provide such intervention may contribute to deficits in other areas of development

(Kerns, Eso & Thomson, 1999). Early childhood teachers may limit direct intervention in children's play to avoid crossing the line between responsiveness and intrusion (File & Kontos, 1993); however, a constructivist, child-initiated, play-based curriculum does not require (or benefit from) a tolerant approach to education (Johnson & Johnson, 1992). Interventions are most successful (learning of new play skills) when there is some shared meaning between the interventionist (teacher) and recipient (child) of the intervention (Kerns et al., 1999; McCathren, Yoder & Warren, 2000). Intervention strategies (introduction and redirection) may be necessary for children who are passive, rarely initiate play and who engage in repetitive acts (Girolametto, 1995), but these strategies can also limit creative responses.

A change in children's play patterns were noted by Karsten (2005), as children nowadays spend more time watching television than play outside. This change is occurring in spite of the documented importance of play to the development and education of young children. Factors identified as contributing to the demise of play consist of teachers': (1) lack of knowledge and value of play; (2) lack of knowledge and skill regarding the incorporation of play into the early childhood curriculum; (3) increasingly busy home schedules; (4) an increased focus on academic acumen at earlier ages; (5) decreased neighbourhood safety; (6) increased television time and time with high-tech video games and (7) a proliferation of realistic, media-linked toys that promote imitation instead of constructive learning. A child's appropriate interaction with objects in the context of play may facilitate not only further cognitive growth, but communicative and social competence (Isenberg & Quisenberry, 2002).

The benefit of improved play skills with consideration to individual potential (Malone & Langone, 1999) are namely: (1) the possible mediation of children's social engagement by the availability of play materials (Wimpory, Hobson & Nash, 2006) -

children with developmental concerns must have or develop play skills that enable them to make appropriate use of play material; (2) acceptance by peers, resulting in an increased opportunity to engage in social exchanges which is a function of play competence (Strain, 1985); (3) children who engage in pretend play typically are more socially mature than children who do not engage in pretend play (Bergen, 2002) and (4) social play interactions are more likely to occur among children who are at coinciding levels of cognitive and social play (Bergen, 2002; Brown & Bergen, 2002).

In a study by the Center for Assistive Technology (2000), Assistive Technology had been used for children with disabilities to interact with and control their environment (example: an adaptor and a switch were connected to a simple battery-operated toy) because children with LD may have difficulty interacting with objects and people. Another finding was that children who are limited in their ability to locate and manipulate toys look for toys that provide immediate and intense reactions when touched. Assistive Technology can be used for children with disabilities as design factors for hand-eye coordination.

8.3 Play and Play Therapy element

Children's play has been associated with a variety of important developmental and educational outcomes which include: (1) problem-solving, (2) planning, (3) conflict and negotiation, (4) personal and social boundaries, (5) release of tension, (6) frustration and (7) aggression (Johnson, Christie & Yawkey, 1999). Play has become an integral part of the curriculum as a result of increasing attention to play therapy as a therapeutic medium (Saracho & Spodek, 2003; Swianarsky, Breitborde & Murphy, 1999) and is gradually being integrated into educational efforts in many nations.

According to Landreth (1991:14; 2002), play is the child's natural medium for self-expression. Play helps develop problem-solving and competence skills (White, 1966) and provides a space for children to digest experience and situations (Piaget, 1969) as well as allows children to deal with behaviours and concerns by acting them out (Isenberg & Quisenberry, 2002). The wisdom of using play therapy as the intervention of choice in elementary schools is increasingly evident in the literature (Johnson, McLeod & Fall, 1997; Landreth, 1993). Limit-setting in the playroom is critical for the success of play therapy (Landreth, 2002). Limit-setting can be integrated into the SPD, for example into a puzzle book by increasing the number of puzzle pieces with the page number (page 1 = 1 puzzle piece, page 2 = 2 puzzle pieces, etc.). Privacy in the playroom is also critical. Child-centred play therapy involves the children in the therapeutic relationship and has the power of helping children feel valuable and respected (Post, Stopanio & Fielden, 1998).

Schoeman and Van der Merwe (1996), Sheridan, Foley and Radlinksi (1995) and Wittenborn, Faber, Harvey and Thomas (2006) described play as a window through which children can be observed and understood, revealing clues about children's range of skills and abilities to negotiate the world around them. It is through play that children learn skills that they have not previously mastered, adapting those skills, gain control and ownership of a world that is, figuratively and literally, larger than the children themselves.

Play therapy has become an acceptable method for providing counselling services to children (Bratton & Ray, 2000; Landreth, 2002) and is an effective therapeutic and communication technique (Landreth & Bratton, 1999). An extensive review of the research related to the use of Play Therapy indicates that the Client-centered Approach, or alternatively named Virginia Axline's Play Therapy, is

considered to be foundational to most introductory processes utilized in Play Therapy. During play therapy, children often use inanimate objects rather than verbal utterances to project their feelings, beliefs and perceptions about themselves and their world. Play is the mode children use to better understand the world, the objects in that world, language, social roles, and even feelings in a safe manner without risk (Griffith, 1997). In Child-centred Play Therapy, the use of reflective feedback is a key element. The therapist serves as a facilitator in the child's journey of self-discovery (Landreth, 2002).

Traditionally, consideration of children with disabilities (special education) has been influenced by both a deficit perspective of developmental potential and educational methods based upon behavioural theory (teacher directives, contingencies, and reinforcement). As noted by Johnson et al. (1999), "early childhood educators view play as a curricular core and as a critical context for learning. In contrast, play has been viewed by special educators as off-tasks behavior or as a reward for compliance with adult structure" (p.156).

Play therapy seeks to overcome the communication barriers which result from cultural differences (Cochran, 1996). Children's play reflects their own cultural values and customs; it is especially important that play therapy techniques be in accordance with the values and traditions of culturally diverse children (Drewes, 2005a, Drewes, 2005b; Hinman, 2003). In working with Mexican American children, it is critical for therapists to be sensitive to the cultural nuances that can be part of their play (Garza & Bratton, 2005).

The importance of play is highlighted when we remember that "imagination is more important than knowledge. For knowledge is limited to all we now know and

understand, while imagination embraces the entire world, and all there ever will be to know and understand" (Einstein, as cited by Melissa Munroe, 2005).

8.4 Cultural Sensitivity and Socio-Economy

Hugo (2002) highlighted the importance of socio-economic and cultural sensitivity within his study through historical data of a picture card game on child accident prevention for school pupils in South Africa in 1994. This baseline study revealed that 80% of learners who live within a squatter community have never been exposed to picture books (Hugo, 1994). One of the most important implications was their limited visual literacy skills which influence their accessibility to information and academic progress.

A study conducted by Zimmer and Zimmer (1978) as well as a more recent study by Hubley (1994) suggested that illustrations must be adapted to fit the cultural and visual literacy profile of the specific target group. 'Ethnovisual'[40] and 'sociovisual'[41] elements of graphic design and illustrations are recommended by the research of Schiffman (1995), as these elements are influenced by social and cultural influences. De Lange's (1999) study investigated the use of culturally modified pictures in printed media through a model that explains and predicts pictorial learning facilitation which identified instructional principles and economic, cultural and social elements as the four critical variables within a communication environment via illustrations. The cultural element can be described as the screen through which information passes to the learner that can affect the interpretation of the information. Hugo (2002) highlighted De Lange's model which identified three factors which jointly determine the level of appropriateness of an illustration, namely: (1) learner variables (age, gender, media literacy, learning motivation, prior knowledge of a certain topic); (2) picture-coding variables (amount of graphic detail, abstraction,

colour use) and (3) socio-cultural variables (health-related behaviour, values, norms, familiarity with certain media types).

Hugo (2002) suggested that the following graphic design elements should be addressed in order for SPD to be cultural sensitive, namely: (1) colour combination, (2) graphic decoration, (3) typefaces, (4) depiction of familiar cultural objects, (5) body features and body language, (6) stereotypical presentation of behavior, (7) level of graphic abstraction and silhouetting, (8) picture sequence, (9) three-dimensional perspective as well as (10) scale and zooming into a section of an object.

In our endeavour to ensure that the above mentioned cultural sensitive graphic design elements be incorporated into SP development, it is advisable that animals be used as characters within SPD as it can possibly eliminate all cultural differences linked to certain culture specific objects, body features, body language and stereotypical presentation of behaviour.

Play has been described as a "cause and effect" of a particular culture within which children are raised (Schwartzman, 1978). This means that children use play as a vehicle for cultural learning and their play can serve as an important indicator and reflection of their development. If play is a "cause and effect" of culture within which children are raised, then teachers, parents and administrators need to be aware of this important process of transmission (Chooi-Theng & Shehan, 2005). Children frequently selected the culturally appropriate toys, such as African American and Native American dolls/families and multicultural markets providing a variety of colours similar to varied skin shades (Landreth, 1991:14).

9. Discussion

The aim of this paper was to review articles on factors that must be taken into consideration for the development of SP to stimulate children with LP. This literature

review bears reference to forty-four books, three unpublished Ph.D. theses and 205 journals mostly in the disciplines of design, education, psychology and occupational therapy. The review of the literature indicated that checklists are used to evaluate various materials, matters and qualities from information design (Petterson, 2002), media appropriateness and cultural sensitivity (Hugo, 2000) to the refinement of a book on stroke care at home (Botha, 2008).

The first cornerstone which influences the development of the SPD is design factors which consist firstly of the design element. The design element consists firstly of illustrations. The review on illustrations can be summarized as follows: (1) representational pictures and imagery have a supporting effect on reading comprehension (Levi, 1987; Paivio, 1971) and must be more explanatory to represent the text; (2) mnemonic illustrations can be used to enhance the memory of children with LD by the use of (a) the pegword strategy, (b) the keyword strategy and (c) letter strategies (King-Sears, Merces & Sindelar, 1992; Mastropieri, Scruggs & Fulk, 1990; Scruggs & Mastropieri, 1992; The Access Center, 2007); (3) learners with reading difficulties can benefit from the use of adjunct aids (Mastropieri & Scruggs, 1997; McCann, 1996) and (4) illustrations must be suitable for the specific target groups (Botha, 2008).

A typeface such as Lexia, which includes a non-symmetrical b and d (i.e. the b does not look like a backwards d), and handwritten forms of a and g, which readers may recognise more easily, are recommended for the use in special education as part of the development of SP (SchwabLearning.org, 2007). Another important aspect that was identified by the review is that English may be the most suitable language to conduct the methodology phase in as it is not limited in colour terms.

Several conclusions are drawn from the review on colour, namely: (1) the eleven UBPCC can be used as a design element in two ways: (a) educational colour - naming of shapes and (b) designing only with these colours; (2) a possible method to establish whether a storyline is positive or negative within the methodology phase is to use a colour emotion association task afterwards (Cimbalo et al., 1978); (3) the colour-coding technique can be used in the remediation of children with reversal problems (p, b and d), problem letters, phonements and words (Doyle, 1982); (4) another function of colour is the carrying of gender-related information (Boyatzis & Varghese, 1993) and (5) the SCWT can be used to classify children as having ADHD (Golden & Golden, 2002).

The first cornerstone which influenced the development of the SPD is the design factors which consist secondly of the book element. The book element consists firstly of the different categories of books in children's literature. This section can be summarized by means of several conclusions that can be drawn from the literature, namely: (1) the primary classroom promotes the reading of storybooks rather than the reading of information (Duke, 2000; Pappas, 1991; Smolkin & Donovan, 2003); (2) interactive and read-aloud books produce greater gains in work with learners in special education (Englert, Tarrant, Mariage & Oxer, 1994; Mariage, 1995); (3) informational text may be more likely to hold the attention of boys and struggling readers (Caswell & Duke, 1998; Donovan, Smolkin & Lomax, 2000); (4) storybooks which include repeating line/s lure children into reader anticipation (Center for Assistive Technology, 2000); (5) interventions such as (a) representational pictures and images (Warner & Alley, 1981), (b) spatial organization of text content (Darch & Carnine, 1986; Mastropieri & Scruggs, 1997), (c) mnemonic illustrations (Mastropieri & Scruggs, 1997; Mastropieri, Scruggs & Levin, 1987), (d) adjunct aids (Horton &

Lovitt, 1989; Mastropieri & Scruggs, 1997) and (e) semantic feature relationships charts (Bos, Anders, Filip & Jaffe, 1989; Mastropieri & Scruggs, 1997) are beneficial for text enhancement within reading comprehension for children with LD; (6) picture books with Radical Change characteristics teach their readers (a) critical thinking skills, (b) visual-literacy skills and (c) interpretive strategies (Pantaleo, 2004) and (7) Radical Change characteristics consist of several important aspects regarding this study, namely: (a) plot trajectory is not direct or straight (McCabe, 1997); (b) multilayered reading experiences include time switches and stories within stories (Dresang, 1999); (c) interactive formats create a greater area on which children can focus with their eyes and mind (Dresang, 1999); (d) multilayerd perspectives can be achieved through multiple voices in one book, one character who speaks from a range of life instance or pictures (Dresang, 1999); (e) scenes from below, from above, to the side or in the midst of the action (Pantaleo, 2004) and (f) effective reading instruction was found when teachers engaged in an interactive style that encouraged active learner participation (Taylor, Peterson, Pearson & Rodriguez, 2002).

The review of the different focus areas of books in children's literature as the second sub-category under the book element can be summarized as follows: (1) songs, rhymes, chants and so forth can be implemented into SP to develop children's social, language, motor and emotional skills (Grasso, et al., 1999); (2) problem-solving skills and hand-eye coordination can be developed through the use of various materials (Miller & Church, 2003) by (a) adding pieces of textured material and/or paper rotating wheels, doors, flaps and cut-outs and (b) textured books; (3) a music programme can provide assistance with the perceptual-motor coordination of learners with various LD; (4) Assistive Technology can be used for children with LD and several design factors must be kept in mind regarding hand-eye coordination of

these children; (5) a comprehensive or a complex storyline pop-up book may not be suitable for learners in the elementary grades; (6) the formats of pop-up books require hands-on interaction and involvement, which can encourage reading with expression, exuberance and physical movement (Kurkjian et al., 2005); (7) hand-eye coordination can be improved by the incorporation of (a) textured materials, (b) wooden blocks and (c) movement of solid objects; (8) perceptual-motor coordination can be improved by the incorporation of (a) rhythmic instruments such as rhythm sticks and triangle cutting, (b) colouring and writing and (c) threading of beads and (9) a deep and unhurried voice is preferred when creating audio cassettes and video voice-overs (McCann, 1996).

The second cornerstone which influenced the development of the SPD is the five different senses, namely sight, hearing, touch, taste and smell. The section on sight/vision as a sense can be summarized by means of several conclusions that can be drawn from the literature, namely: (1) sight is the most commonly used source of information for obtaining knowledge about an environment or object (O'Neill & Chong, 2001); (2) students with LD performed poorer on spatial-visualization measures (Van Garderen, 2006) and mathematical tasks that involve some spatial component (Grobecker & De Lisi, 2000; Thornton et al., 1997; Wansart, 1990); (3) visual imagery may be useful for different types of problems (Jencks & Peck, 1972; Polya, 1957; Zimmerman & Cunningham, 1991) and (4) it is important to know whether a child with LD has visual imagery abilities so that it can be utilized as a strategy for problem-solving when needed (Forrest, 1981).

Several conclusions are drawn from the literature on sound/hearing, namely: (1) music can be useful as a therapeutic medium (Kemper & Danhauer, 2005; Kennelly & Brien-Elliot, 2001) and (2) songs, rhymes, chants, musical games and

lullabies have been used to teach young children certain skills required for functioning (Grasso et al., 1999:203).

The review on touch as a sense identified that preschoolers develop creative problem-solving skills and increase hand-eye coordination through the use of tactile materials (Miller & Church, 2003).

The third cornerstone which influenced the development of the SPD is supporting factors which consist firstly of the toy element. The section on toys can be summarized by several conclusions that can be drawn from the literature, namely: (1) developmentally speaking, toys should adhere to the criteria of Johnson and Smolen (1995); (2) the selection of toys and play material for children with special needs must adhere to the guidelines set by Bailey and Wolery (1992); (3) appropriate toy selection for children must adhere to the Toy Safety Regulations as set by the Consumer Product Safety Commission (1997); (4) interactive toys can have a negative impact on a child if the toys are not appropriate for a child's developmental level (Oravec, 2000) and (5) reactive toys evoked more manipulative activity and visual attention among children with multiple handicaps than non-reactive toys (Bambara, et al. 1984).

The section on play and play therapy as the third element of supporting factors can be summarized as follows: (1) play is a child's natural medium for self-expression (Landreth, 1991:14); (2) play seeks to overcome communication barriers which result from cultural differences (Cochran, 1996), but play techniques must be in accordance with values and traditions (Drewes, 2005a; Drewes, 2005b; Hinman, 2003); (3) play is a window through which children can be observed and understood (Schoeman & Van der Merwe, 1996); (4) play therapy is an effective therapeutic interventive measure and an accepted method to provide counselling services to

children (Bratton & Ray, 2000; Landreth & Bratton, 1999); (5) limit-setting in the play/classroom is critical for the success of play therapy (Landreth, 2002) and (6) from the guidelines deduced from cultural sensitive graphic design elements (Hugo, 2002) as well as the topics of books identified by Donovan et al. (1999), the conclusion can be drawn that if animals are used as characters within the SPD, it can possibly eliminate all cultural differences.

10. Conclusion

From the discussion above a checklist of suitable design elements can be inferred. The most important guidelines that were identified by the literature outlined the design elements of the SPD that are needed for children with LP. These guidelines suggested five book focus areas, namely music/sound, hand-eye coordination, perceptual-motor coordination, pop-up and textured books. A sensory book should be an interactive and read-aloud book as these types of books produce greater gains in work with learners in special education. From the review of the three cornerstones, one may conclude the following:

Several researchers have recognized the supporting effect of illustrations on reading comprehension (Levi, 1987; Paivio, 1971; Peeck, 1987), but concern has been expressed that illustrations could distract the attention of learners with LD away from the text. A possible solution to this problem can be that pictorial illustrations should be more explanatory to represent the text; however, this solution did not obtain optimal results in a study by Haber (1983). In a study by Mastropieri and Scruggs (1997), research on the use of representational pictures and imagery instruction indicated vague results whereas all other strategies (mnemonic illustrations, spatial organization, study guides and semantic feature analysis charts) evoked a positive effect on students with LD.

An enhanced recall and factual assumption was reported when mnemonic illustrations were used as compared to the same material as descriptive illustrations (Scruggs et al., 1987). Learners with LD fare better using the "keyword method" on specific tasks (Mastropieri et al., 1990) and substantially outperformed control learners in the learning of new facts or vocabulary through mnemonic strategies (Mastropieri & Scruggs, 1989).

Colour can be used in remediating learners with reversal problems, but some systems differ in the use of this technique, notably that of Bannatyne (1971:646) where only colour-coded vowels were used whereas others lean more towards a phonics approach and colour-coding phonemes, such as the PCS (Hammil & Bartel 1978: 82). A conclusion that can be drawn from the study by Doyle (1982) is that students with LD differ in the benefiting of colour-coding according to their score on the WISC. Students who score higher on the verbal section of the WISC benefit more from the non-colour-coded drill and children with a higher performance score seem to draw much more benefit from colour-coding. Colour did not enhance sight-word learning for longer reading comprehension tasks in a study by Belfiore et al. (1996), but colour had an immediate effect across and within sessions. Doyle (1982) explored the effectiveness of the colour-coding technique in the remediation of the reversals of p, b and d in children with reversal problems. It was found that in this particular experiment by Doyle, using colour-coded letters as cues in words was less effective than simply practising the same words without colour-coded cues. From the above section several methods of colour-coding have been identified, namely colour-coding the problem letters (p, b and d), the vowels, phonics and phonemes. The colour-coding technique should be used in association with the WISC to obtain optimum results.

In a study by Winston et al. (1995) it was found that children of all ages use black to complete negative characterized topics and primary colours were used to complete positive characterized topics; this finding was neither age nor topic specific. In another study by Winston et al. (1995) as well as Burkitt et al. (2003), black and other dark colours were associated with depression or anxiety, this, however is in contrast with Boyatzis and Varghese's (1993) study which found that the colour black evoked a positive reaction from almost half of the children they tested. In a study by Cimbalo et al. (1978) the colour red, which is a primary colour, was associated with anger, aggression, excitement and happiness.

Mostly storybooks are promoted by the primary classroom while the reading of informational text is neglected (Duke, 2000; Pappas, 1991; Smolkin & Donovan, 2003). Caswell and Duke (1998) found in their study that informational text may be more likely to hold the attention of boys and struggling readers.

According to Ball (2003), pop-up books are great enticement for reluctant readers, but it should be kept in mind that a comprehensive pop-up book may be overwhelming for a learner in the elementary grades (Ball, 2003) as well as books with interacting paper engineering with a complex storyline (Kurkjian et al., 2005).

The limitations of this literature review are the development of the SPD without a methodology phase in which the product can be observed in a classroom situation. The methodology phase will be implemented in the second article with an observation analysis and questionnaire to obtain additional guidelines from children and teachers regarding the SPD.

The recommendation that can be made from the literature review is the compilation of a checklist that incorporates the three cornerstones of SP for children with LP. The checklist can be used as a qualitative tool with which teachers or qualified personnel can evaluate an SPD in a classroom situation or within a

therapeutic practice. The checklist has several categories. Each category is completed with either a yes or no answer in regard to the SP which is being evaluated. The checklist consists of thirteen categories. Each category consists of several guidelines to which the SP must adhere to. Some of the guidelines consist of several points but only those with a numeral to the left-hand side must be marked with a yes or no answer. These points must guide the evaluator to answer yes or no to the specific guideline. Should the number of yes answers per category exceed the number of no answers per category, it would be an indication that the specific SP passed the evaluation of that category. The more yes answers, the more suitable the SP is. An SP will not always involve all of the different categories. These categories which are not applicable to the product may be marked n/a.

Table 1

A checklist of suitable guidelines from the literature for the assessment of a sensory product

Nr.	Description	Y	N
A	Cornerstone 1: Design Factors		
1.	The Design Element		
1.1	**Category 1** - Illustrations		
1.1.1	Are the supporting illustrations representational of the accompanying text?		
1.1.2	Are the supporting illustrations mnemonic[42] in nature by using the keyword strategy,[43] peg word strategy,[44] and letter strategy?[45]		
1.1.3	Are adjunct aids[46] used as supporting materials?		
1.1.4	Do the illustrations used within the sensory product meet the following criteria identified by Botha (2008)?:		
	Are the illustrations realistic?		
	Do the illustrations agree with the content of the text?		
	Does the text provide information regarding the illustrations?		
	Are graphic cues (arrows and lines) used within the illustrations to direct attention to a specific item?		
	Do the illustrations have captions?		
	Do the illustrations have legends that are explanatory, instructive and understandable?		
	Text may not flow over the illustrations		
	Are the illustrations suitable for the specific target group?		
1.1.5	Are the illustrations used within the SPD appropriate according to the following guidelines set by Hugo (2002)?:		
	The appropriateness of learner variables.[47]		
	The appropriateness of picture coding variables.[48]		

	The appropriateness of socio-cultural variables.[49]		
1.2.	**Category 2** - Language		
1.2.1	The use of the English language in the methodology phase to identify the necessary colour terms		
1.2.2	Are the language guidelines set by Botha (2008) incorporated into the SPD by means of:		
	the use of short words, preferably one to two syllables?		
	the use of short sentences with one idea per sentence?		
	the use of simple grammatical structures and punctuation?		
	the use of short paragraphs with only one idea per paragraph?		
	the use of text written in the active voice?		
	the explanation of difficult concepts by using general everyday words?		
	the use of text written in the second person?		
	the use of numbers rather than words?		
	the use of consistent language throughout the SPD?		
1.3	**Category 3** - Colour		
1.3.1	Are the eleven universal colour categories used to identify the necessary colour terms?		
1.3.2	Are the eleven universal colour categories used with the designing of the sensory products?		
1.3.3	Is a colour emotion association task[50] included in the sensory product design to establish if the storyline is positive or negative?		
1.3.4	Does the colour used within the illustrations and text carry gender-related information that is cultural appropriate?		
1.3.5	Is colour used within the SPD for illustrations that carry information that is vital to the contents in the visual (e.g. species of butterflies)?		

1.3.6	Was the chosen colour scheme pre-tested on the intended audience?		
1.3.7	Is the colour-coding technique[51] used within the text?		
1.3.8	Is Bannatyne's Psycholinguistic Color System (PCS) incorporated within the colour-coding technique within the text?		
1.3.9	Is the WISC test used in association with the colour-coding technique?[52]		
1.3.10	Are the SCWT incorporated into the SPD to help with the identification of children with ADHD?		
1.3.11	Is there good contrast between the colour of the paper and the colour of the typography?		
1.4	**Category 4** - Typography, layout and visual appearance		
1.4.1	Does the typeface used include a non-symmetrical b and d?		
1.4.2	Does the typeface used include handwritten forms of a and g?		
1.4.3	Are only two different typefaces used within each SPD?		
1.4.4	Is a bold typeface used to highlight specific words or phrases?		
1.4.5	Are the following key elements used within the SPD as identified by Botha (2008):		
	A font of at least 12 points?		
	A clear typeface?		
	Is upper and lower case used?		
	Is there ample white space on each page?		
	Are the headings clear, consistent and close to the related text?		
	Is text left aligned?		
	Is the cover attractive and does it indicate the core content as well as the intended audience?		
	Is the layout consistent throughout the SPD?		

2.	The Book Element		
2.1	**Category 5** - Different categories of books		
2.1.1	Does the sensory product have storybook characteristics?		
2.1.2	Does the sensory product make use of an interactive[53] and read-aloud approach regarding storybooks?		
2.1.3	Is informational text incorporated in the sensory product specifically intended for boys and struggling readers?		
2.1.4	Is a repetitive line used?		
2.1.5	Is text enhancement and reading comprehension elements[54] included?		
2.2	**Category 6** - Different focus areas of books		
2.2.1	Are songs, rhymes, chants and so forth incorporated?		
2.2.2	Does the theme of the book provide for a possible music programme?[55]		
2.2.3	Is a deep and unhurried voice used for the creation of the audio cassettes for the music of the sensory product?		
2.2.4	Are various materials incorporated within the books such as (1) textured materials, (2) wooden blocks and (3) the movement of solid objects?		
2.2.5	Are several textured materials used such as (1) pieces of materials and/or paper rotating wheels, doors, flaps and cut-outs and (2) textured books?		
2.2.6	Are perceptual-motor coordination incorporated in the themes through (1) rhythmic instruments such as rhythm sticks and triangle cutting, (2) colouring and writing as well as (3) the threading of beads?		

2.2.7	Does the switch characteristics of the sensory product adhere to the guidelines of the Center for Assistive Technology (2000) by means of:		
	Is the size of the surface “target” that a child must activate sufficient?		
	Is the amount of force (pressure) required to activate a switch appropriate?		
	Is the amount of movement before the switch is activated appropriate?		
	Is the feedback of the switch, whether tactile and/or auditory, sufficient?		
	Is the switch durable?		
	Is the texture of the switch appropriate for the child’s age?		
	Does the positioning options of switches of the sensory product adhere to the guidelines of the Center for Assistive Technology (2000) by means of:		
	Is the switch positioned so that the child is in a comfortable position when activating it?		
	Is the switch placed near the child’s most convenient, most reliable access site?		
	Can the toy/device that the child is activating be placed in close proximity to the switch itself?		
	Is the switch secured in a stable position?		
2.2.8	Are the guidelines specified by Dales (2007) for paper engineering incorporated in the SPD by means of:		
	Do the pop-ups or movable parts enhance the meaning of the text and assist in helping the reader construct meaning beyond what could be communicated in two dimensions?		

	Is the paper engineering visually appealing?		
	Do the artistic elements (colour, shape, space, perspective and texture) represent typically acceptable standards of quality?		
	Do the design elements (rhythm and movement, tension and page layout) aid in creating a unique coordination between text and visuals?		
	Is the text unobstructed by the mechanical parts?		
	Are the pop-ups and movable parts durable?		
	Do the pages open and close with ease?		
	Are the movable parts easy to manipulate?		
	Are the tabs or other aspects to be manipulated obvious?		
2.3	**Category 7** - Guidelines for children's books		
2.3.1	Are Radical Change characteristics identified by Dresang (1999) incorporated in the SPD by means of:		
	A plot trajectory that is not direct or straight?		
	A multilayered reading experience that includes time switches and stories within stories?		
	An interactive format that creates a greater area on which children can focus with their eyes and mind?		
	A multilayered perspective that can be achieved through multiple voices in one book, one character who speaks from a range of life instance, or pictures?		
	Scenes from below, from above, to the side or in the midst of the action?		
	Is effective reading instruction incorporated in an interactive style that encourages active learner participation?		

B	Cornerstone 2: Senses		
1.	**Category 8** - Sight/vision		
1.1	Is sight/vision the most commonly used source of information for obtaining knowledge about a book and associated activities within the SPD?		
1.2	Is a possible spatial-visualization component incorporated?		
1.3	Are visual imagery utilized as a strategy for problem-solving?		
2.	**Category 9** - Sound		
2.1	Are music integrated within the SPD through songs, rhymes, chants, musical games and lullabies?		
2.2	Can the music that is integrated be used as a therapeutic medium?		
3.	**Category 10** - Touch		
3.1	Are tactile materials incorporated within the SPD to serve the function of creative problem-solving skills and to increase hand-eye coordination?		
C	Cornerstone 3: Supporting Factors		
1.	**Category 11** - The Toy Element		
1.1	Is the SPD appropriate for young school-age children's developmental level?		
1.2	Is the sensory product used as a reactive toy?[56]		
1.3	Toys must adhere to the criteria of Johnson and Smolken (1995) to ensure appropriateness for young school-age children by:		
	Does the sensory product require involvement, concentration and an element of chance which require certain skills?		
	Does the sensory product use some electric current, but not enough to overheat and result in burns?		
	Is the sensory product designed to expand children's school experiences?		

	Is the sensory product suited for the individual child's skills in order to promote his or her interest?		
	Does the sensory product foster solo and group play?		
1.4	Are the following factors incorporated into the SPD for the selection of appropriate toys for children that adhere to the toy safety regulations as set by the Consumer Product Safety Commission, namely:		
	Is the SPD safe for young school-age children in relation to its construction and durability?		
	Is the SPD appealing and interesting to young school-age children?		
	Is the SPD suited for young school-age children's physical capabilities?		
	Is the SPD suited for young school-age children's mental and social development?		
1.5	Are the set of guidelines that was developed by Bailey and Wolery (1992) for the selection of toys and play materials in regard to children with special needs incorporated in the SPD by means of:		
	Are the toys and play materials reactive (toys that produce sound, movement or light when activated by a child)?		
	Are toys and play materials age-appropriate?		
	Are toys and materials adapted if necessary to increase engagement and learning?		
	Do play materials include naturally occurring objects (boxes, kitchen utensils and packaging materials)?		
	Are toys and play materials selected to promote learning of important skills?		

2.	**Category 12** - The Play and Play Therapy Element		
2.1	Are limit-setting[57] incorporated in the SPD?		
3.	**Category 13** - The Cultural Sensitivity and Socio-Economic Element		
3.1	Does the SPD overcome communication barriers which result from cultural differences?		
3.2	Are the play techniques that are incorporated in the SPD in accordance with values and traditions of the specific culture involved?		
3.3	Are animal characters used to possibly overcome the communication barrier that exists due to cultural differences?		
3.4	Is the SPD cultural sensitive in its graphic elements according to the following guidelines set by Hugo (2002):		
	The colour combination?		
	Graphical decoration?		
	Typefaces that is used?		
	Depiction of familiar cultural objects?		
	Are the body features and body language of illustrations of people in line with their culture?		
	Stereotypical presentation of behaviour?		
	Is the level of graphic abstraction and silhouetting culturally appropriate?		
	Is the illustration sequence culturally appropriate?		
	Is the three-dimensional perspective of illustrations culturally appropriate?		
	Is the scale and zooming into a section of an object suitable for the selected target market's culture?		

Endnotes

[1]The term Learning Problems is an umbrella term that for the purpose of this study includes learning restraints, learning disabilities and/or disorders. A learning restraint develops when certain factors cause a child not to achieve his or her potential. A child with a learning disability or disorder has an identifiable deficiency in his or her given potential, such as a sensory, neural, intellectual or physical deficiency. (Kapp, 1991).

[2]Adjunct aids can consist of study guides, underlining and highlighting.

[3]A word chosen because it encompasses two important arguments we might have with the emerging cultural, institutional and global order.

[4]Sensation is the process where sensory channels are used in the learning process. When a child does not fully or effectively use one of the sensory channels, he or she can be deprived of an effective learning experience and the learning process is thereby greatly inhibited (Johnson & Myklebust, 1967).

[5]Perception is the ability to recognize the sensory intake in the sensation process (Johnson & Myklebust, 1967). Toddlers have been observed by Lempers, Flavell and Flavell (1977) to make appropriate adjustments to stimuli which indicates that young children do have some knowledge about perception.

[6]Imagery builds forth on the perception process (Johnson & Myklebust, 1967).

[7]The perception process is the ability to single out perceptions by recalling aspects of a particular experience whereas symbolization is a complex experience through which a child acquires a language (Johnson & Myklebust, 1967).

[8]Conceptualization is the ability to relate objects and ideas through experiences (Johnson & Myklebust, 1967).

[9]Stimulation in general refers to how organisms perceive incoming stimuli. As such it is part of the stimulus-response mechanism. Stimulation is the action of various agents (stimuli) on muscles, nerves, or a sensory end organ, by which activity is evoked, especially the nervous impulse produced by various agents on nerves, or a sensory end organ, by which the part connected with the nerve is thrown into a state of activity (Wikipedia, n/d).

[10]Recognized sensory systems are those for vision, hearing, somatic sensation (touch), taste and olfaction (smell). A sensory code includes all of the above-mentioned systems (Kolb & Whishaw, 2003).

[11]Dual-coding works with representational illustrations that are both visual and auditory (Clark & Paivio, 1987; Suzuki, 1985).

[12]Visual code refers to the visual system that has the complex task of (re)constructing a three-dimensional world from a two-dimensional projection of that world (Wikipedia, n/d).

[13]For example: to promote recall that ranidae is a scientific term for common frogs, a picture can be shown of a frog sitting in the rain (keyword for ranidae) (Mastropieri & Scruggs, 1997).

[14]For example: one=bun; two=shoe; three=tree (Mastropieri & Scruggs, 1997).

[15]Hugo's grading model: A grading model that assesses and indicates the level of appropriateness of health learning materials. The model uses an X- and Y-axes system in relation to each of the other window segments with an S-shaped structure that flows over all four segments. Socio-cultural sensitivity and appropriate media and technology use are represented on the X- and Y-axes respectively. By combining the results of the S-shaped curve of all the important factors, a balanced grading can be given to a specific product's appropriateness and suitability (Botha, 2008).

[16]Bannatyne's Psycholinguistic Color System (PCS): The Bannatyne Program is intentionally designed to assist dyslexic students to permanently learn phoneme-to-grapheme associations through a variety of devices and techniques, and to minimize mirror-imaging. Retrieved from: http://www.bannatynereadingprogram.com/BP12LDIS.htm

[17]Wechsler Intelligence Scale (WISC): The WISC was revised and a new scale was developed, namely the Wechsler Intelligence Scale – Revised (WISC-R)**.** Lufi and Cohen (1988) believed that the best use of the WISC-R would be as part of an attempt to understand the cognitive deficits of various clinical groups; these group results can then be used to build better remedial programmes.

[18]The Stroop Color and Word Test: The Stroop Color and Word Test consists of three pages. Firstly a page with three colour names printed in black, secondly the same colours printed as "ggg" and thirdly as mismatched colours.

[19]Discrimination of pairs of stimuli separated by a category boundary is more accurate and faster than discrimination of equally-separated pairs in the same category, which occurs if two colours are separated by a category pair.

[20]Visual search for a colour target is facilitated if the target is in a different category to the distractors by adults and children.

[21]The eleven categories of colour terms include white, black, red, green, yellow, blue, brown, purple, pink, orange and grey.

[22]A possible method to establish whether a storyline is positive or negative.

[23]For example: Children can learn colour words without knowing the colour to which they refer to or they will use a single colour word to signify different colours; furthermore they often apply colour terms in a haphazard and inconsistent manner.

[24]For example: “Little pig, little pig, let me come in... I’ll huff and I’ll puff and I’ll blow your house down”.

[25]The retelling of a story consists of the provision of feedback from the child about the storybook that has been read.

[26]The contexts in which a teacher genuinely shares authority with the children during an action (Oyler, 1996).

[27] The incorporation of cue cards, think-sheets, maps and strategies.

[28]Informational texts are defined as text or content that has a function to communicate, an expectation of durable factual content, timeless verb constructions, generic noun construction, technical vocabulary, classificatory and definitional material, comparative/contrastive, problem/solution, cause/effect structures and graphic elements such as diagrams, page numbers or maps.

[29]Adjunct aids can consist of study guides, underlining, semantic relationship charts and highlighting (Horton & Lovitt, 1989; Mastropieri & Scruggs, 1997).

[30]Material and/or paper can consist of: (1) textured paper, (2) Perspex™, (3) aluminium, (4) plastic, (5) hardboard, (6) vinyl, (7) bubble wrap, (8) cork, (9) hand-made paper and (10) papyrus.

[31]Radical Change is the term used to describe a conceptual framework or theory for understanding, appreciating and evaluating the types of significant changes in current children and young adult’s literature.

[32]Synergism is defined as the simultaneous action of separate agencies, which together have greater total effect than the sum of their individual effects (Wikipedia, n/d).

[33]Polysemy is the capacity of a sign (e.g. a word, phrase, etc.) or signs to have multiple meanings (sememes, i.e. a large semantic field). This is a pivotal concept within social sciences, such as media studies and linguistics (Wikipedia, n/d).

[34]A unique machine that "traces" the letters of words on a child's abdomen, with the teacher's assistance, the student can then relate the tactile experience to the sight and sound of individual letters, letter patterns and words (Haber, 1975).

[35]For example: Planting kits, toy typewriters, computers, etc.

[36] All ages: no shock or thermal hazards in electronic toys; amount of lead in toy paint severely limited; no toxic materials in or on toys; art materials used by children under 12 should be non-hazardous and indicate they conform with ASTM D-4236; Latex balloons and toys and games with latex balloons must be labeled with a warning of the choking and suffocation hazards associated with pieces of and uninflated balloons. Under the age of eight: No electrically operated toys with heating elements; no sharp points on toys; no sharp edges on toys.

[37]Toys that are equipped with microchips that have the capability to respond to input from each other, from the environment, and from children themselves, transforming these toys from passive items into entities that can engage in forms of conversation and play with children.

[38]Toys which maintain some motion and/or produce some sensory feedback when manipulated by the child.

[39]Toys with limited potential for producing motion and/or sensory feedback when manipulated by a child.

[40]Colour, line, shape and value.

[41]Age, gender, class and culture (racial, religious and regional).

[42]Mnemonic illustrations transform textual information to enhance memory. For example: to promote recall that ranidae is a scientific term for common frogs, a picture can be shown of a frog sitting in the rain (keyword for ranidae) (Mastropieri & Scruggs, 1997).

[43]The Keyword strategy links new information to keywords that are already encoded to memory.

[44]The Peg Word strategy uses rhyming words to represent numerical proxies or order.

[45]Letter strategies involve the use of acronyms and acrostics.

[46]Adjunct aids can consist of study guides, underlining and highlighting (Mastropieri & Scruggs, 1997).

[47]Learner variables can consist of age, gender, media literacy, learning motivation and prior knowledge of a certain topic.

[48]Picture-coding variables can consist of amount of graphic detail, abstraction and colour use.

[49]Socio-cultural variables can consist of health-related behaviour, values, norms and familiarity with certain media types.

[50]A possible method to establish whether a storyline is positive or negative within the methodology phase.

[51]The colour-coding technique can be applied to problem letters, vowels, phonics and phonemes that are reversed by means of colour-coding. For example: b=green, d=blue and p=yellow within a section of text.

[52]Students who score higher on the verbal section of the WISC benefit more from the non-colour-coded drill and children with a higher performance score seem to draw much more benefit from colour-coding.

[53]Interactive format: The contexts in which a teacher genuinely shares authority with the children during an action (Oyler, 1996).

[54]Elements can include (a) pictures and images (Rose, 1986; Warner & Alley, 1981), (b) spatial organization of text content (Darch & Carnine, 1986), (c) mnemonic illustrations (Mastropieri, Scruggs & Levin, 1987; Mastropieri & Scruggs, 1997), (d) adjunct aids (Horton & Lovitt, 1989; Mastropieri & Scruggs, 1997) and (e) semantic relationships charts (Bos, Anders, Filip & Jaffe, 1989; Mastropieri & Scruggs, 1997).

[55]A music programme can consist of songs, rhymes and chants that can be incorporated into a piece of audio material that can be played in a classroom situation with an accompanying visual aid and the learning of a musical instrument that can be played in association with singing as a group.

[56]Toys which maintain some motion and/or produce some sensory feedback when manipulated by the child (McGill, Shores & Fox, 1984).

[57]Limit-setting: Increasing the number of puzzle pieces with the page number (page 1 = 1 puzzle piece, page 2 = 2 puzzle pieces, etc.)

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Section C

Structure of Section C

A graphic representation to depict the structure of Section C is set out in Figure 3.

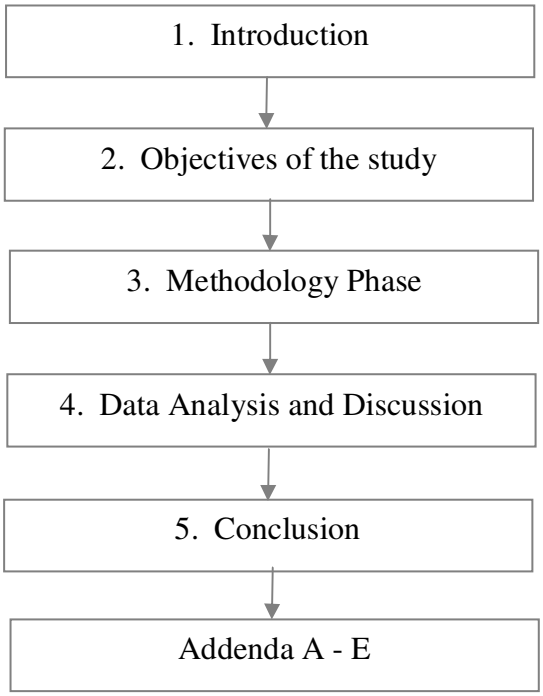

Figure 3. A graphic representation to depict the structure of Section C.

RESPONSES FROM CHILDREN WITH LEARNING PROBLEMS TOWARDS SENSORY PRODUCTS AND RECOMMENDATIONS FOR THE IMPROVEMENT OF THE SENSORY PRODUCT

1. Introduction

Special needs teachers aid children with Learning Problems (LP) through intervention strategies once they are identified. Intervention strategies involve the use of instruments such as scripted and prescribed programmes (Fuchs & Fuchs, 2006), reading aloud by teachers to children (Fisher, Flood, Lapp & Frey, 2004) and one-on-one instruction as part of the three-tiered Reading to Intervention Model (RIM) (Scanlon & Sweeney, 2008). Remediation steps for children may even include regular feedback from teachers, the use of diagrams, graphics and pictures to provide a key to the meanings of words, □odeled instructional practices and engaging children in open-ended questions (Learning Disabilities Association of America [LDA], 2009). Toys that remedial teachers can use in their classrooms may consist of books with tactile properties, puzzles, musical instruments, singalongs and interactive games as can possibly provide stimulation to children with LP. Tactile toys are referred to as sensory products (SP) which are defined by a combination of the different sensory actions. These sensory actions include seeing, hearing, smelling, touching and tasting. Qualities that define SP are that they include properties such as interactivity and sensory actions.

In a study of children's interactions with interactive toy technology it was reported that this type of technology has potential (Luckin, Connolly, Plowman & Airey, 2003). The shortcomings of Luckin et al.'s (2003) interactive toys were that the toys themselves were not suitable learning aids as the children's responses to the

toys were inadequate and in some cases even inappropriate. In a related study the need for developing interactive toys was highlighted as children with developmental disabilities respond better to these type of toys during play sessions (Hsieh, 2008; Bambara, Spiegel-McGill, Shores & Fox, 1984). SP have the potential to assist teachers and children with LP only if those products are appropriate for the children's developmental level (Oravec, 2000).

Factors which may influence the development of SP to stimulate children with LP are design factors such as illustrations, colour and themes and supporting factors which include therapeutic practices and cultural sensitivity. The effective use of these factors may be beneficial for text enhancement and reading comprehension within books for children with Learning Disabilities (LD).

The research conducted by Hsieh (2008) as well as Bambara et al. (1984) highlighted the benefits and value of SP for children with developmental disabilities, but the shortcomings of Luckin et al.'s (2003) study must be taken into consideration because these products must be appropriate for the child's developmental level (Oravec, 2000). The questions that were identified by the above discussion are how to develop more effective SP, how to rate such a product and how to determine the quality of an SP. One way by which teachers can evaluate SP is to make use of a checklist.

Checklists are used to evaluate various materials, matters and qualities, from information design (Petterson, 2002), media appropriateness and cultural sensitivity (Hugo, 2000) to the refinement of a book on stroke care at home (Botha, 2008). Such a checklist must include the factors which play a contributing role towards the development of such a product such as design factors, therapeutic practices and cultural sensitivity. An SP was evaluated using a checklist which was previously

developed according to a literature review by the authors. The SP was redesigned according to the checklist, resulting in the SP which was tested with the children.

The study used a teacher observation analysis to gather the children's responses and interactions with the SP. The teacher observation analysis is based on Virginia Axline's eight basic principles of nondirective play therapy (Landreth, 2000) as well as the nine key suggestions for reading a picture book in a classroom (Richardson & Miller, 1997). A teacher observation analysis of the interaction between a child and an SP is of importance as it documents any unique interaction that was observed as well as recommendations that were made. This type of analysis was used by Eber and Miller (2003) as well as Grandau (2005).

2. Objectives of the Study

The objective of the study is to record the responses of the children towards the SP as well as the recommendations by the teachers.

3. Methodology Phase

3.1 Description of tools for data collection

A questionnaire was compiled for the data collection in regard to children's interaction and experience with the SPD within a class situation. A remedial teacher and an occupational therapist were consulted for the compilation of this specific questionnaire. They identified all relevant questions that were suitable for the age group concerned. The primary aim of this tool is to document children's interaction and experience with the SPD so that possible problems can be identified in this regard.

The expansion of the SP requires the identification of suitable story themes. The aim of this tool is the identification of the most suitable story themes for children in Grades 1 and 2 for the expansion of the SPD. The twenty themes were recommended as top early elementary themes by Reading is Fundamental (2009).

3.2 Permission to conduct research

An application to conduct research had been sent to the Department of Education, Free State. Permission was granted to conduct research at schools under conditions that were specified by the Department of Education, Free State (see Addendum A).

3.3 Selection Process

3.3.1 Selection process of Schools. Forty-five primary schools were identified, through the national telephone directory, within the city of Bloemfontein, Free State, South Africa (these exclude higher primary schools and Bochabela schools). Primary schools which are situated within or nearby the central business district of the city were selected for the sake of convenience. Primary schools were further selected on the criteria of number of pupils, school fees, geographical location and their children had to be representative of the South African population. Four schools were identified as possible locations where the SP testing could be conducted. These schools' number of children ranged between 840 and 1200 and school fees between R1700 to R2750 per year and were situated in the geographical district of the CBD of Bloemfontein. Letters of permission to conduct research were sent out to the selected schools' principals (see Addendum B). Permission was obtained from only two schools.

3.3.2 Selection process of Children. Children were recruited from the two schools from which permission was obtained in Bloemfontein, Free State, South Africa. A total of forty-two children in Grades 1 and 2 were selected for participation in the SP testing. Twenty-four male and eighteen female children were selected. The children selected from School A comprised of one six-year-old, two seven-year-olds, twelve eight-year-olds and six nine-year-olds and those from School B comprised of one seven-year-old child, fifteen eight-year-old children and five nine-year-old children. All children received their schooling in the English language. It must be noted that all the

children were children who's second language was English. The children were identified by the schools' remedial teachers and were children with LP. Letters of permission for the participation of the children were sent out to the parents of the children (see Addendum C).

3.4 Method

The three selected children were put in a classroom. School A had the resources of three remedial teachers to its disposal. One was the primary storyteller while the other two acted as observers. These two teachers sat at the back of the class observing the interaction of the children with the SP. The SP was placed on a low table for the children to see and they could page through it if they so desired. All three children sat around the table so that the proximity of the children was in close relation to the teacher. The remedial teacher who was the primary storyteller handled the SPD throughout all of the sessions. The interactive prompts were read by the storyteller and the children were included in the different activities. These consisted of pushing the buttons to activate the sound element, singing along to the song, playing the triangle, pulling the flaps and feeling the different textures. After the interaction with the SP, each child was interviewed by one of the three remedial teachers directly after the session. The teachers noted their responses to the questions of the associated questionnaire and recorded each child's response towards the SP.

School B had only one remedial teacher available to assist with the testing. Three children were used in each session. After the interaction with the SP, only one of the three children was interviewed directly afterwards. The other two were also interviewed individually, but twenty minutes or more after each other.

4. Data analysis and Discussion

4.1 Child's Interaction with the SP (Questionnaire 1)

The results of the children's interaction and experience are presented in Table 2. See Addendum D for the original questionnaires.

Table 2

Summary of children's responses towards the sensory product

Schools	Question 1 The child paged through the book because:			Question 2 Did the children enjoy the book as a whole?	Question 3 The child identified the following element as the most likeable:				Question 4 Did the children understand the essence of the story?	Question 5 Would the children like to page through similar books?
	Illustrations	Aesthetical attractiveness	Reading Factor		Sound element	Touch element	Interactive element	Illustration element		
A	14	13	4	21	15	4	3	4	16	21
B	9	10	3	21	16	3	5	13	5	21

4.1.1 Discussion of the Results

School A. Children were selected from Grade 1 and Grade 2 remedial classes. Only one child did not want to page through the SPD. The colourful illustrations caught several of the children's attention and different kinds of animals were identified as their favourites. This group of children enjoyed the singalong and the animal sounds the most. Most of the children understood the essence of the story (n = 16).

One child did not answer the question on which element was the most likable whereas other children provided one or more answers. The children enjoyed the book as a whole and the sound element was identified as the most likeable element. The reading factor received the least attention from the children.

School B. The selected children were from Grade 2 remedial classes only. One child remarked that he did not want to read the book because other books are easier to read than the SP presented to the group. This child, however, still enjoyed the book when it was read by the teacher. The children's favourite animals were the bear, the rhinoceros and the giraffe – especially its spots. This group of children by far enjoyed the singalongs most. The remedial teacher gave all the children an opportunity to play the triangle while the others sang the song. Only a small portion of the children did learn the essence of the story ($n = 5$). All the children enjoyed the book as a whole and identified the sound element as the most likable element.

4.2 Teacher's Feedback and Observation from the Interaction that took place between the Children and the SP (Questionnaires 2 and 3)

The questions in this section were aimed to document the children's interaction with the SP as the teacher experienced it.

School A. The remedial teacher documented that all the children's responses towards the SP were seen as suitable behaviour. The children found the SP to be interesting and enjoyed the interactive components. The components favoured the most were the sound and touch elements. These elements enabled the children to sing along to the songs and they could also experience different textures. The design of the electronic mechanism was documented as being easy to handle for a child and it is thus concluded that the design was successful. Children with different disabilities and/or disorders reacted differently to the SP.

School B. The remedial teacher completed questionnaires for each of the days in which the methodology phase was running at the school. She documented that

except for one child all the children's responses towards the SP were seen as suitable behaviour. The reason provided for this was that he is a shy child who struggles to express himself. The remedial teacher suggests that the story should rather be divided into several reading sessions for the children to be exposed over a longer period to the SP or otherwise that it is more suitable for Grade 3 children. The children found the SP to be interesting and enjoyed all the interactive components. The component identified as the most favourable was the sound element. The playing of the triangle amused the children and they enjoyed singing along to the song. Another element that the children were fond of was the texture of the giraffe. The book's interactive components were documented as easy to page through but some of the children struggled to pull and lift the flaps.

Children with different disabilities and/or disorders reacted differently to the SP. Some of the children's attention spans are short which resulted in the story being lost. This, according to the teachers, can be due to information overload in the story and new information that the children obtained. Some of the children reacted by singing along to the song, while others only listened to it or said something additional.

4.3 The Theme Questionnaire that the Teachers used to Identify Suitable Story Themes for Grade 1 and Grade 2 Children (Questionnaire 4)

The expansion of the SPD requires the identification of suitable story themes. Twenty suitable story themes were identified and compiled within a questionnaire for teachers. Table 3 catalogues the data collected from the two remedial teachers at the different schools, namely A and B, and a Grade 1 and a Grade 2 teacher at School B. The teachers had to use a scale of 1 to 5 with 1 being the most suitable themes for this age group and 5 being the least suitable. See Addendum D for the original questionnaires.

Table 3

Teacher theme questionnaire

	Themes	A	B	B1	B2
1	A treasure hunt (going on a treasure hunt to find the hidden treasure)	1	3	4	
2	A sea holiday (sand, shells, sun and sandcastles)	1	4	5	
3	Making new friends (first day at a new school)	1	1	1	1
4	Then and now (Mammoth vs Elephant)	3	4	5	
5	Swimming pool party (games, tubes and water safety)	2	2	4	1
6	A space adventure (our galaxy and planets)	2	4	5	
7	Sport activities and equipment (cricket is played with a bat and ball)	1	4	2	
8	Making music by using musical instruments (singalongs)	2	1	1	1
9	The natural elements of mother earth (wind, rain, sun, trees, water)	2	1	2	1
10	Houses of animals around the world (Igloo = Polar bear)	4	5	3	
11	The early bird catches the worm (hard work reaps rewards)	3	4	4	
12	Traffic rules and regulations (sign boards, traffic lights and police officers)	1	2	1	
13	Healthy food choices for growing little ones (fruit and vegetables)	1	1	1	1
14	Animal nationalities (China = Giant Panda; Africa = Lion)	4	5	5	
15	Different transportation methods (trains, planes, cars and boats)	1	3	2	
16	Hospitalization (ride in an ambulance, emergency services, nurses)	1	2	3	
17	One day as a firefighter (activities of a firefighter)	2	3	3	
18	Explore the depths of the sea (different kinds of fish)	2	4	4	
19	A birthday party (invitations, baking the cake, hosting a party)	1	3	1	1
20	Picnic in the woods (do not pollute the environment)	1	2	3	

4.3.1 Discussion of the Results. From the above data it can be determined that the two most suitable themes are making new friends (nr. 3) and healthy food choices for growing little ones (nr. 13). The second most suitable themes are making music by using musical instruments (nr. 8), the natural elements of mother earth (nr.

9), traffic rules and regulations (nr. 12) and a birthday party (nr. 19). The data in Table 2 does not necessarily display suitable themes for all children, but rather serves as an indication that theme choice differ from school to school as well as from grade to grade. It must also be taken into consideration that the teacher's preference towards certain themes also had an influence of theme selection.

5. Conclusion

The objective of the study is to record the responses of the children towards the SP as well as the recommendations by the teachers. The data was collected by means of four questionnaires (see Addendum D).

The first questionnaire documented children's interaction and experience with the SP within a class situation. The second and third questionnaire documents the teacher's feedback and observation from the interaction that took place between the children and the SP. The remedial teacher of School B recommended that the SP is more suitable for English first language children or alternatively Grade 3 children. Both remedial teachers provided recommendations for the improvement of the friendship theme, the flow of the story and the illustrations which were subsequently implemented into the SP for the final product development. The most important recommendation that was made was that the SPD is more suitable for Grade 3 children or English first language Grade 2 children. Other recommendations included that the friendship theme should be utilized earlier in the story and repeated several times thereafter to indicate the value of friendship and so place more accent on the essence of the story. This can be achieved by using a picture of all of the friends early on in the story, illustrating a scene where the animals help or support each other and more animal friends that interact with each other as well as that two pages within the storybook's content should be rearranged so that the storyline flows better. The

teacher indicated difficult words that should have been paraphrased within the story or replaced with other, more suitable words. These words are “existed”, “jailbreak”, “emigrated” and “exhausted”. Another recommendation was that South Africa should be illustrated on the world map to provide the children with a better orientation of where the different continents are in relation to South Africa. The conclusion that can be drawn is that the SP must firstly be evaluated for obvious mistakes and to ensure suitability for the selected age group.

The data analysis of suitable themes suggested two themes that were most suitable for children in Grade 1 and Grade 2. Several contradicting theme choices were made in the questionnaires by the teachers. This only indicates that theme selection differs from school to school as well as from grade to grade. It must also be taken into consideration that the teacher’s preference towards certain themes also has an influence on theme selection.

For future research the recommendation can be made that the SP must firstly be evaluated by remedial teachers to ensure an SP that adheres to all criteria.

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Addendum A

This addendum contains the permission letter from the Free State Department of Education.

FREE STATE PROVINCE

Enquiries : Gaborone MMA
Reference no. : 16/4/1/27-2007

Tel : 051 404 8658
Fax : 051 447 7318

2007-07-31

Ms Y Olivier
16 Bidwell Street
Wilgehof
BLOEMFONTEIN
9301

Dear Ms Olivier

REGISTRATION OF RESEARCH PROJECT

1. This letter is in reply to your application for the registration of your research project.

2. Research topic: **The development of sensory products to stimulate children with learning disabilities.**

3 Your research project has been registered with the Free State Education Department.

4. Approval is granted under the following conditions:-

4.1 Educators and officials participate voluntarily in the project.
4.2 The names of all schools and educators involved remain confidential.
4.3 The questionnaires are completed and the interviews are conducted outside normal tuition time.
4.4 This letter is shown to all participating persons.
4.5 A bound copy of the report and a summary on a computer disc on this study is donated to the Free State Department of Education.
4.6 Findings and recommendations are presented to relevant officials in the Department.

5. The costs relating to all the conditions mentioned above are your own responsibility.

6. **You are requested to confirm acceptance of the above conditions in writing to:**

The Head: Education, for attention:
DIRECTOR : QUALITY ASSURANCE
Room 401, Syfrets Building
Private Bag X20565, BLOEMFONTEIN, 9301

We wish you every success with your research.

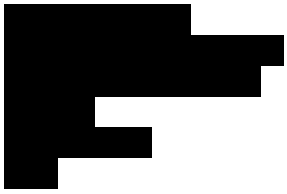
Yours sincerely

FR SELLO
DIRECTOR : QUALITY ASSURANCE

Addendum B

This addendum contains the letters that were sent out to the schools' principals requesting their permission to conduct the methodology phase at their schools.

17 June 2009



Dear Principal

Permission to conduct research

I am currently a registered Master's student in Graphic Design at the Central University of Technology, Free State. The aim of my research is the development of a checklist outlining suitable guidelines for sensory product development for children with learning problems. The research output of the research is the development of a sensory product book range that specifically aims to stimulate such children by means of adhering to the criteria set by the literature review.

The methodology phase of my study consists of a pre-testing phase of several storylines to establish whether the children's emotional reactions in regard to each separate storyline is positive or negative. This stage will identify the five topics and storylines for the sensory product book range.

The second phase of the methodology comprises of the introduction of a children's book that was edited according to the criteria of the literature review by the teacher of the class (see Attachment 1 for a sample). The children's experiences and interaction with the product will be observed for an observation analysis that will contribute towards the study. After the introduction of the product in a read-aloud and interactive session with a group of three learners, it will be asked of the teacher to complete two questionnaires (see Attachment 2 and 3). These questionnaires will be used as guidelines for the final development of the sensory product book range.

I wish to obtain your permission to conduct my methodology phase within your school. The children that will be involved are Grade 1 and Grade 2 learners as specified by the approval letter of the Department of Education (see Attachment 4). If permission is granted, may I proceed to make contact with your Grade 1 and Grade 2 teachers? The ideal date that I wish to conduct my methodology phase in, is August 2009. It will only comprise of one or two school days per grade and can also be carried out as an extra-curricular activity in the afternoons.

Further correspondence can be made via e-mail at: yolandi@cut.ac.za or via telephone on 079 849 5931.

Yours sincerely

Mrs Yolandi Burger
MASTER'S STUDENT, CUT

Addendum C

This addendum contains the letter that was sent out to the parents of the participating children seeking their permission to include their children in the research that was conducted at the selected schools.

12 August 2009

[redacted]

Dear Parent

Permission to conduct research

I am a registered master's degree student in Graphic Design at the Central University of Technology, Free State. The aim of my study is to develop an interactive book for children with learning problems. It is our hope that this book will help future children with their learning activities in the classroom.

The teacher will introduce our first interactive book to the children in class. A copy of the first page of this book is attached to this letter. This particular book is about the animals in a zoo that went on a treasure hunt to find the greatest treasure in the world. After a long search the animals found the treasure chest but with no treasure in it. They come to the conclusion that the greatest treasure in the world is friendship. The teacher will observe how the children interact with the book and will record their experience and interaction with the book. We will then use their feedback to improve the interactive book. The teacher will use a series of questions to determine the child's experience of the book. These questions are also attached for your convenience to this letter.

We will appreciate it if your child could participate in this project. We will only use Grade 1 and Grade 2 learners as specified by the approval letter of the Free State Department of Education (see attached letter). The only additional information that we will collect will be the child's age and gender.

For any enquiries please contact me via e-mail at: yolandi@cut.ac.za or on 079 849 5931.

Yours sincerely

Mrs Yolandi Burger
MASTER'S STUDENT, CUT

Dr Rudi de Lange
STUDENT'S STUDY LEADER, CUT

Addendum D

This addendum contains samples of the different questionnaires that the teachers and children had to complete. The follow questionnaires are included in this addendum:

1. The child's interaction with the sensory product.
2. The teacher's feedback from the interaction that took place between the children and the sensory product.
3. The teacher's observation in regard to the children's interaction with the sensory product.
4. Teacher Theme Questionnaire.

The Child's Interaction with the Sensory Product

Age: _____

Gender: _____

- Why did you page through the storybook?
  (If the child picked up the storybook of his own accord and started paging through it.)
  _____
  _____
  _____

- What made you look at the storybook before paging through it?
  _____
  _____
  _____

- Did you enjoy the storybook?
  _____

- What did you like most about the storybook?
  _____
  _____
  _____

- Why?
  (If the child does not know, the teacher can point out the different characteristics and sections of the book, namely colour, music, hand-eye coordination, puzzles and pop-up.)
  _____
  _____
  _____

- What did you learn from the storybook?

  _____

  _____

  _____

- How will you use what you have learned from the storybook?

  _____

  _____

  _____

- Would you like to page through similar storybooks?

  _____

  _____

  _____

The Teacher's Feedback from the Interaction that took place between the Children and the Sensory Product

- Was the child's reaction to the storybook typical and/or expected?

  _____

- If not, why?

  _____

  _____

  _____

- Did the child understand the content of the storybook?

  _____

- If not, was the storybook to abstract for the specific age group that the child belongs to?

  _____

- Did the child enjoy the storybook?

  _____

- How did the child's enjoyment of the book manifest itself?
  (Example: Did he or she laugh? Did he or she want to page through similar storybooks, etc?)

  _____

  _____

  _____

- Did children with different disabilities/disorders react differently to the storybook?

  _____

- In which way?

  _____

  _____

  _____

- Which section of the storybook did the child enjoy the most?
  (Example: Colour, music, hand-eye coordination, puzzle or pop-up.)

  _____

  _____

  _____

- Why?
  (Example: It was entertaining, interesting, or easy to use.)

  _____

  _____

  _____

- Was the child able to page through the booklet on his or her own, i.e. was it easy to handle?

  _____

- Did the child want to look at the storybook out of his own: Was it eye-catching?

  _____

  _____

  _____

The Teacher's Observation in regard to the Children's interaction with the Sensory Product

The teacher is required to conduct an observation analysis in regard to the children's interaction with the SP. Any unique interaction and/or recommendations can be mentioned.

Teacher Theme Questionnaire

Please indicate the most suitable themes for children in Grade 1 and Grade 2 in numerical order.
(Example: most suitable = 1 and least suitable = 5)

Themes	**Suitability**
A treasure hunt (going on a treasure hunt to find the hidden treasure)	
A sea holiday (sand, shells, sun and sandcastles)	
Making new friends (first day at a new school)	
Then and now (Mammoth vs Elephant)	
Swimming pool party (games, tubes and water safety)	
A space adventure (our galaxy and planets)	
Sport activities and equipment (cricket is played with a bat and ball)	
Making music by using musical instruments (singalongs)	
The natural elements of mother earth (wind, rain, sun, trees, water)	
Houses of animals around the world (Igloo = Polar bear)	
The early bird catches the worm (hard work reaps rewards)	
Traffic rules and regulations (sign boards, traffic lights and police officers)	
Healthy food choices for growing little ones (fruit and vegetables)	
Animal nationalities (China = Giant Panda; Africa = Lion)	
Different transportation methods (trains, planes, cars and boats)	
Hospitalization (ride in an ambulance, emergency services, nurses)	
One day as a firefighter (activities of a firefighter)	
Explore the depths of the sea (different kinds of fish)	
A birthday party (invitations, baking the cake, hosting a party)	
Picnic in the woods (do not pollute the environment)	

Section D

Structure of Section D

A graphic representation to depict the structure of Section D is set out in Figure 4.

Figure 4. A graphic representation to depict the structure of Section D.

CONCLUSION FOR DISSERTATION

The first article's literature review identified three main cornerstones which were used to compile a checklist of suitable guidelines for the assessment of a sensory product. The checklist can be used as a qualitative tool with which teachers or qualified personnel can evaluate a sensory product in a classroom situation or within a therapeutic practice. A sensory product was developed from the literature review according to the checklist. This product was introduced into a classroom situation to children with LP. Their interaction and experience with the SP was documented, in the second article, as mostly positive. The recommendations of the remedial teachers for the improvement of the product were also incorporated into the final sensory product which was entered into the National Innovation Fund Competition, 2009.

Section E

Structure of Section E

A graphic representation to depict the structure of Section E is set out in Figure 5.

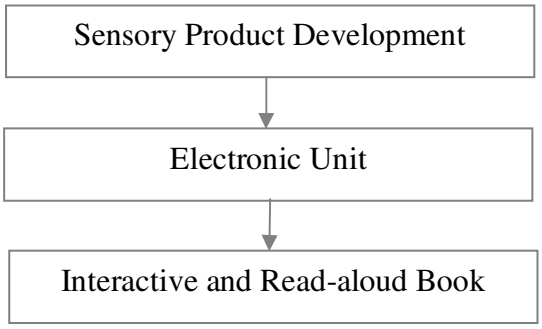


Figure 5. A graphic representation to depict the structure of Section D.

SENSORY PRODUCT DEVELOPMENT

This section includes the development process as well as the final sensory product that was developed according to the literature review of the first article (Section B) and the recommendations from the teachers in the second article (Section C).

The original sensory product that was adapted according to the checklist was a puzzle booklet, initially developed by the author for her B.Tech. studies. The adapted sensory product enhanced several aspects such as music, texture, illustrations, hand-eye coordination and several other elements. This product was used for the execution of the methodology phase and consists of an electronic unit as well as an interactive and read-aloud book. See Addendum 2 for photographs of the actual prototype.

Electronic Unit

The electronic unit as seen in Figure 5, which is a Computer-aided Design (CAD) rendering, was designed from technical drawings (see Addendum 3) and contains:

- A sound board with colour-coded buttons that are linked to the six animal sounds and the two songs. The colour-coded buttons are included in the book and teach children colour association (example: Press the RED button to hear the animal sound of a Rhinoceros).
- An SD card slot to provide an expansion on the product. New book editions can be designed with new sounds. These sounds can be loaded on an SD card and inserted into the slot to provide new sounds on the old electronic unit to go well with the new book.
- A speaker with adjustable volume is necessary because the volume of the unit must be louder in a classroom but can be softer at home when a parent reads the story to his or her child.
- An on/off button underneath the speaker cover provides an aesthetical design for this important part of the electronic unit.
- A book tray that slides out to the left to provide support for the book while it is being read.
- A handle that offers a grip for it to be hand-held as well as a central point of gravity at the back for the product to be mounted on a wall if preferred.

Figure 6. A CAD rendering of the electronic unit of the sensory product development

Interactive and Read-aloud book

The Interactive and Read-aloud book contains several elements such as illustrations, pop-ups, a repetitive song, texture that the children can feel, flaps that lift up, flaps that pull out to the side, a rotating wheel, a slide mechanism, puzzles, arrows that provide visual cues, a font that is easy to read, an essence to the story and colour association between text and the buttons on the electronic unit. Addendum 4 contains a mock-up of several pages of the book as well as a CD that contains the two songs and the six animal sounds. The two songs for the singalong had to be written and recorded in a studio. See Addendum 5 for the process which was followed.

The sensory product book which was used for the methodology phase in the second article (Section C) consisted of the following pages (see Figure 6 - 29).

- Page 1 The cover of the book (Figure 6).
- Page 2 The beginning of the story with an interactive flap that pulls out to the side creating a full picture of Rusty the Rhinoceros as well as the animal sound of the Rhinoceros (Figure 7).
- Page 3 An interactive flap that pulls out to the side and illustrates the animals walking with the reader through the story (Figure 8).
- Page 4 An interactive flap that lifts up revealing the spots of Gigi the Giraffe. Attention is drawn to the flap by means of an arrow (Figure 9).
- Page 5 An interactive flap that lifts up revealing the spots of Gigi the Giraffe. Attention is drawn to the flap by means of an arrow. This page also contains the animal sound the Bear (Figure 10).

• Page 6 A spatial visualization task is included on this page as the number of friends is equal to the number of puzzle pieces. Page 8 also uses this task, but these two pages together provide a limit-setting task (Figure 11).

• Page 7 The child is for the first time introduced to the singalong which also serves as the repetitive line within the book. It required of the child to press the number 1 button and while singing along to the song to play the triangle as well. The playing of the musical instrument provides a hand-eye coordination task. A visual cue is also used to attract attention to the parrot which is flying through the air (Figure 12).

• Page 8 A spatial visualization task is included and, as described on page 6 serves as a limit-setting task (Figure 13).

• Page 9 Only text (Figure 14).

• Page 10 The singalong is repeated and the same actions are required from the child. This page also contains a texture on the spots of the giraffe and a treasure map that pulls out to the left. Attention is drawn to the texture by means of an arrow (Figure 15).

• Page 11 A flap that has to be lifted up to reveal the curious birds watching the animals are indicated by means of an arrow (Figure 16).

• Page 12 A slide mechanism is included in this page to enable the cub to slide down the slope (Figure 17).

• Page 13 Attention is drawn to the texture of the bird sitting on the Buffalo's head by means of an arrow. This page also contains the animal sound of a Buffalo (Figure 18).

• Page 14 Attention is drawn to the texture of another bird which is flying in close relation to the bear and the cub (Figure 19).

• Page 15 The spread contains a pop-up of two koala bears who are running and/or jumping as well as a flap of the world map that pulls out to the right (Figure 20).

• Page 16 A texture was placed on Gigi the Giraffe's spots and attention is drawn to the texture by means of a visual cue (Figure 21).

• Page 17 The singalong is repeated on this page as well and the same actions are requested. Attention is drawn to the texture of the spots of the giraffe by means of an arrow (Figure 22).

• Page 18 Another texture is highlighted by means of an arrow (Figure 23).

• Page 19 The singalong is repeated once again and includes the animal sound of a giant panda. A visual cue is used to draw attention to "X marks the spot" (Figure 24).

• Page 20 The revealing of the treasure chest with its contents is illustrated by the use of a rotating wheel. The children are asked to perform the same actions which are associated with the singalong (Figure 25).

• Page 21 The animal sound of an orangutan is included in this page (Figure 26).

• Page 22 The animal sound of a parrot is included in this page (Figure 27).

• Page 23 The essence of the story is learned by the children and the singalong changes to capture this (Figure 28).

• Page 24 The back cover of the book (Figure 29).

Figure 7. Page 1.

Figure 8A. Page 2.

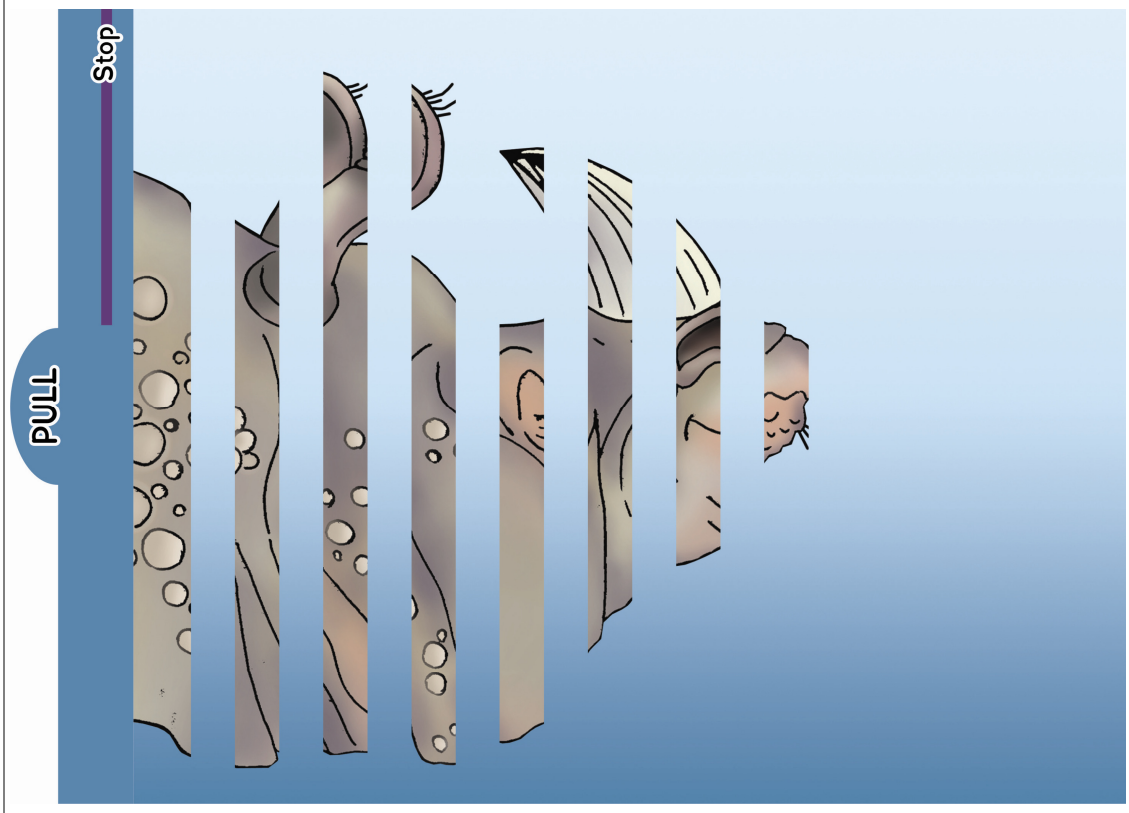


Figure 8B. Interactive component of Page 2.

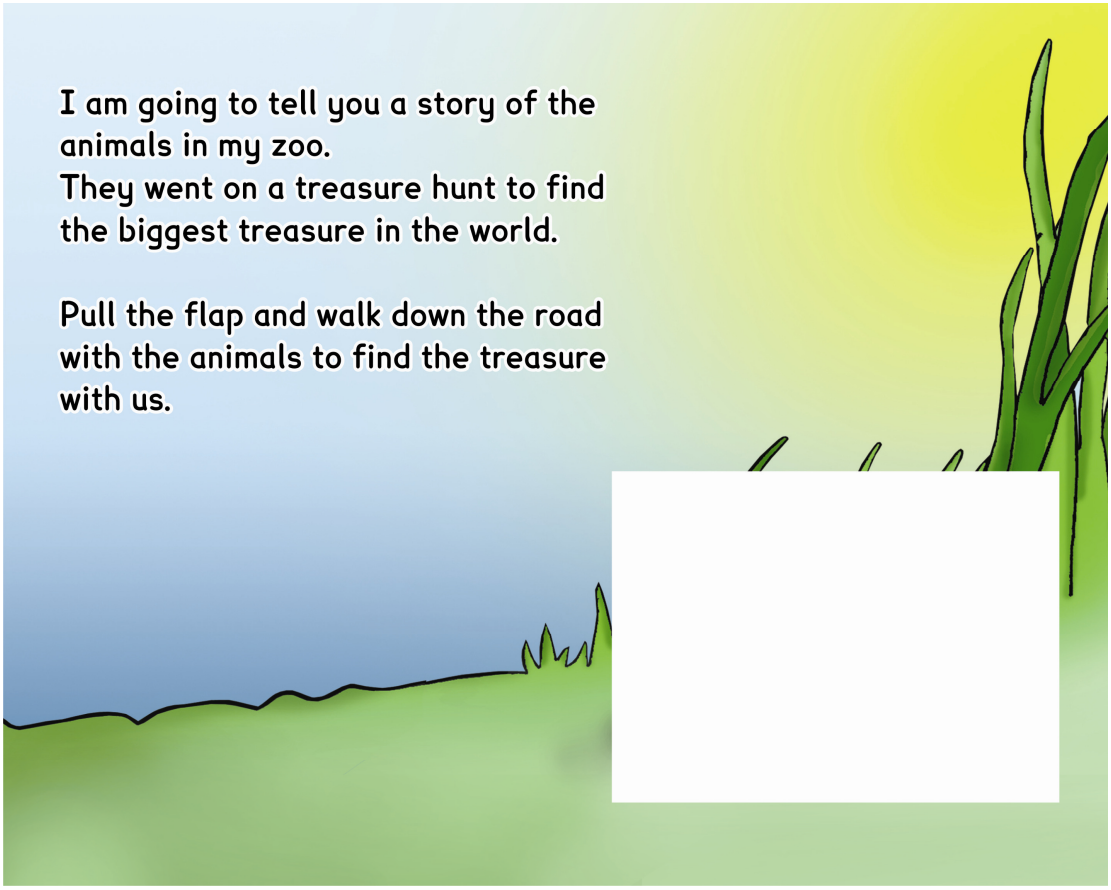


Figure 9A. Page 3.

Figure 9B. Interactive Component of Page 3.

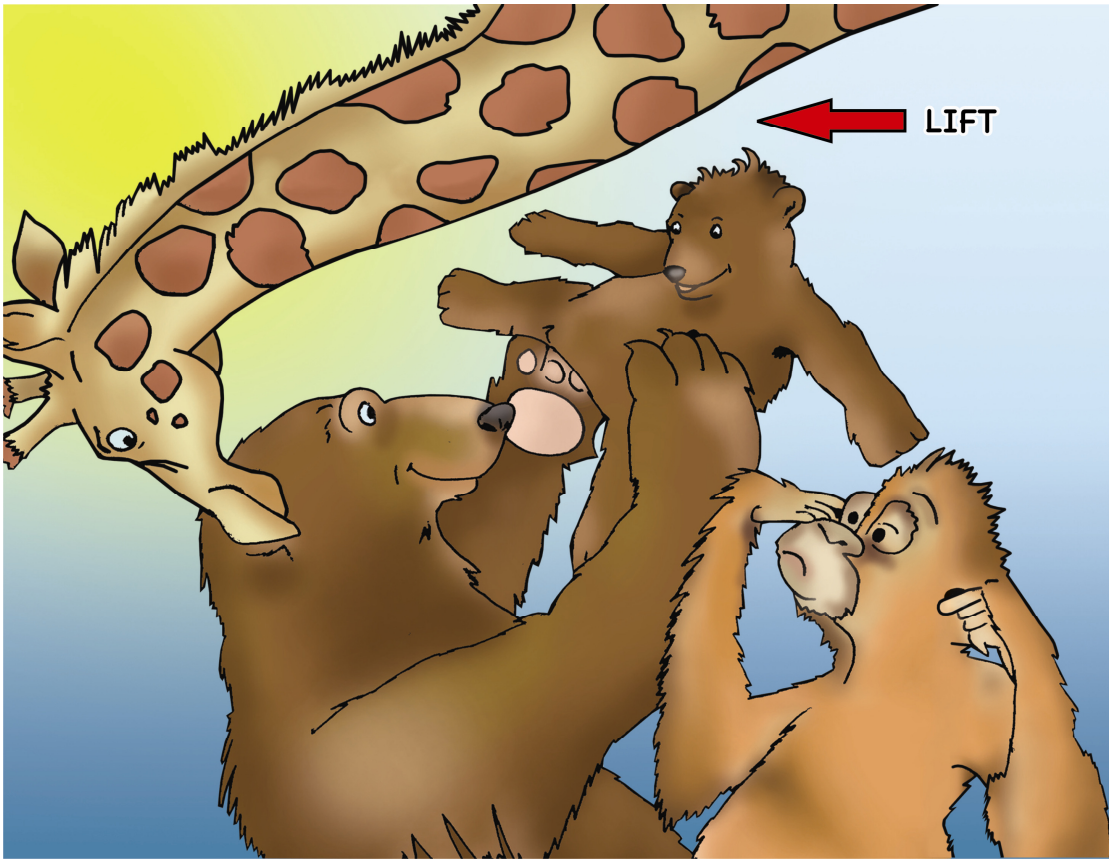


Figure 10A. Page 4.

Figure 10B. Interactive component of Page 4.

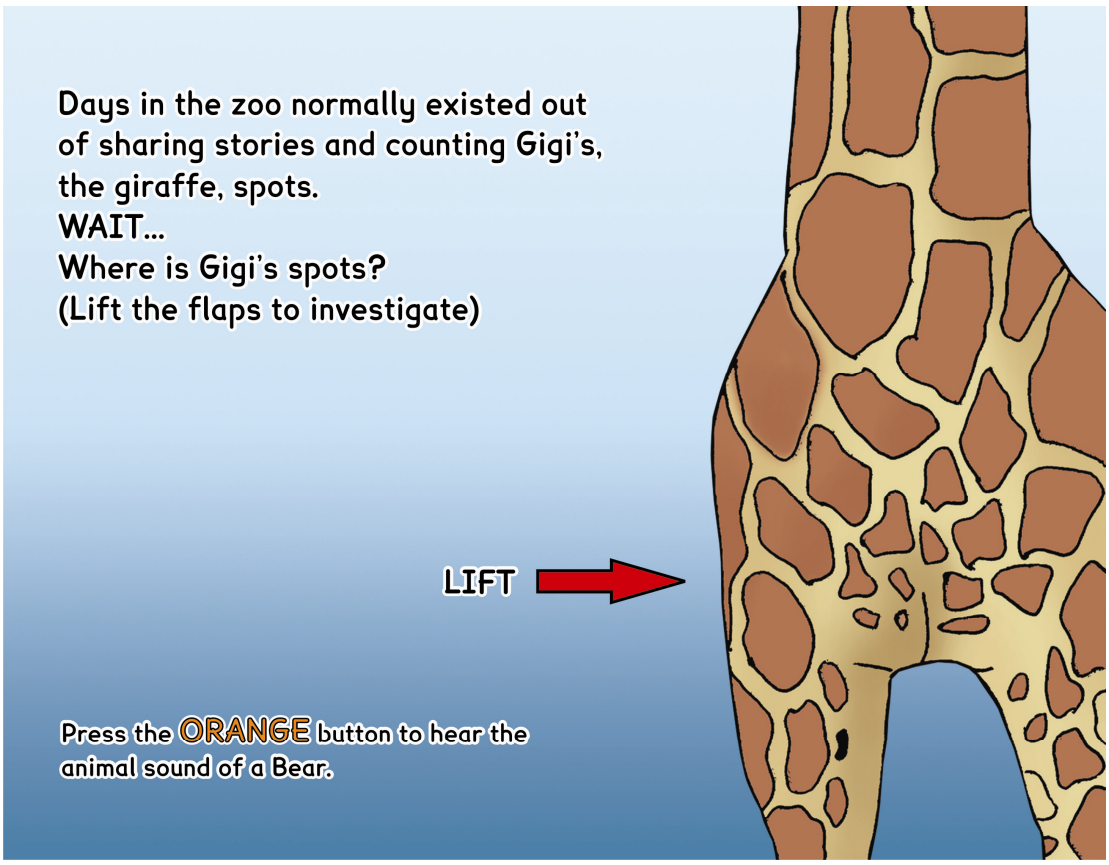


Figure 11A. Page 5.

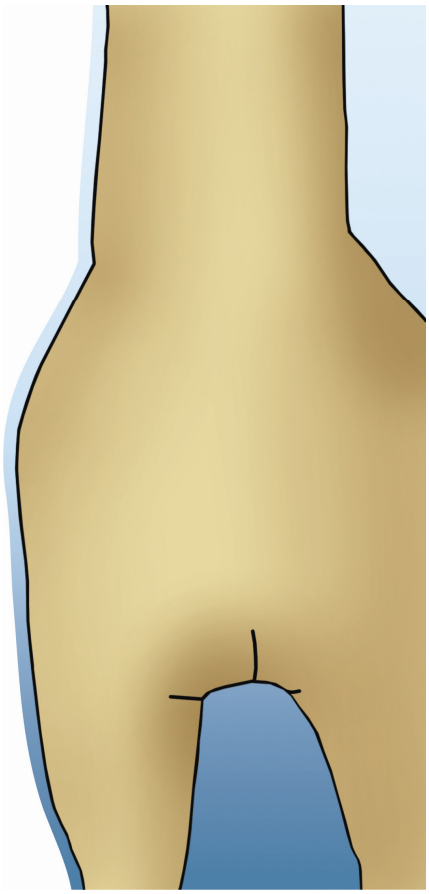


Figure 11B. Interactive component of Page 5.

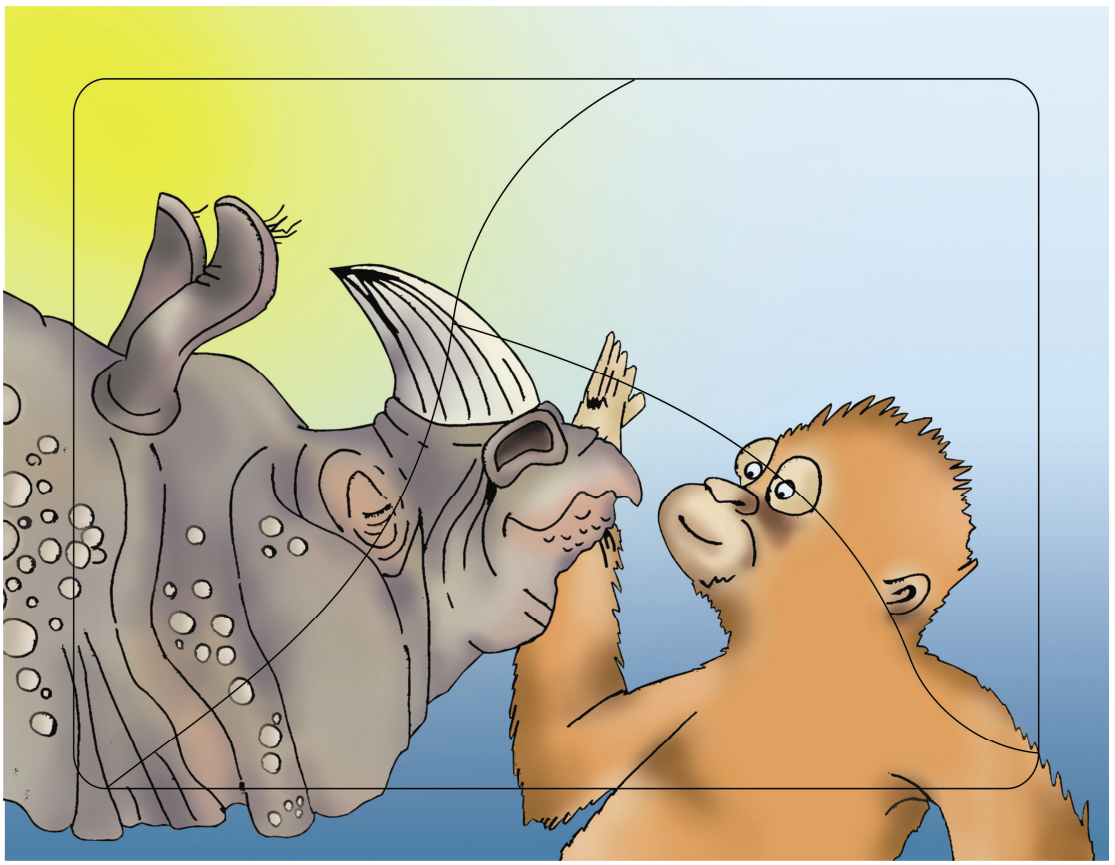


Figure 12. Page 6.

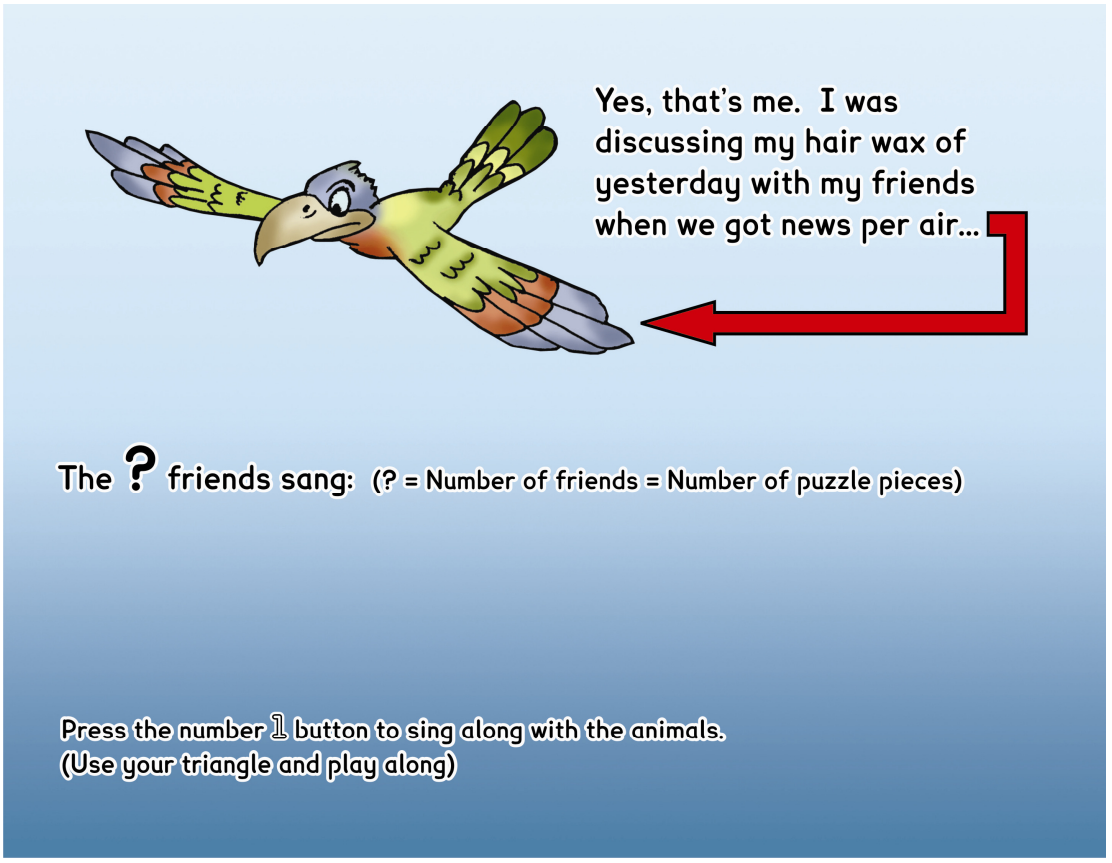


Figure 13. Page 7.

Figure 14. Page 8.

Figure 15. Page 9.

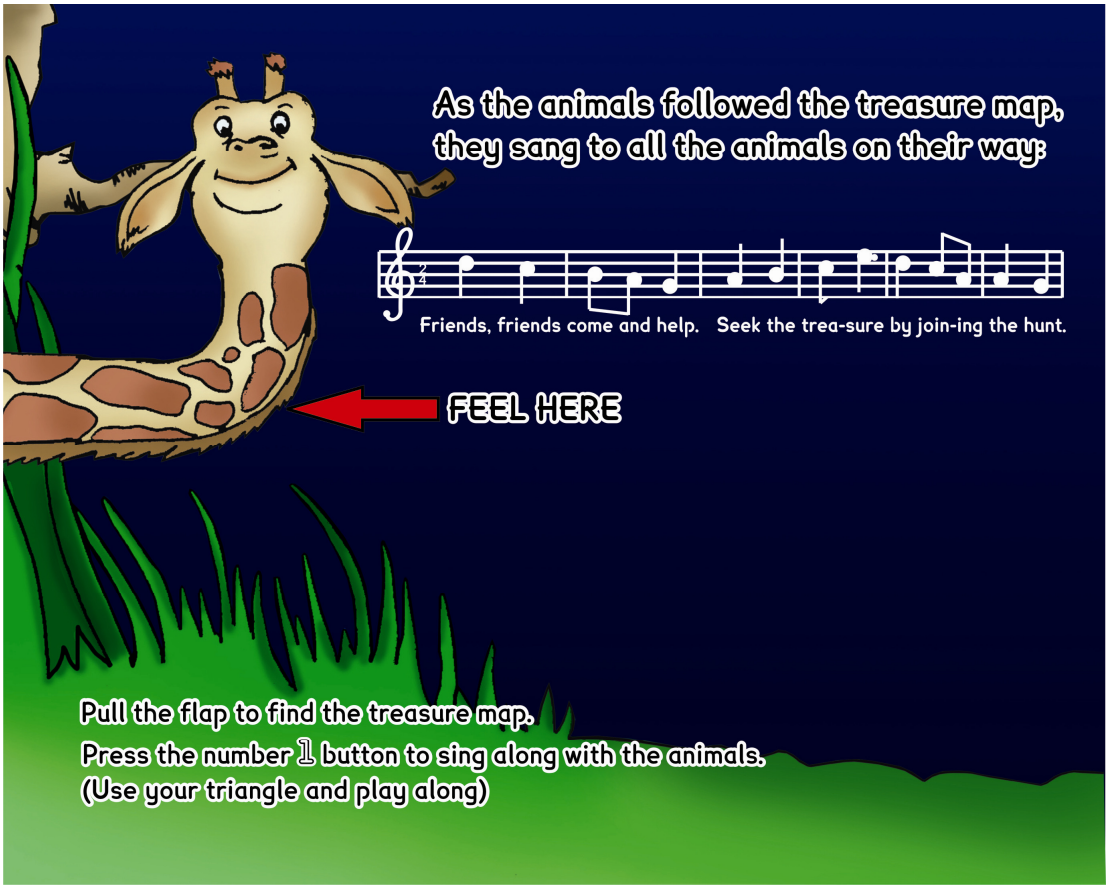


Figure 16A. Page 10.

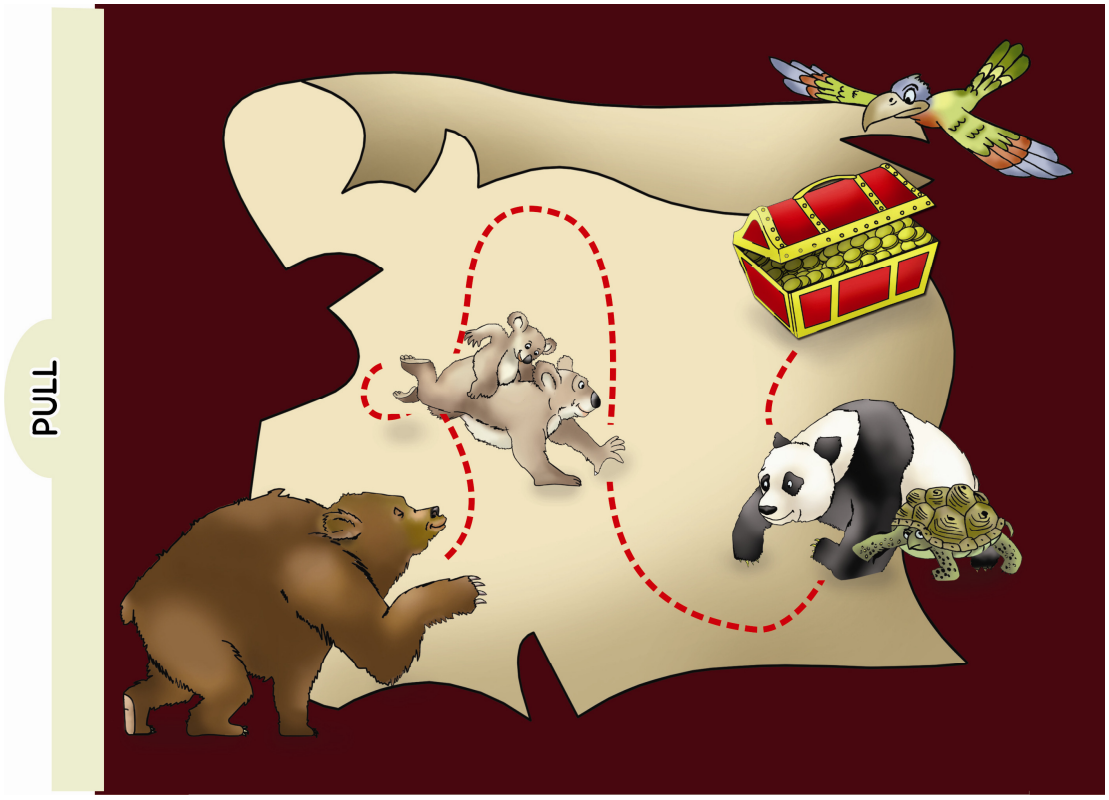


Figure 16B. Interactive component of Page 10.

Figure 17A. Page 11.

Figure 17B. Interactive component of Page 11.

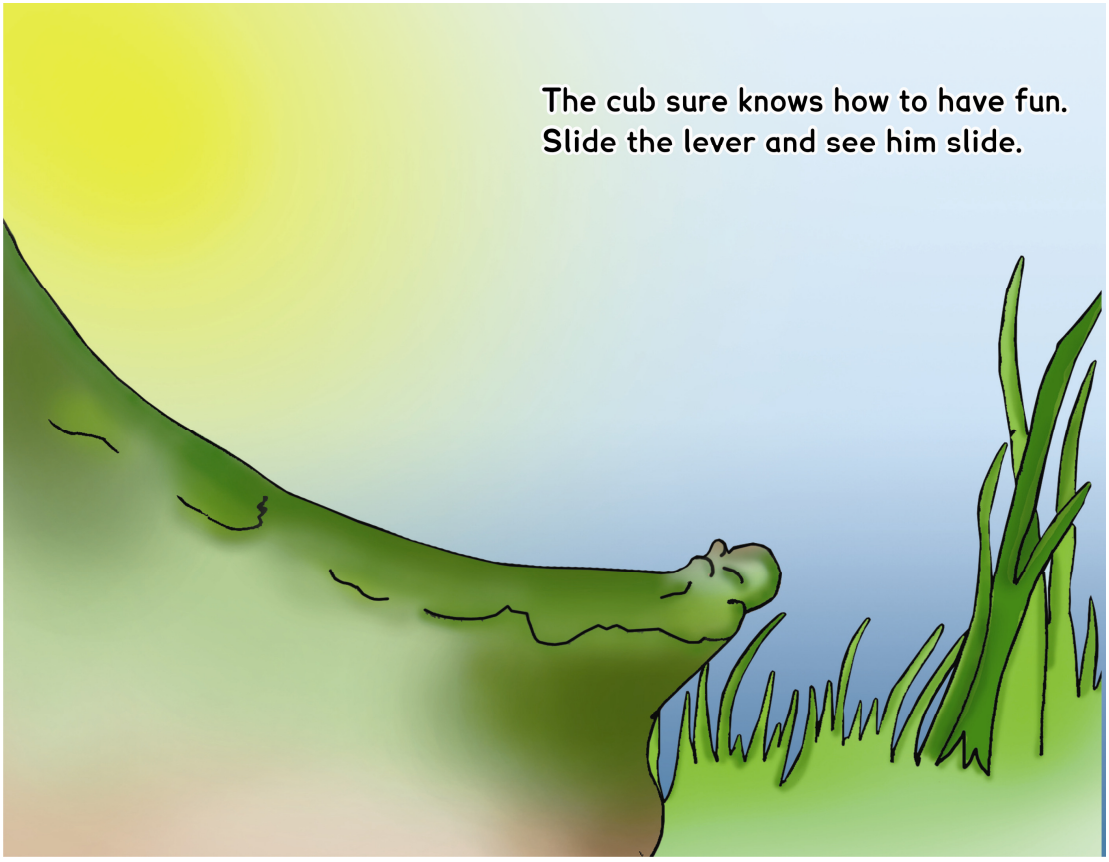


Figure 18A. Page 12.

Figure 18B. Interactive Component of Page 12.

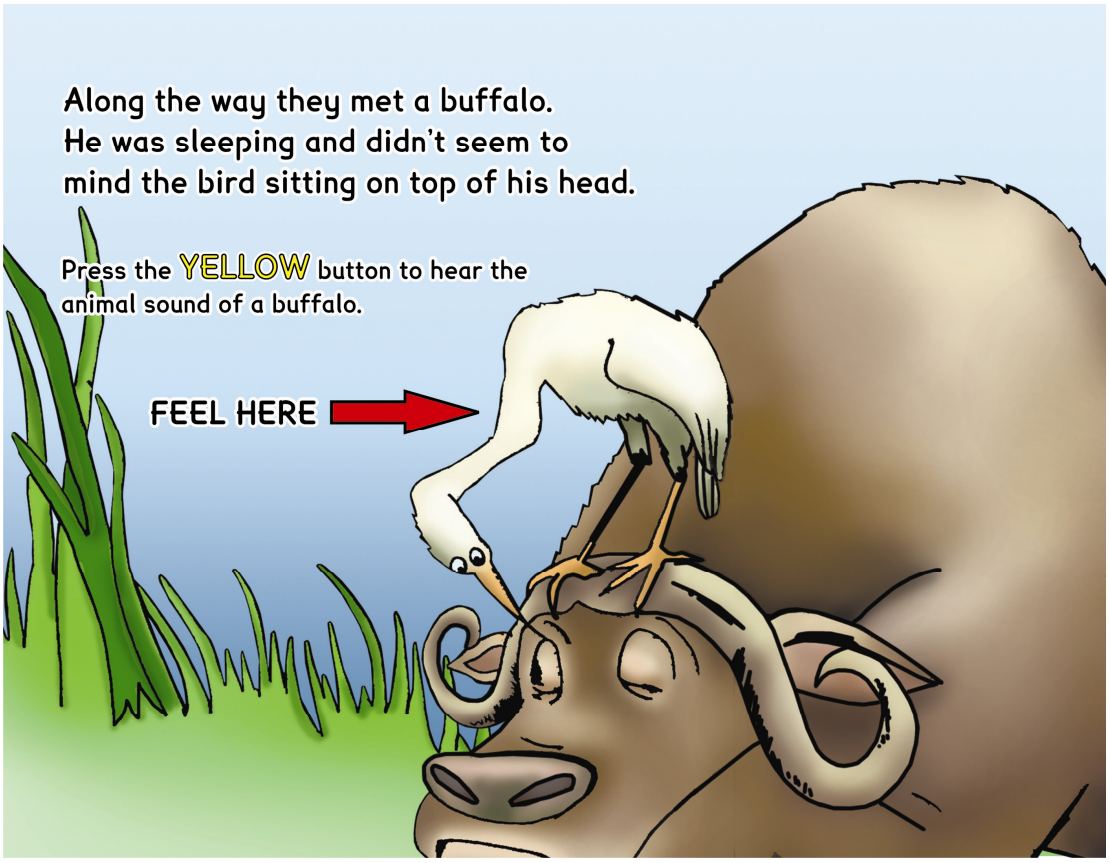


Figure 19. Page 13.

Figure 20A. Page 14.

Figure 20B. Interactive component of Page 14.

Figure 21A. Page 15.

Figure 21B. Interactive component of Page 15.

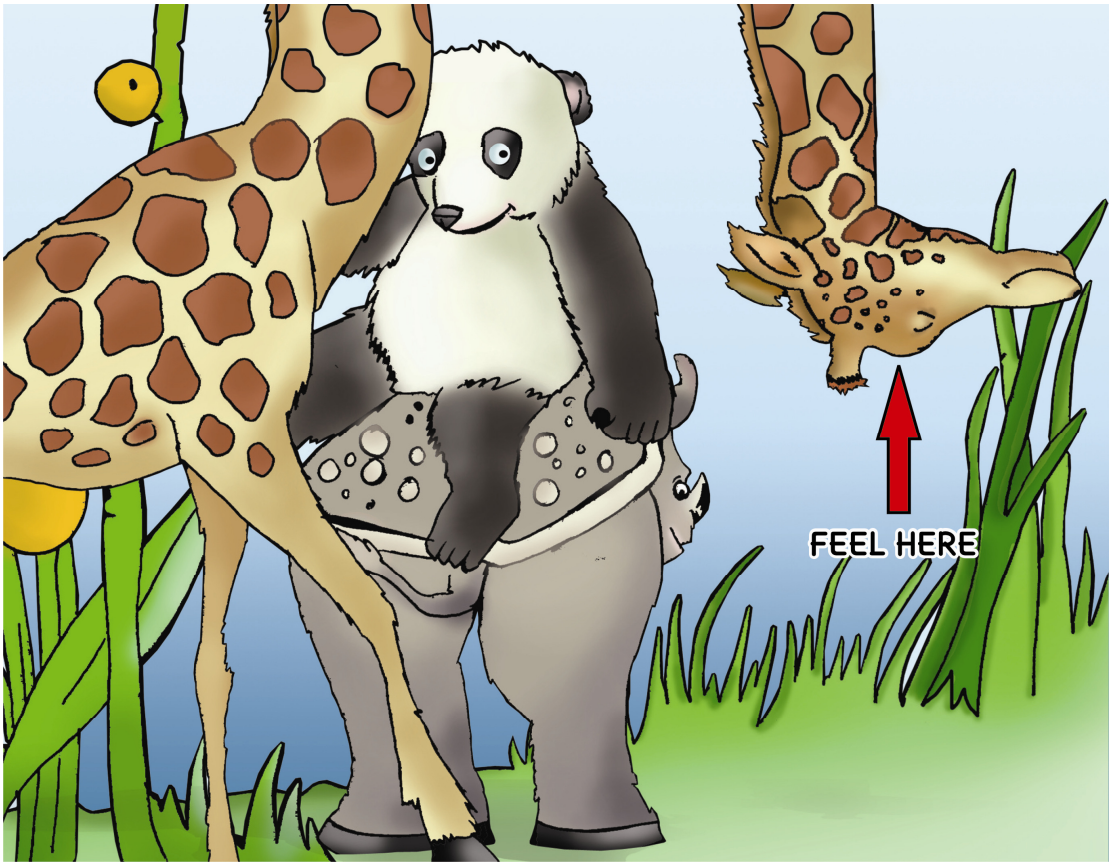


Figure 22. Page 16.

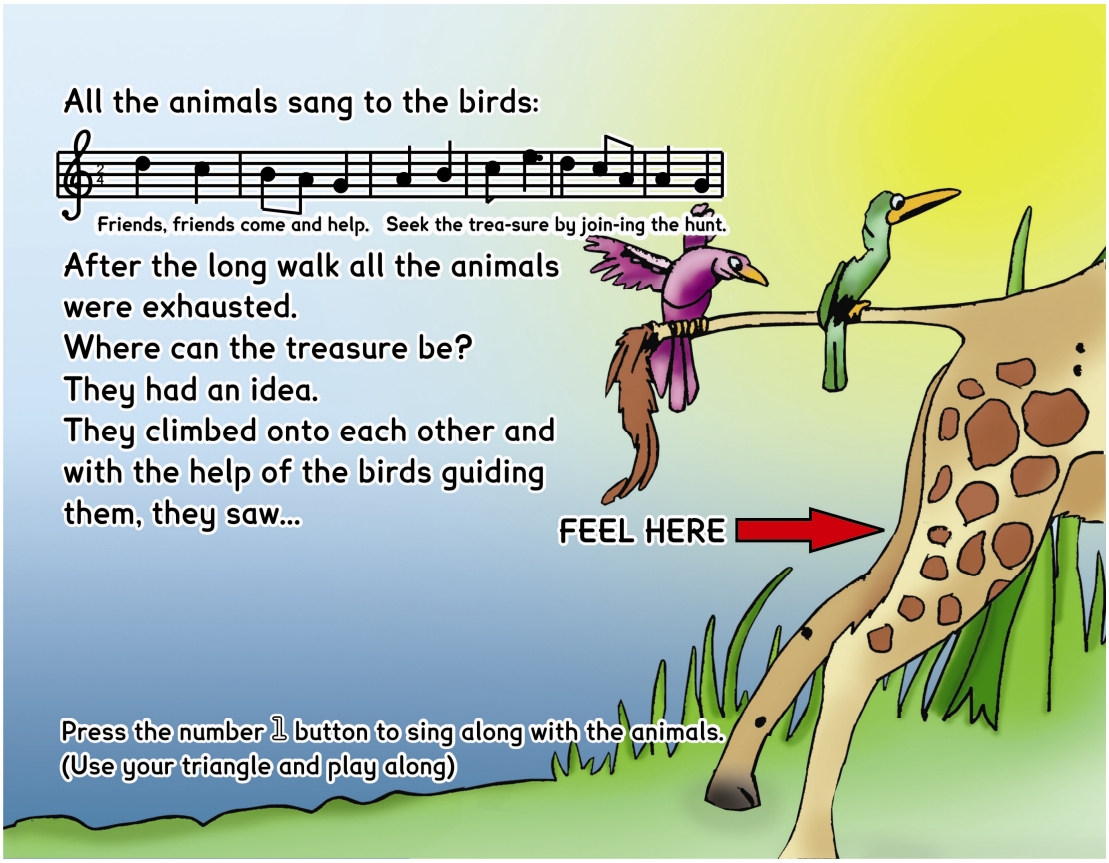


Figure 23. Page 17.

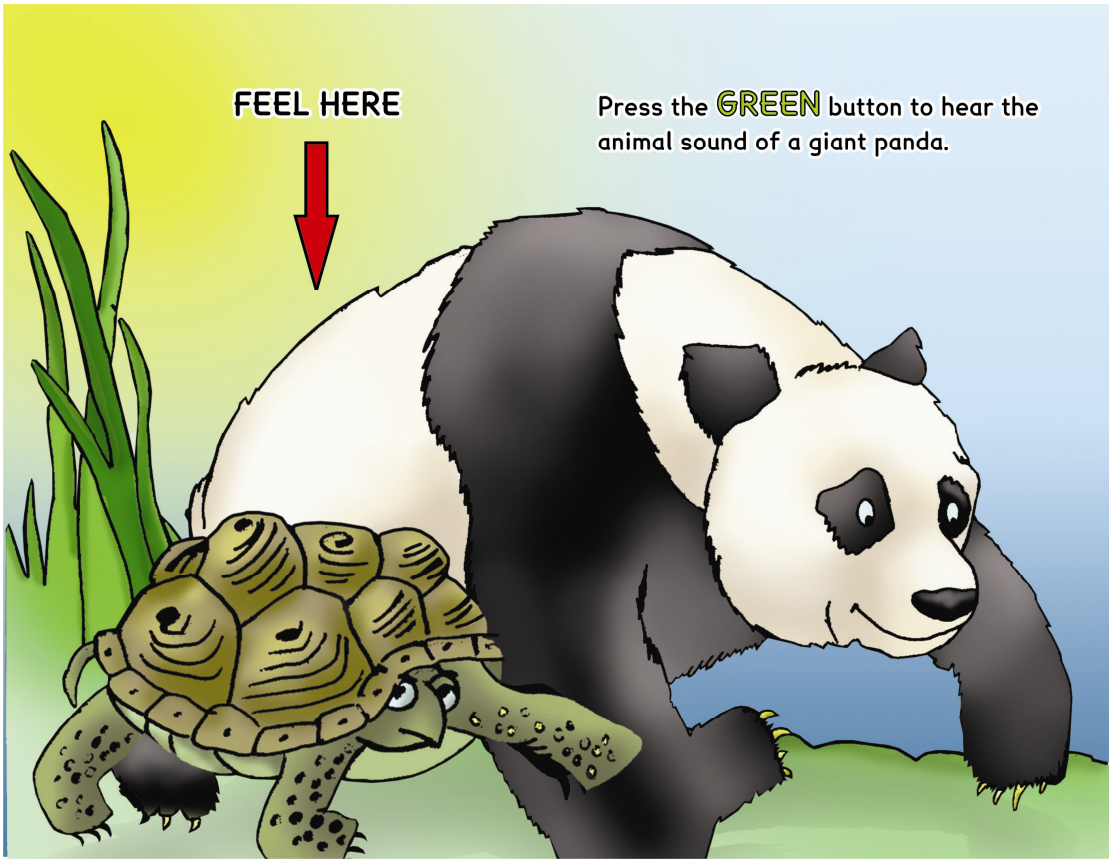


Figure 24. Page 18.

Figure 25. Page 19.

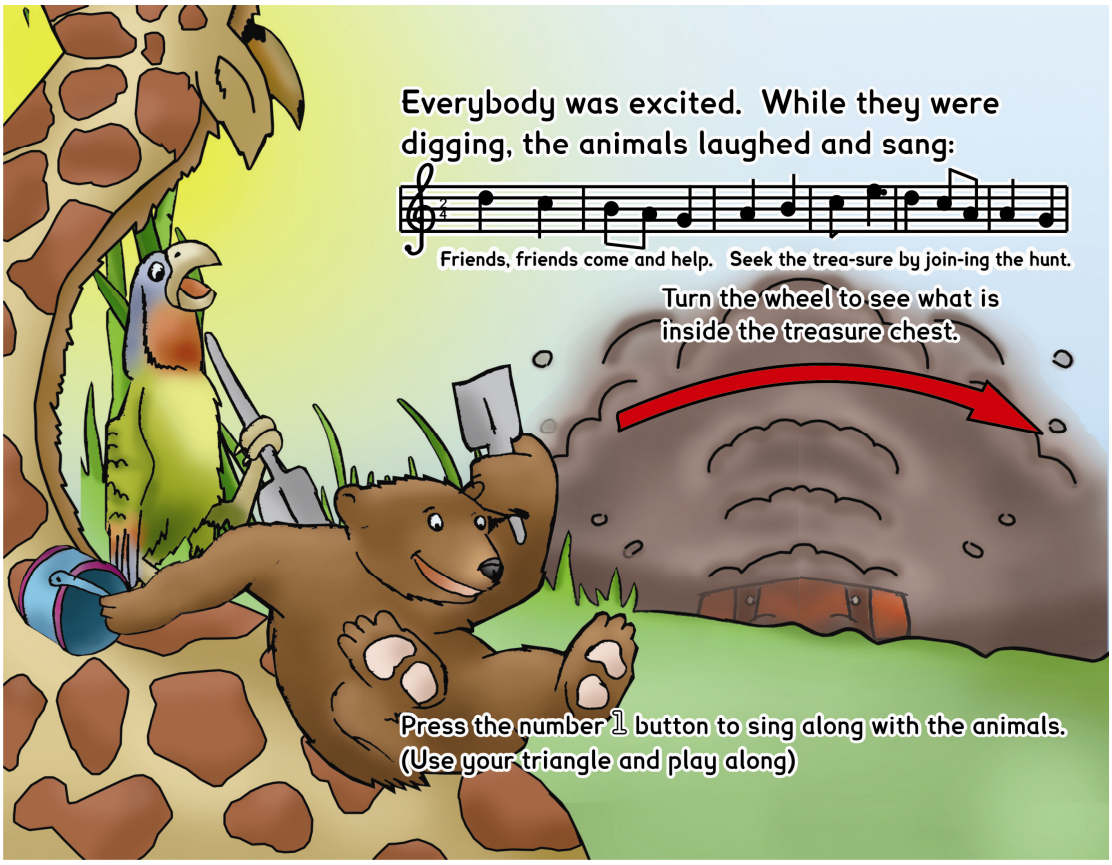


Figure 26A. Page 20.

Figure 26B. Interactive Component of Page 20.

Figure 27. Page 21.

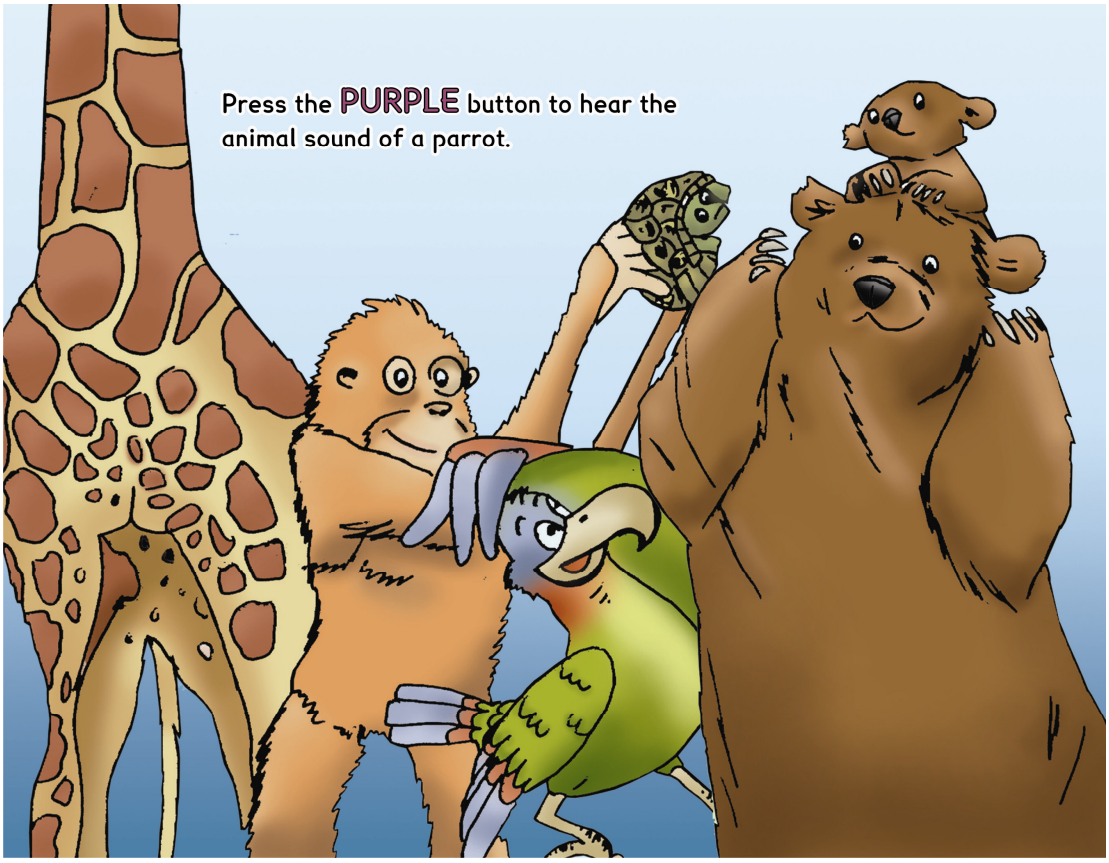


Figure 28. Page 22.

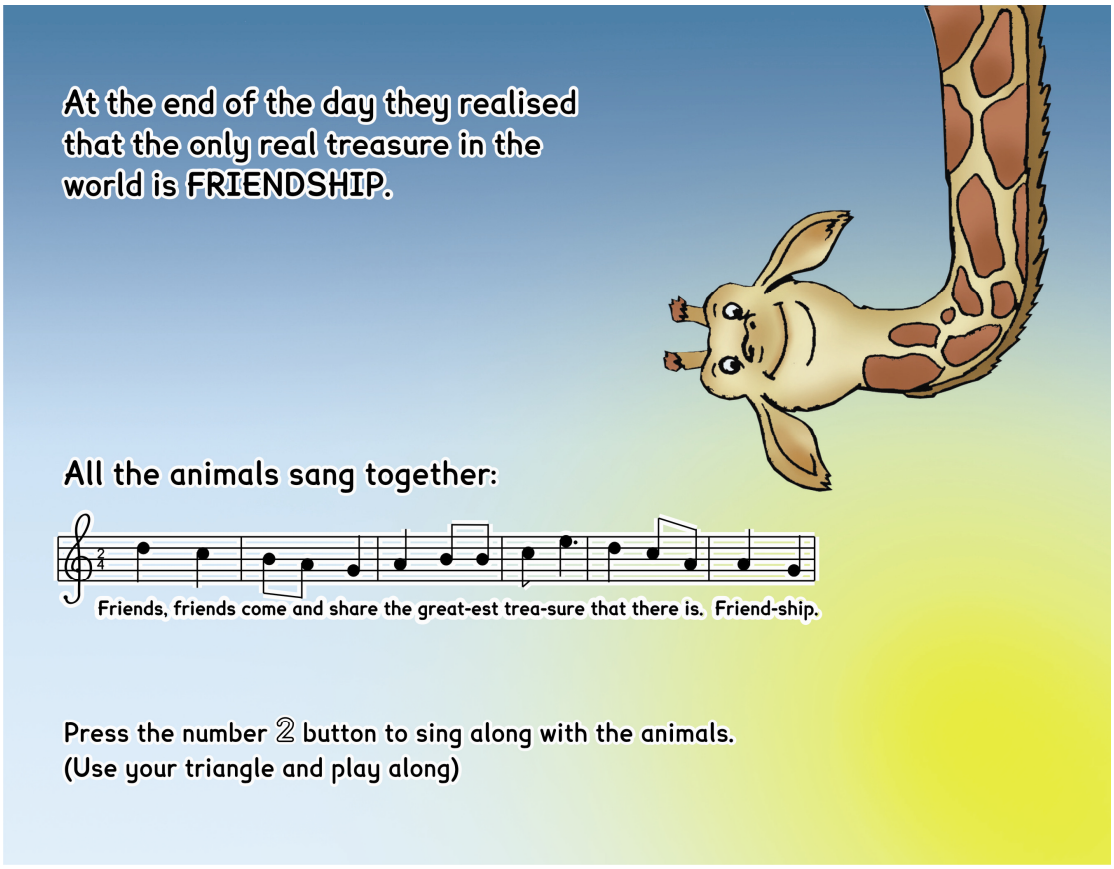


Figure 29. Page 23.

Figure 30. Page 24.

Recommendations from the second article lead to the final draft of the book. Several words, elements, spelling and grammar were adjusted according to these recommendations, namely (see Figure 30 - 44):

- Page 1 Spelling and grammar (Figure 30).
- Page 2 Spelling and grammar (Figure 31).
- Page 5 Spelling and grammar (Figure 32).
- Page 7 The layout of the page was changed in order for the storyline to flow better (Figure 33).
- Page 8 & 9 The illustration and text changed to illustrate the animal friends helping each other as well as the word "jailbreak" was replaced with a more suitable word selection (Figure 34 & Figure 35).
- Page 12 The illustration of the sliding mechanism was changed to accommodate two animal friends that slides down the slope (Figure 36).
- Page 14 The visual cue was corrected (Figure 37).
- Page 15 The word "emigrated" was replaced with a more suitable word selection and South Africa is indicated on the world map (Figure 38 & Figure 39).
- Page 17 The word "exhausted" was replaced with a more suitable selection of words (Figure 40).
- Page 18 & 19 The layout of the spread was changed in order for the storyline to flow better and the visual cue was corrected on page 18 (Figure 41 & Figure 42).
- Page 21 Spelling and grammar (Figure 43).
- Page 23 The second song was corrected (Figure 44).

Figure 31. Page 1.

Figure 32. Page 2A.

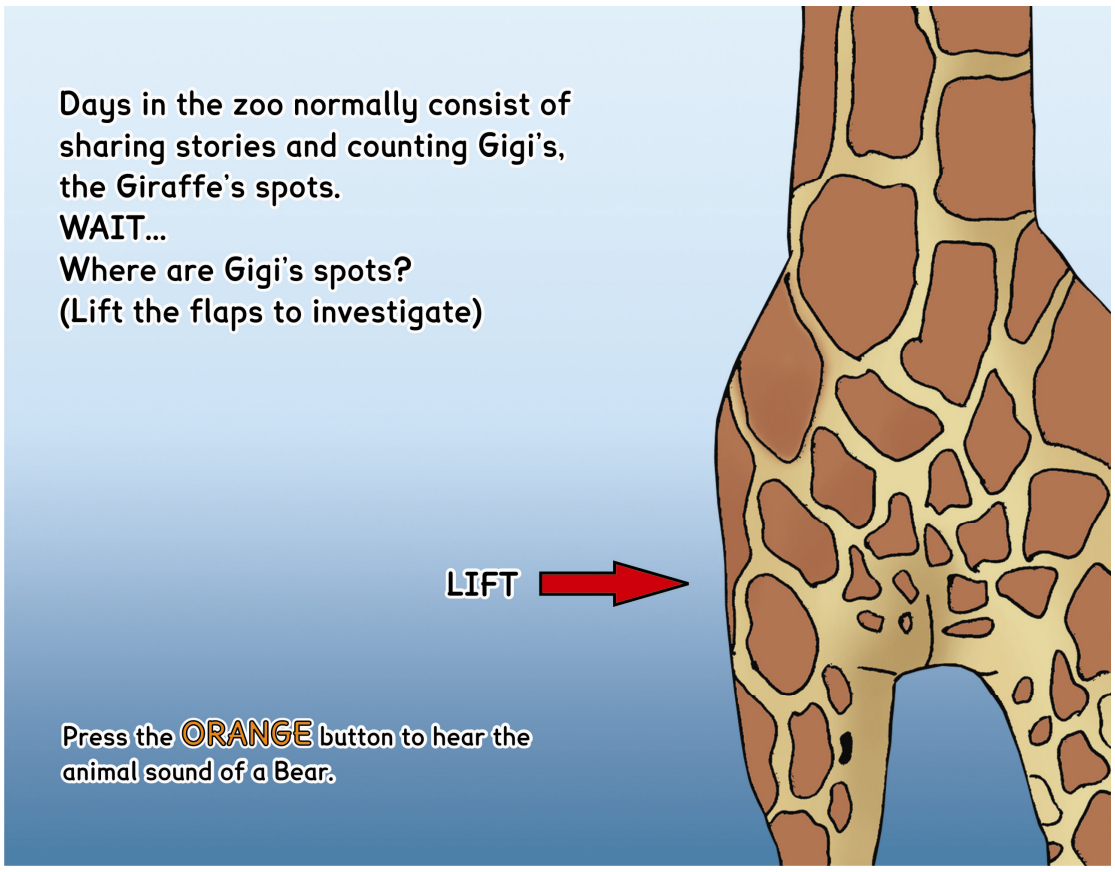


Figure 33. Page 5.

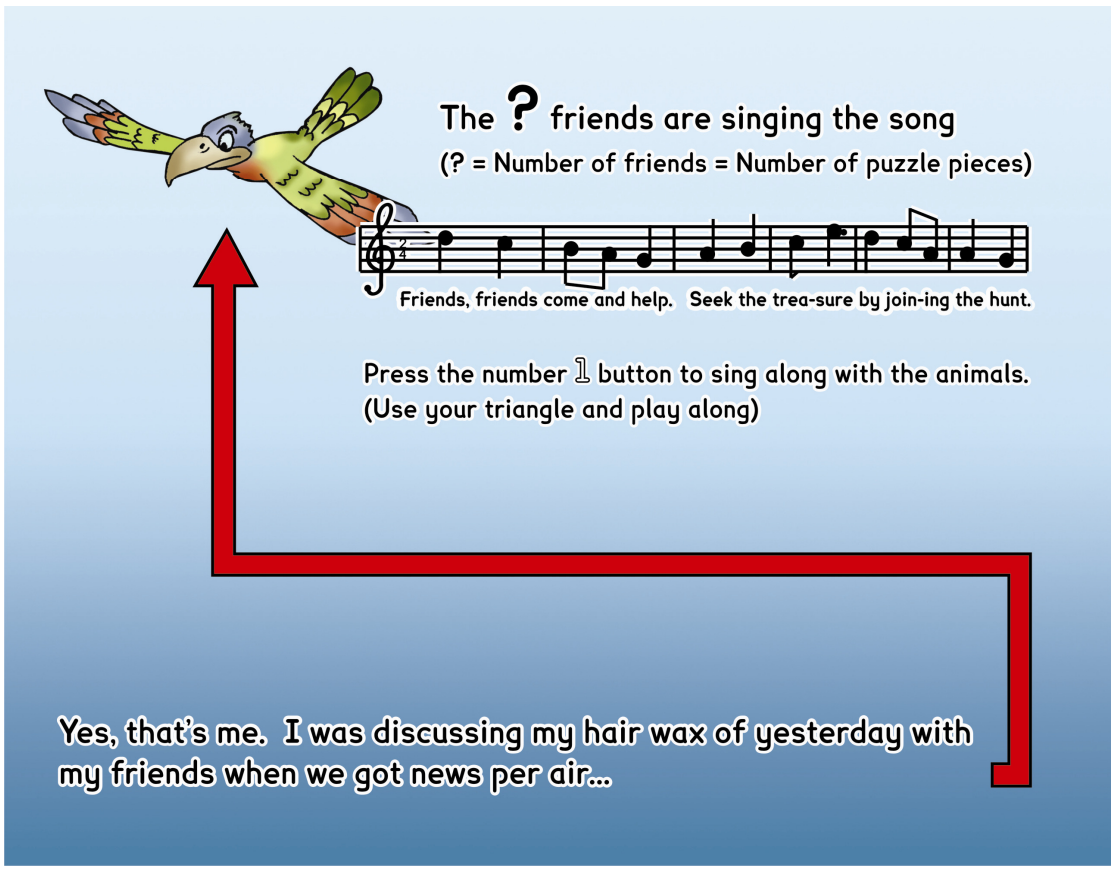


Figure 34. Page 7.

Figure 35. Page 8.

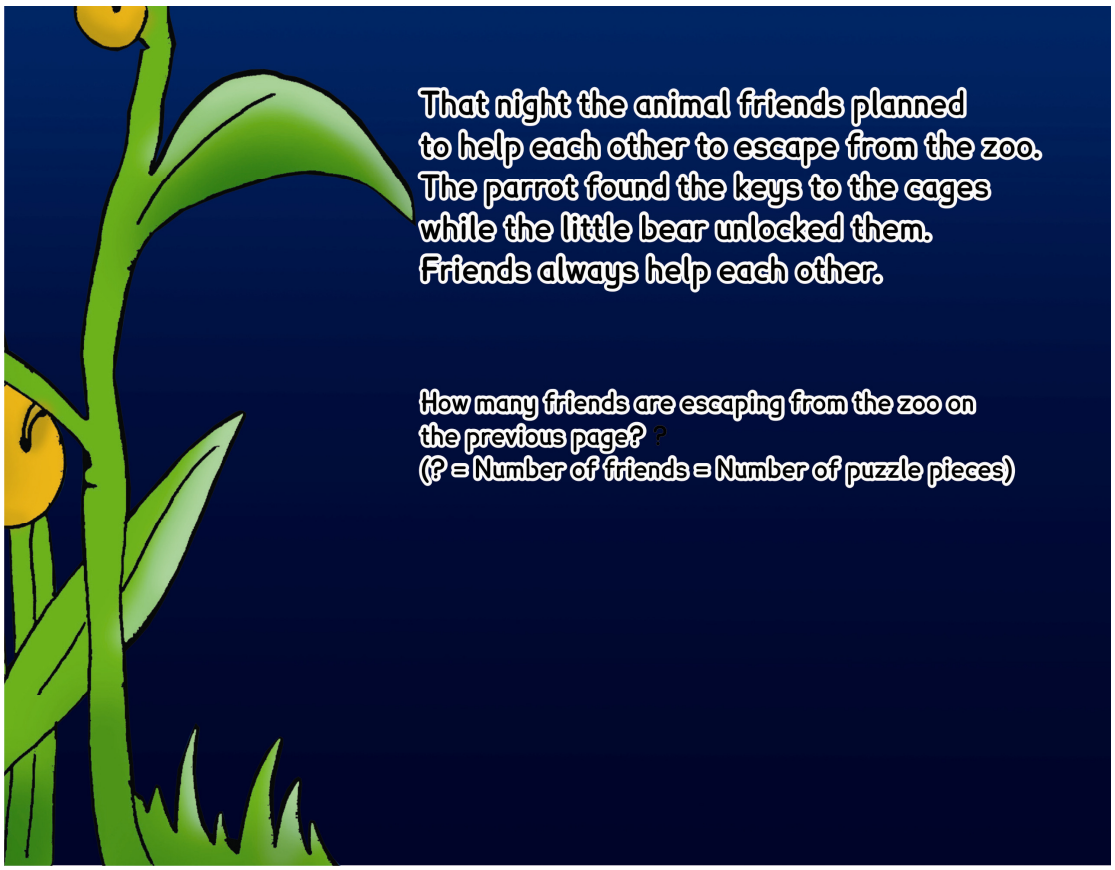


Figure 36. Page 9.

Figure 37. Page 12.

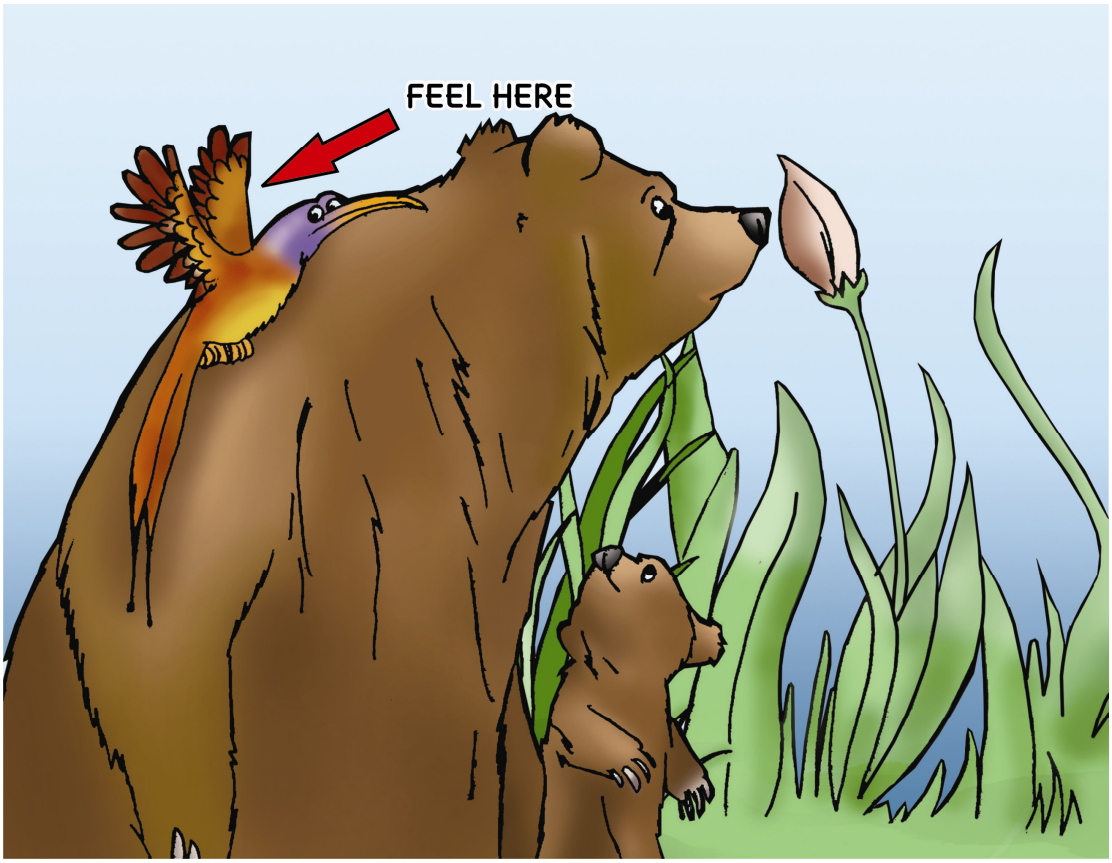


Figure 38. Page 14.

Figure 39. Page 15.

Figure 40. Interactive component of Page 15.

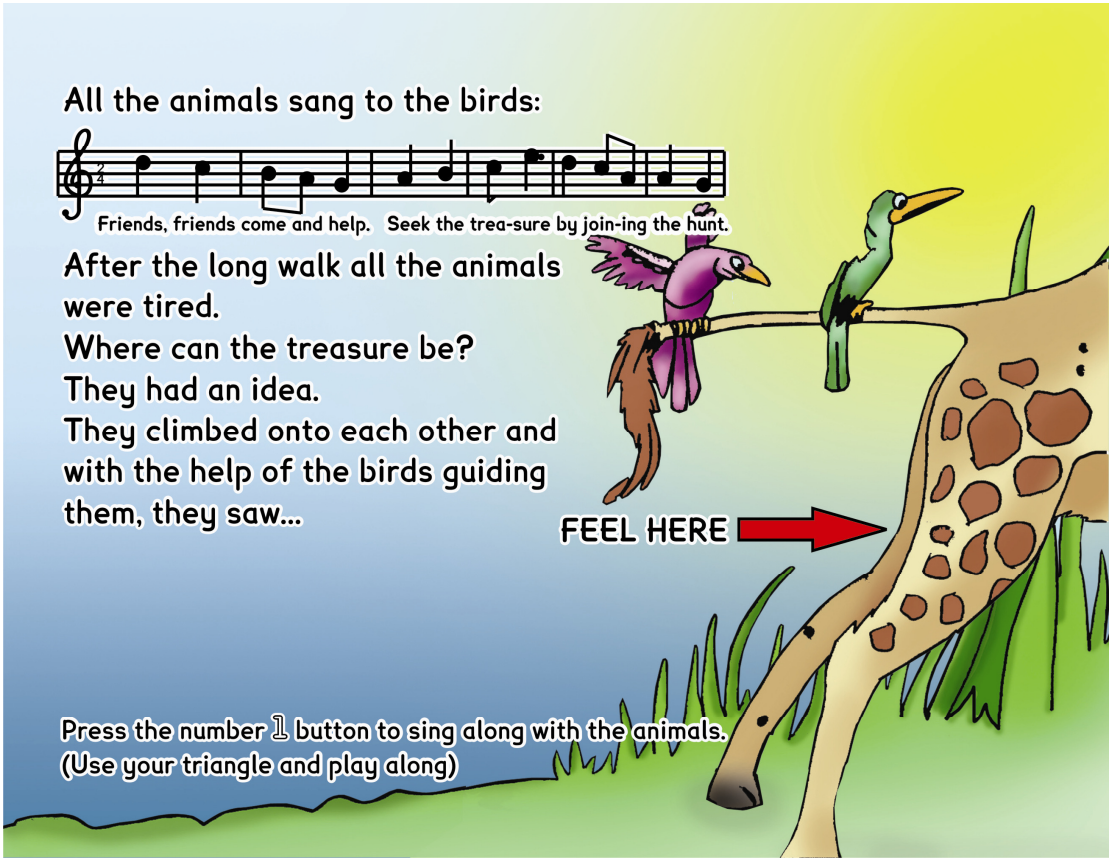


Figure 41. Page 17.

Figure 42. Page 18.

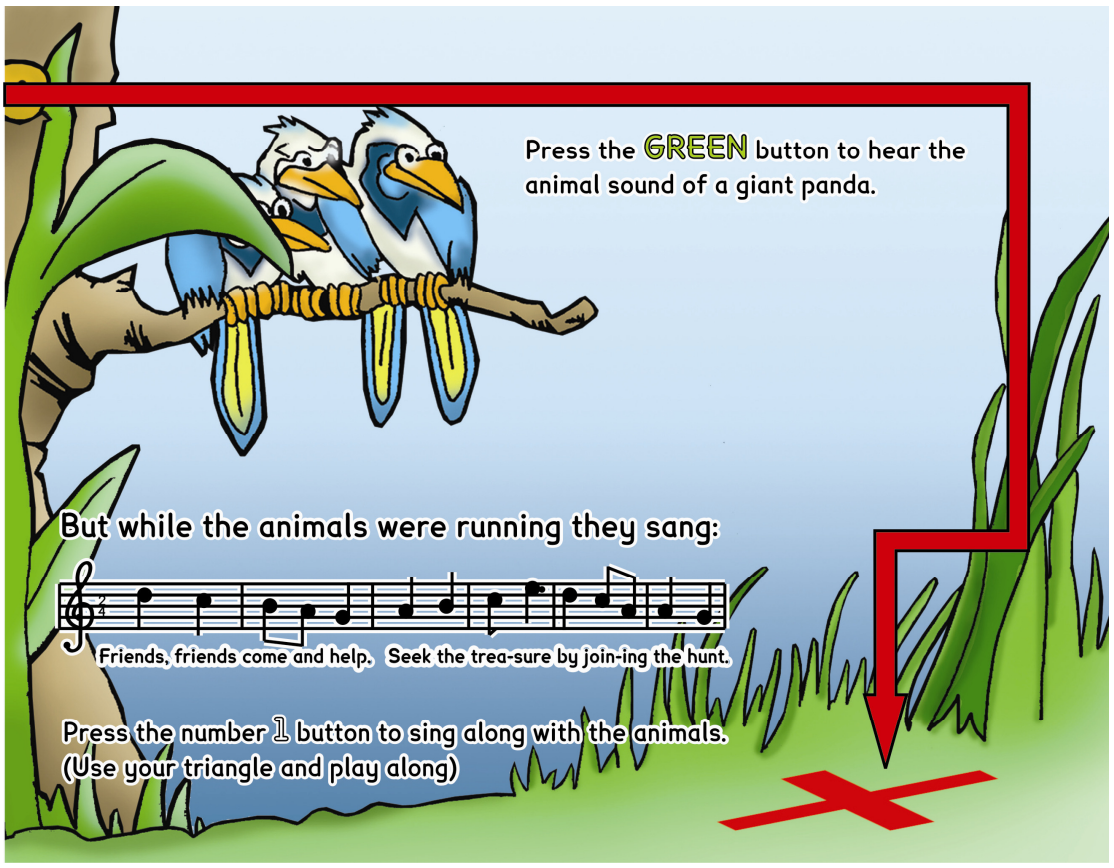


Figure 43. Page 19.

Figure 44. Page 21.

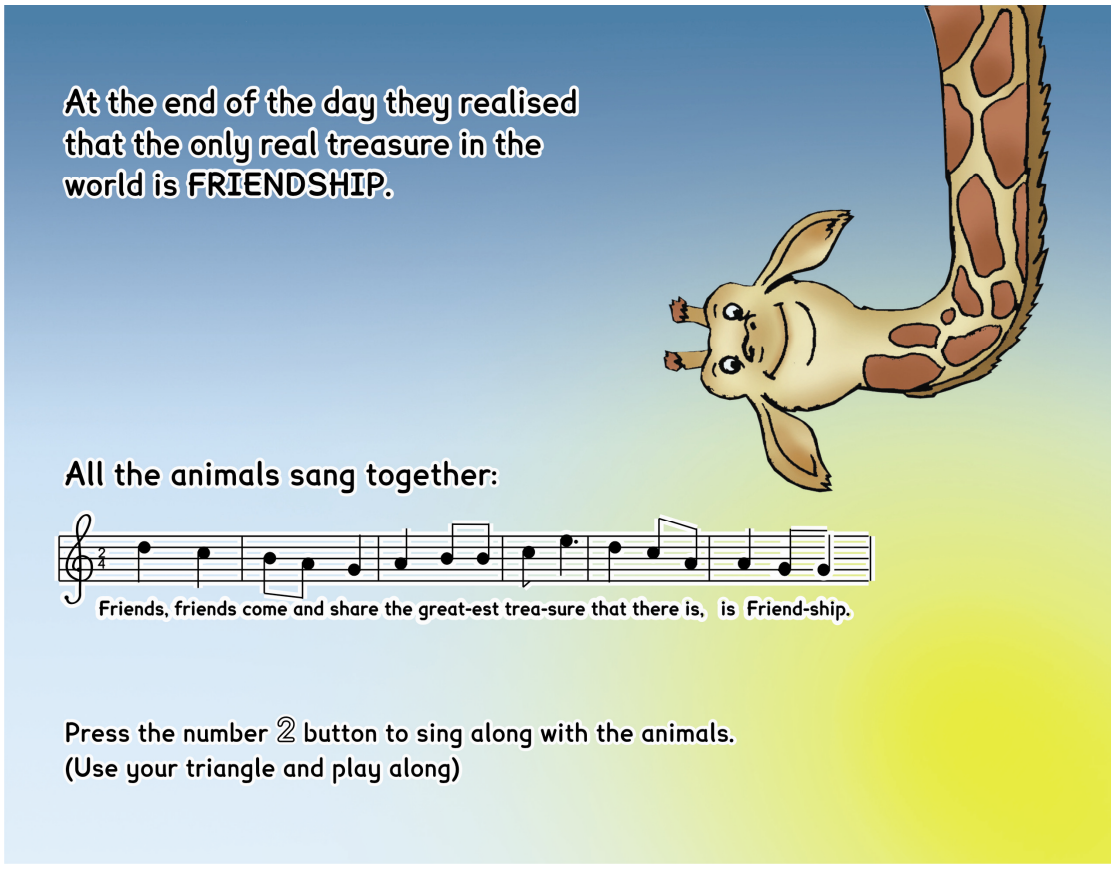


Figure 45. Page 23.

Section F

Structure of Section F

A graphic representation to depict the structure of Section F is set out in Figure 46.

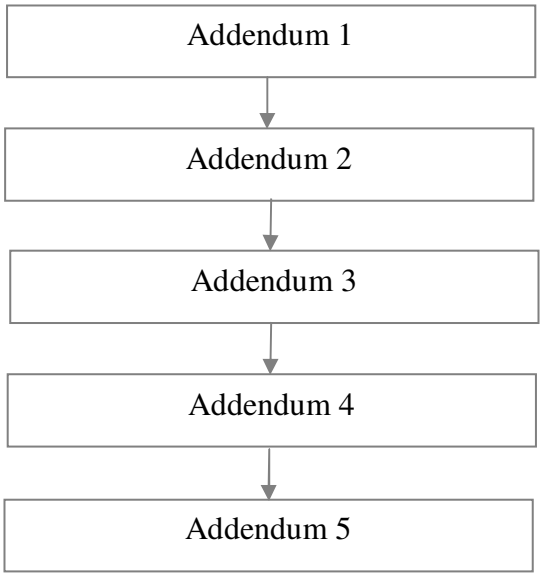


Figure 46. A graphic representation to depict the structure of Section F.

Addendum 1

Letter from the *International Journal of Disability, Development and Education* and the *Journal of Special Education* confirming the submission of the articles.

Addendum 2

Photographs of the actual prototype including the electronic unit as well as the interactive and read-aloud book.

Figure 47: Photograph of the front of the sensory product

Figure 48: Photograph of the back of the sensory product

Figure 49: Photograph of the side view of the sensory product

Figure 50: Photograph of a child's interaction with the sensory product

Addendum 3

The technical drawings of the electronic unit of the sensory product development.

Figure 51: Assembly

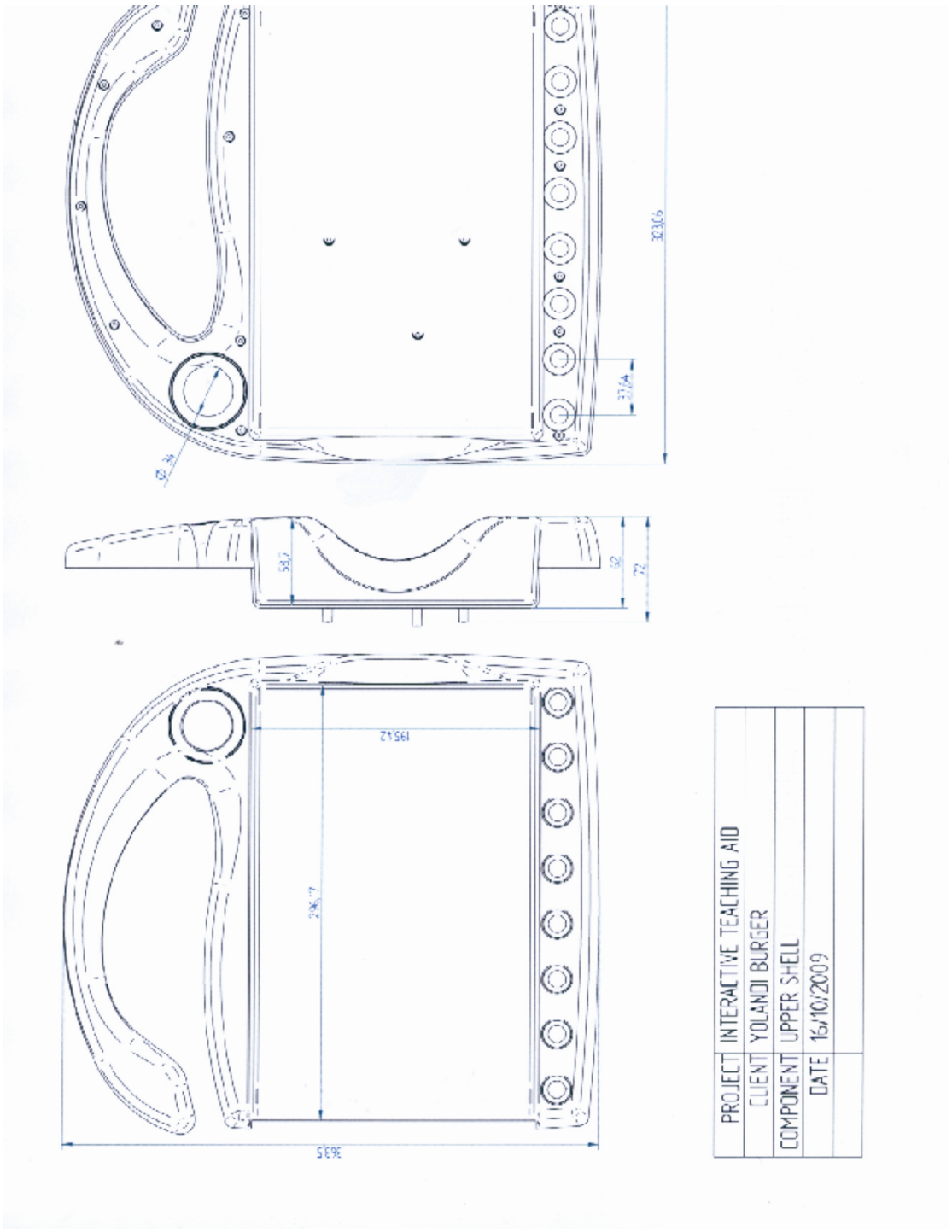


Figure 52: Upper Shell – Part 1

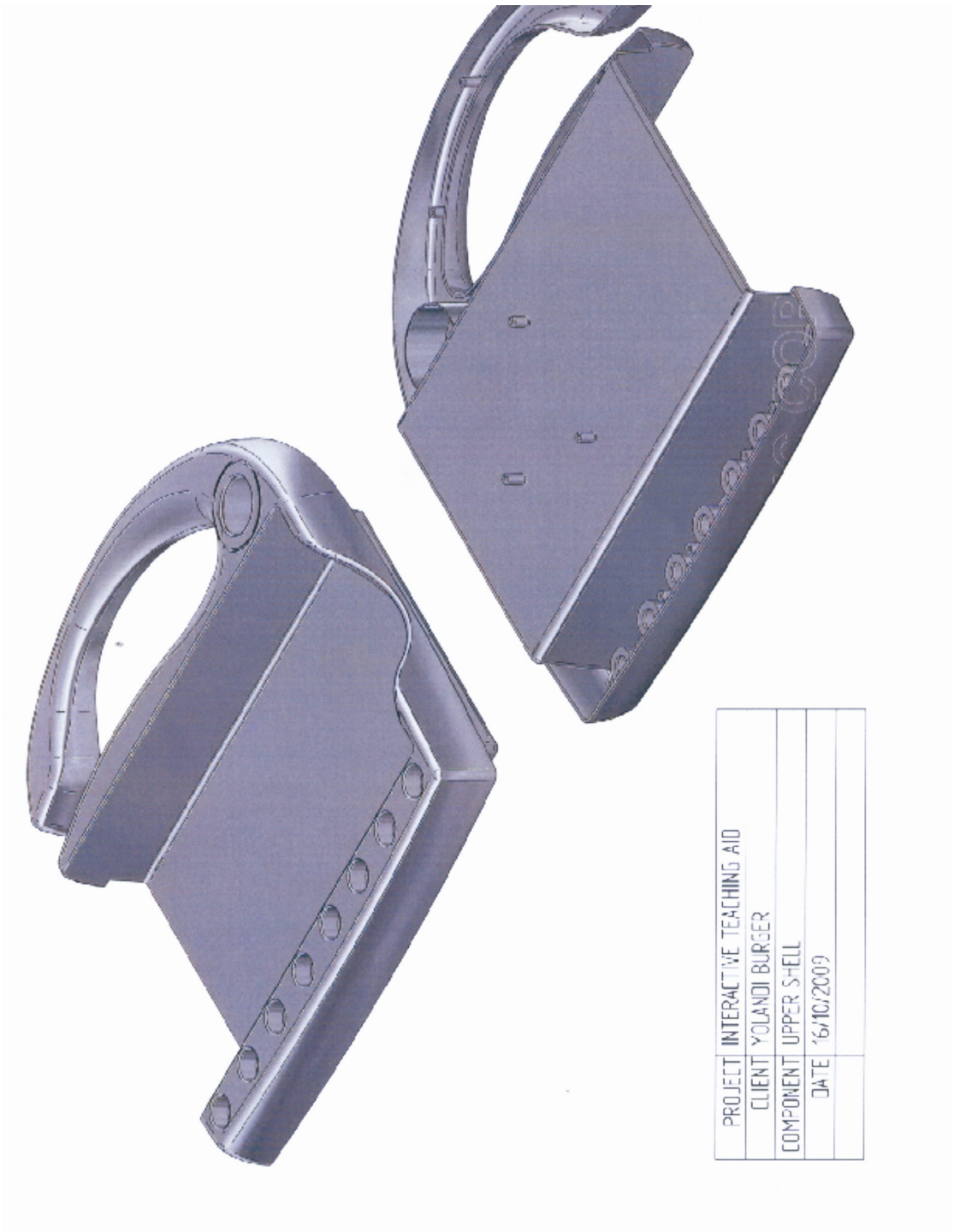


Figure 53: Upper Shell – Part 2

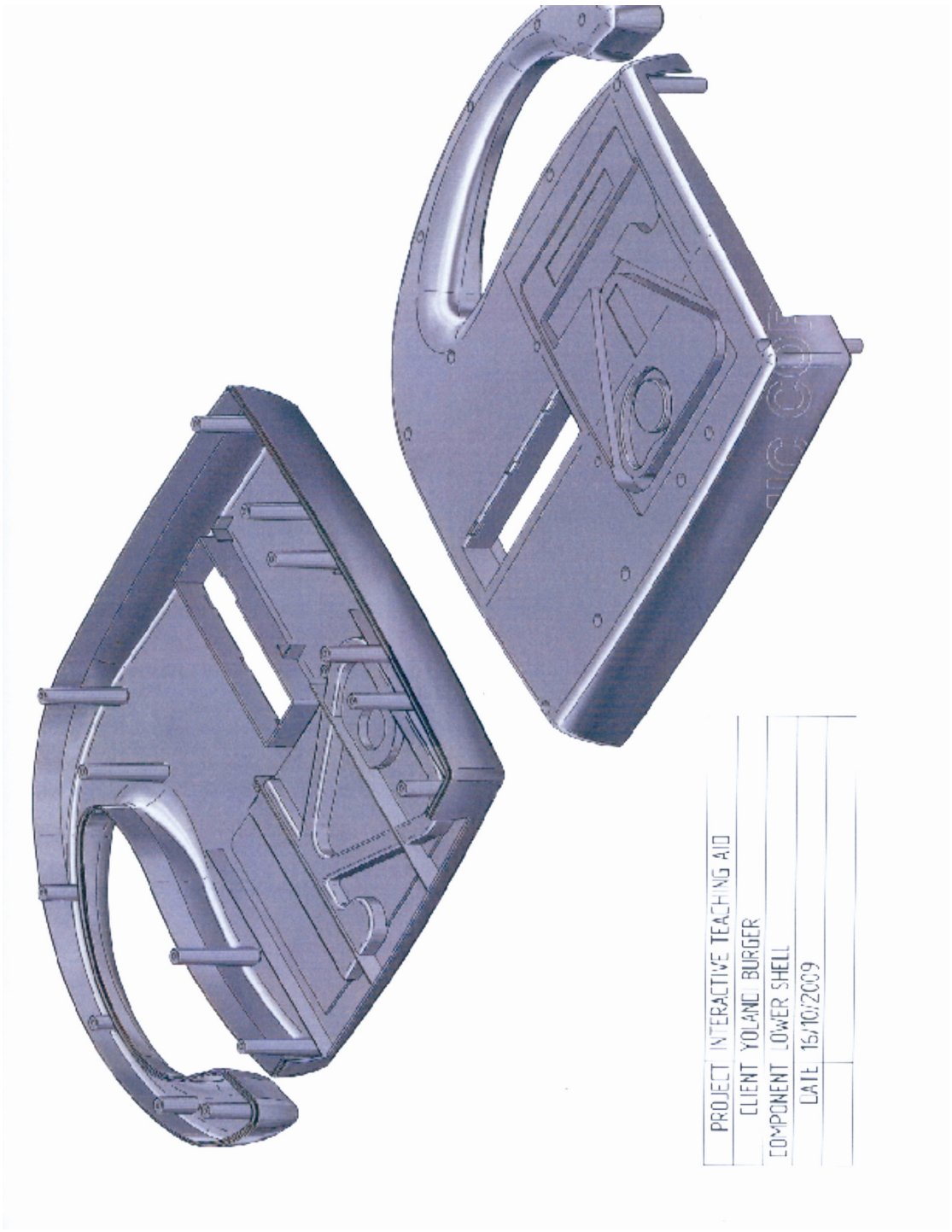


Figure 54: Lower Shell – Part 1

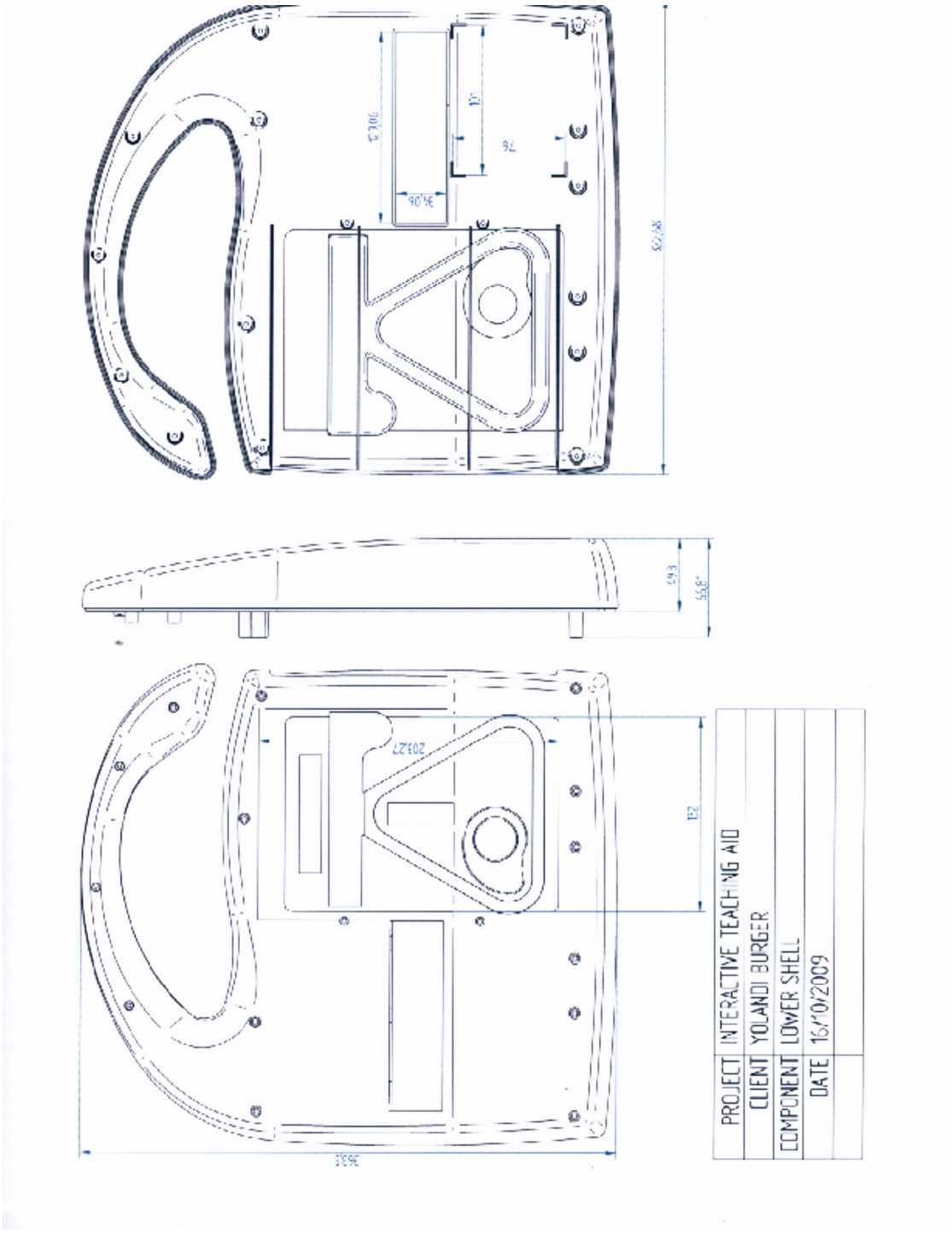


Figure 55: Lower Shell – Part 2

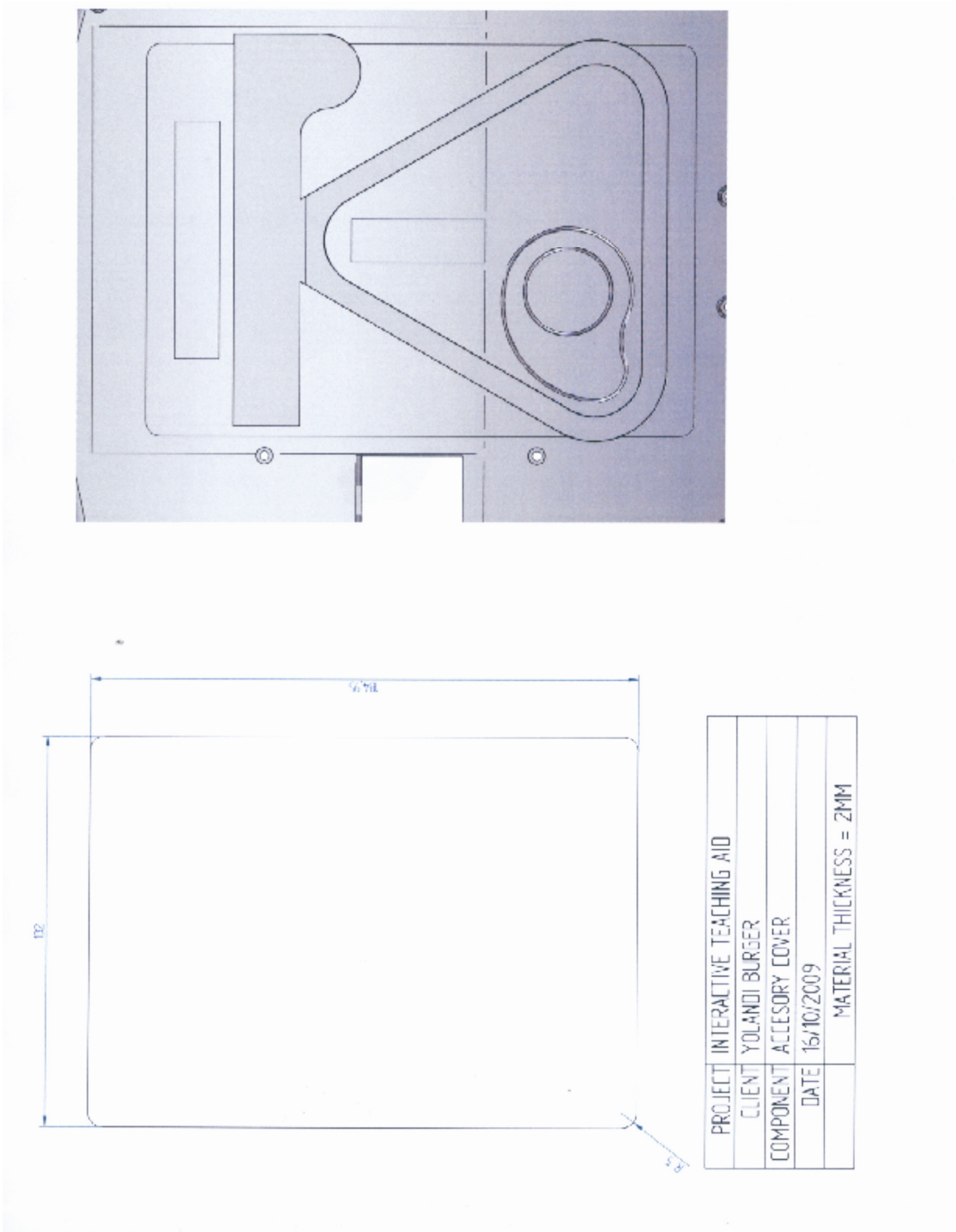


Figure 56: Accessory Cover

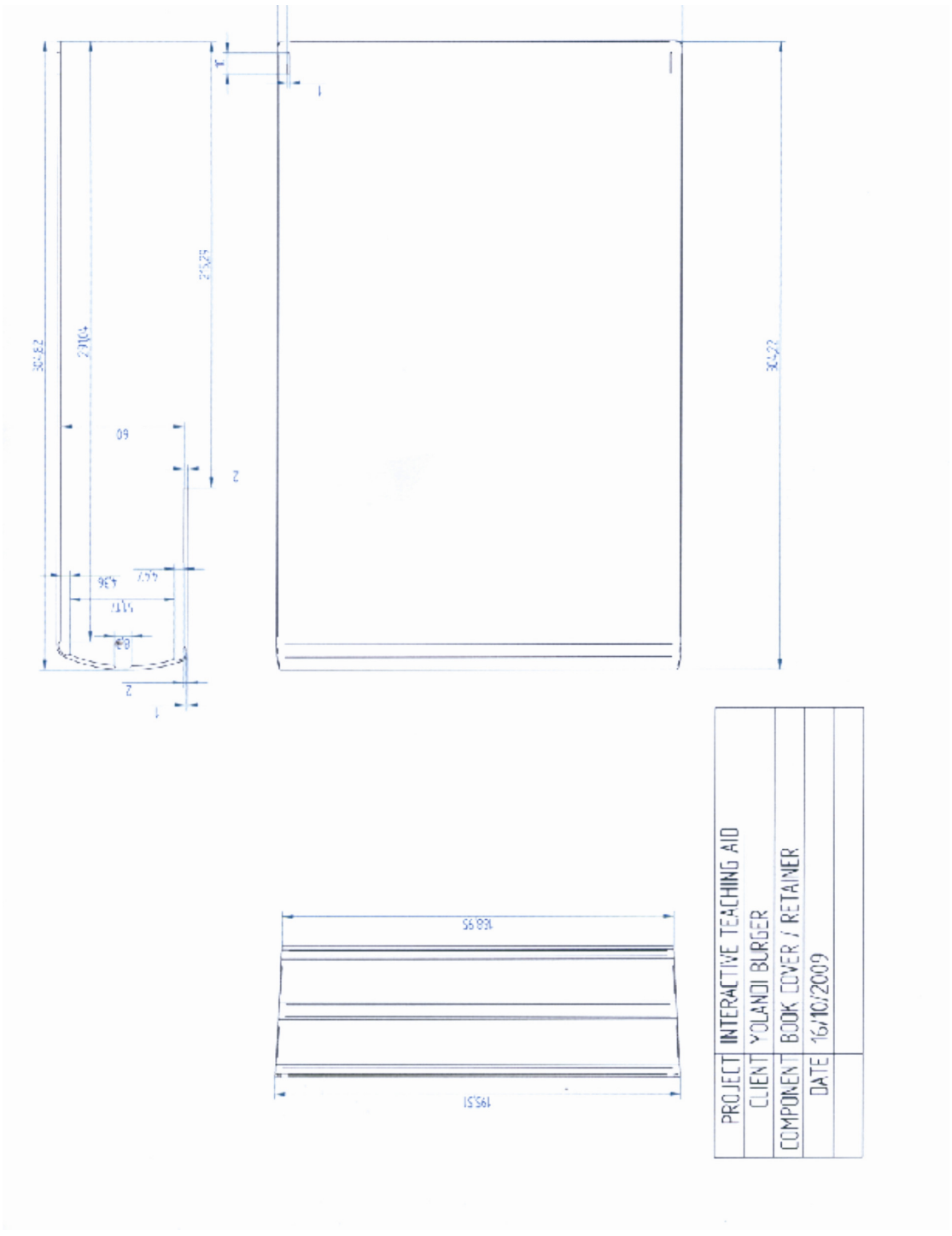


Figure 57: Book Cover/Retainer – Part 1

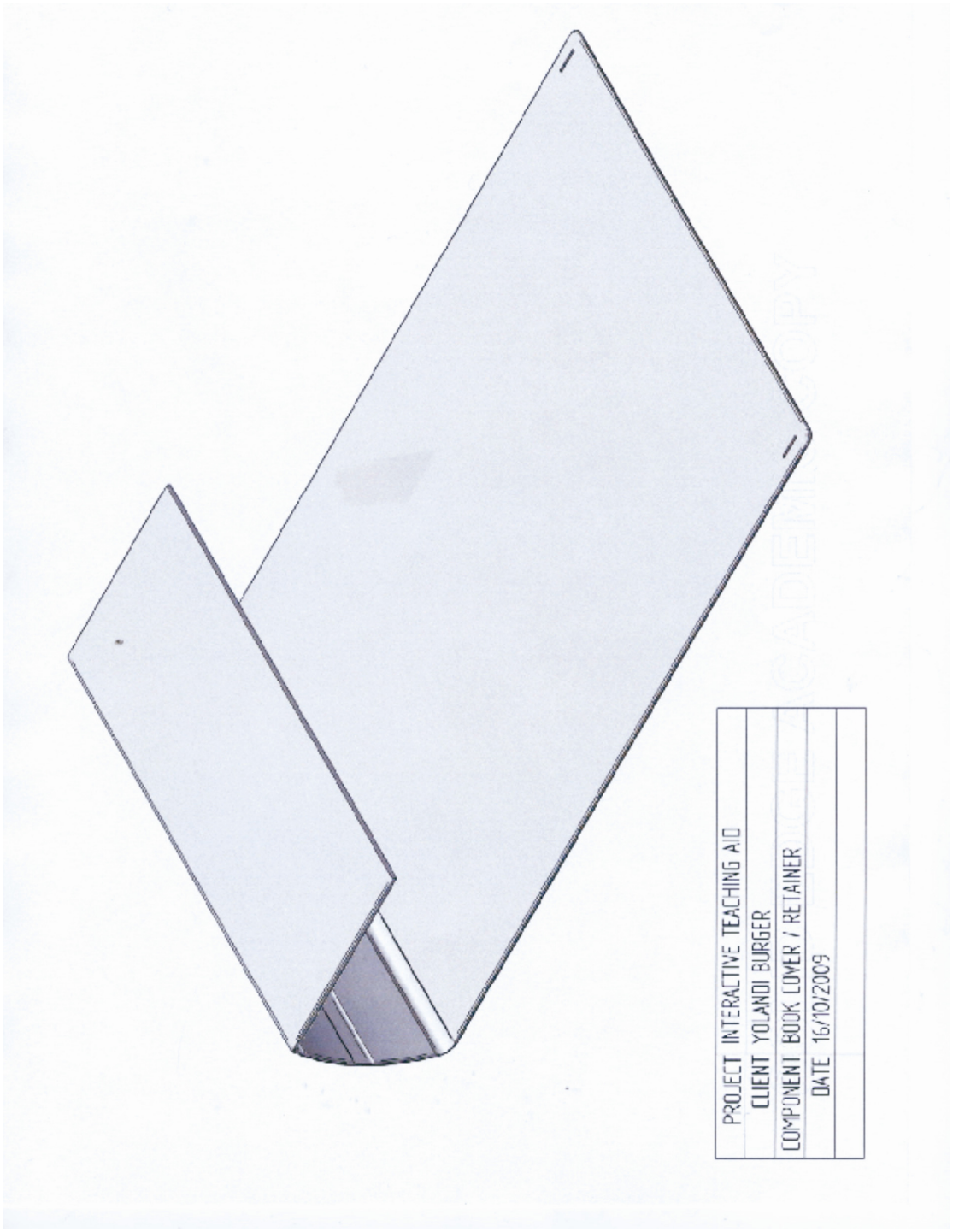


Figure 58: Book Cover/Retainer – Part 2

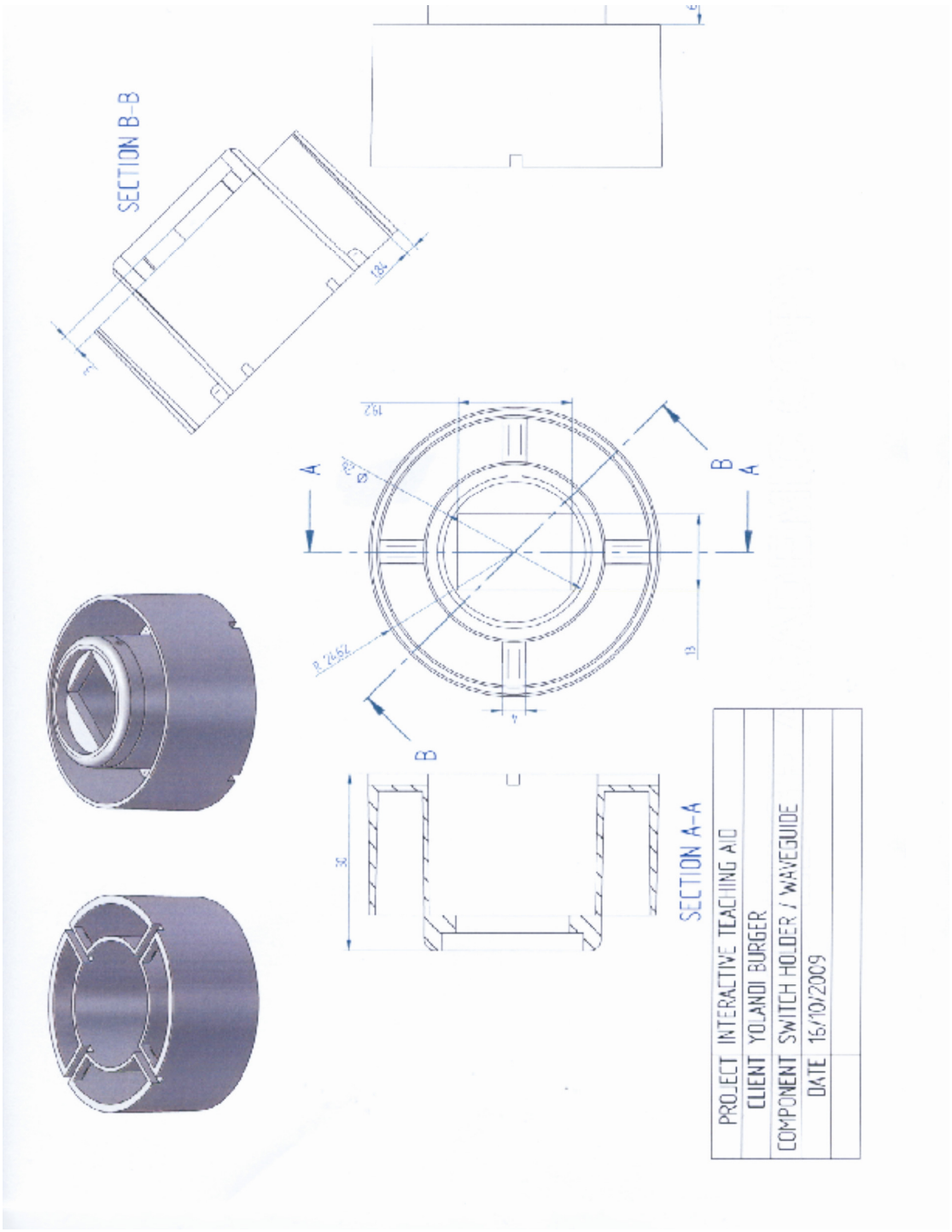


Figure 59: Switch Holder/Waveguide

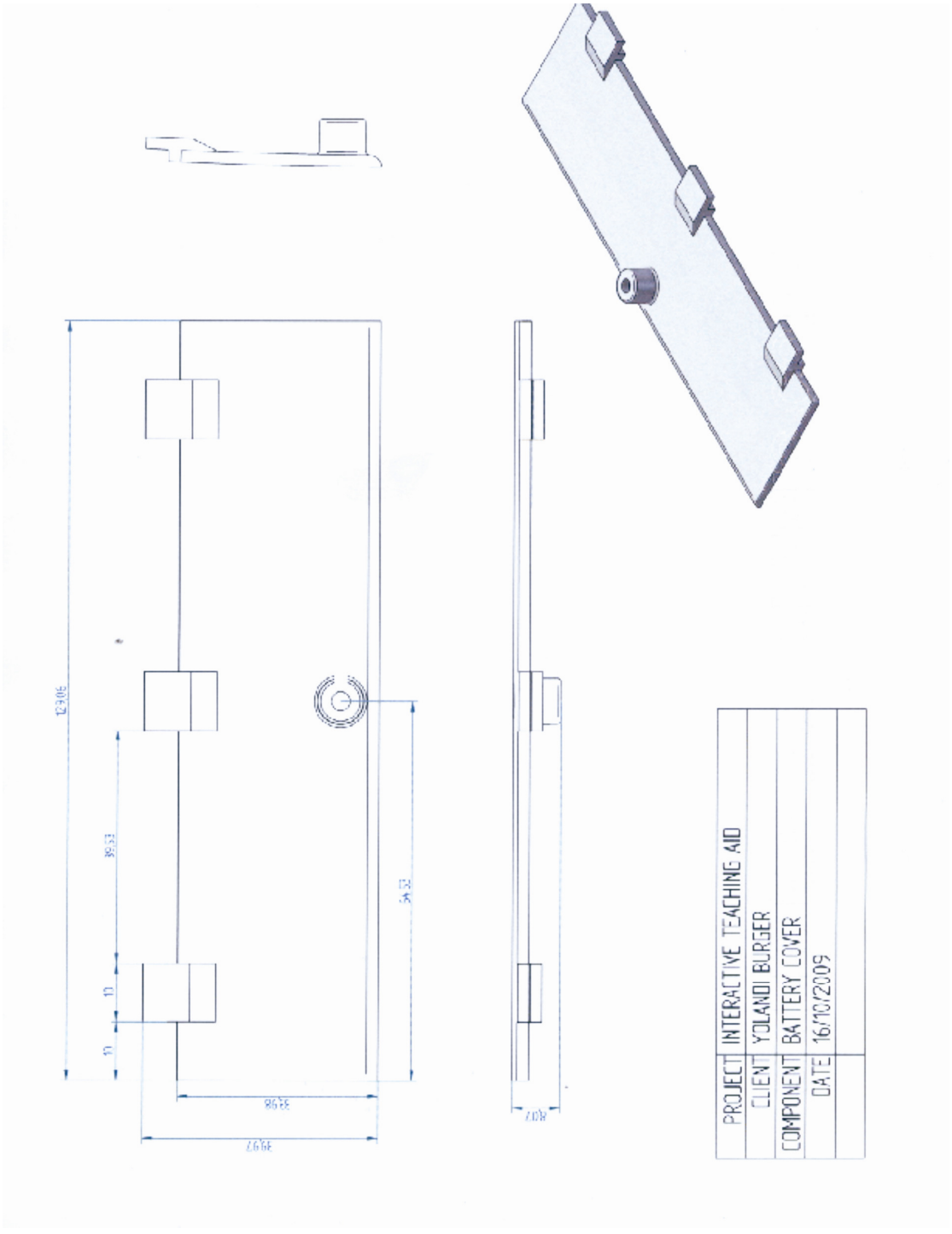


Figure 60: Battery Cover

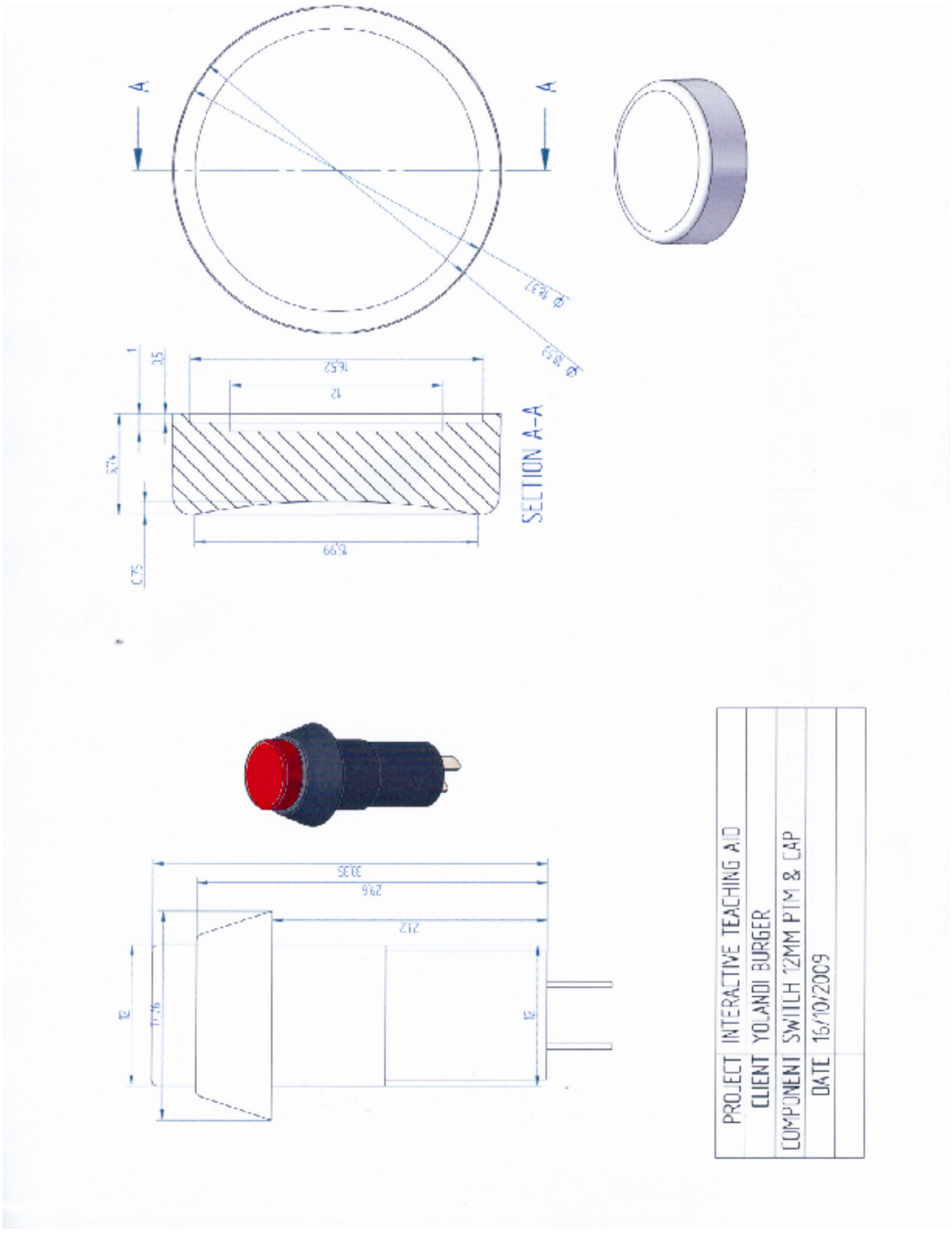


Figure 61: Switch 12mm PTM & Cap

Addendum 4

The composing and recording process of the two singalongs.

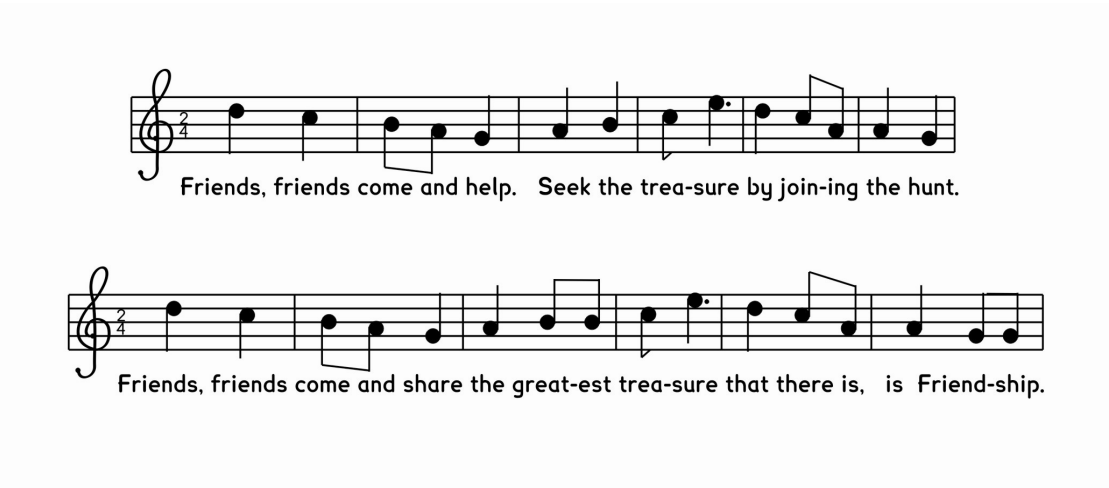


Figure 62: Song composition and writing of the lyrics.

Figure 63: Photographs of the recording process – Ms Nolothandu Patu the singer

Figure 64: Photographs of the recording process – Ms Dalene du Plessis the pianist

Figure 65: Photographs of the recording process – Mr David Mauchlin the producer

Addendum 5

This addendum contains the National Innovation Fund's business plan for the institutional leg of the competition as well as the runner-up award letter for the institutional leg of the competition.

National Innovation Competition 2009

National Innovation Competition 2009

Yolandi Burger

Student Business Plan Competition

National Innovation Competition 2009

Student Business Plan Competition
Entry Form

I, the undersigned,	Yolandi Burger
ID number:	840505 0033 086
of (residential address):	Olienhout 31
	Cussonia Avenue
	Kiepersol
	Bloemfontein, 9301

currently a registered student at: Central University of Technology, Free State

I hereby declare that as far I know the IP in the submitted business plan does not infringe any third party intellectual property rights, and indemnify the Innovation Fund and its agents against any infringement or damage claim by another party. I also agree to the rules, terms and conditions of the competition as described at www.innovationfund.ac.za/nic/terms.

Date: 28 August 2009

_____

Signature of the Project Team Leader

1. COVER PAGE

National Innovation Competition 2009

Business Plan Title: Handheld Interactive and Read-Aloud Book

Contact details of the Team Leader

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Name: Yolandi
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Name of University/Technikon entrant/s are registered at:

Central University of Technology, Free State

2. EXECUTIVE SUMMARY

The Opportunity

Treatment effectiveness to help children at a crucial age depends on early intervention and can include play material of various categories. It is envisaged that if sensory stimulants were integrated into play therapy mediums (sensory books), it will be able to stimulate a child with Learning Problems (LP) in the classroom, at home or within therapeutic practices.

The Objectives

The primary aim of the product is the stimulation of a child with LP through the interaction with the book and electronic unit. It also aids in the identification of children with Attention Deficit Hyperactivity Disorder (ADHD) by the incorporation of the Stroop Word and Color Test (SWCT) and children that may benefit from the colour-coding process by the incorporation of the Wechsler Intelligence Scale (WISC).

Description of the product

The sensory product development consists of an electronic unit and several book editions. The book editions include an interactive and read-aloud book, a colouring book and a SD card for the electronic unit's sound board. The interactive and read-aloud books incorporate several elements such as colour, hand-eye coordination, music, perceptual-motor coordination, pop-ups, puzzles, perceptual-motor coordination and several tests such as the SWCT and WISC. All the above-mentioned elements were identified by a literature review that may be beneficial for children with LP.

Marketing Strategy / Product Commercialization

The first phase of the marketing strategy is an online directory. Consumers will be able to view the products online. The second phase can include the introduction of a publicist and a marketing campaign for the introduction of the product line. The third phase can consist of promotional book readings at book stores to promote the product line as well as demonstrations at schools.

Competitor Analysis

There are no direct competitors for sensory product development. Indirect competitors in the South African market are categorized into their products/services: (1) toys, (2) books, (3) arts & craft, (4) on-line help, (5) therapy and (6) medication. Possible risks: (1) New product line, (2) Organizations not interested, (3) Direct selling is not a possibility and (4) Production costs are high and the profit margin decrease.

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4. DESCRIPTION OF PRODUCT

Introduction

Children with LP can be remediated by means of a multidisciplinary approach that can include play therapy. Through play, children can learn problem-solving, appropriate social skills, acquire the ability to organize, planning and attain self-esteem.

Problem Statement

A latent disability or disabilities are mostly identified once a child enters primary school level. Treatment effectiveness to help children at a crucial age depends on early intervention. Early intervention is the key to a better future for children that are categorized under the Emotional, Behavioural & Learning Disabilities (EBLD) group. Treatment can include play material of various categories that a therapist can use to stimulate the child and by so doing enter the child's world.

Anticipated Outcome

It is anticipated that the sensory product development will consist of an electronic unit and several book editions. The book editions include an interactive and read-aloud book, a colouring book and an SD card for the electronic unit's sound board. The interactive and read-aloud books incorporate several elements such as colour, hand-eye coordination, music, perceptual-motor coordination, pop-ups, puzzles and several tests such as the SWCT and WISC. Each edition includes a recurring rhyme or song which the class/child can sing together/along to. The song is programmed on the sound panel as a singalongs that children sing and play on an instrument. This promotes perceptual motor coordination. Throughout the book edition animal characters are used to overcome the cultural barrier that may exist. Animal sounds were incorporated in the book as well as on the sound board by linking colours on the sound board to the different animals featured in the book. All the above-mentioned elements were identified by a literature review that may be beneficial for children with LP. Each edition will have an individual theme selected by teachers and therapists as suitable themes for children between the ages of 6 to 9. Lexia is a sans serif font that is used for the typography in the book range. This font type includes a non-symmetrical *b* and *d* and handwritten forms of *a* and *g* respectively, formswhich readers may recognize more easily. Research on similar products and the needs of these specific children will lead to the sensory product development before the testing phase which will take place in two different schools in the Free State. A testing phase was done in 2006 with sensory products for children with learning problems which obtained optimal results. The sensory product range was narrowed to the interactive book and electronic unit and will be tested in September 2009. The results and recommendations from the methodology phase will be incorporated into the product range for the final prototype.

Novelty of Product Development

The product line has a specific age market, namely children between the ages of 6-9 years. The sensory product development is aimed at early intervention in South African schools and addresses the problem of the identification of a latent disability. The product line is designed according to the literature review that was conducted and will be tested with the specific target market. The product range will be implemented into the market as an electronic unit with different book editions with their accompanying SD cards. A new book edition will be brought onto the market every six to twelve months. The new book slides into the place of the old one and the accompanying SD is placed into the slot on the electronic board, thus creating the possibility that a new story can be read on the same electronic unit.

Benefit

The benefits of the product range are the earlier identification of children with a latent disability as well as the stimulation for children with LP and without LP. If the product range can be implemented into schools in South Africa, an actual problem can be addressed as well as to help parents to stimulate their children at home and therapists to incorporate it into their practices. The product line has a specific target market with one electronic unit and several book editions. This is a more cost-effective approach than a completely new product with every edition.

Impact

The sensory product range will be designed to meet the South African market's needs, but also have an export possibility on the international market as it adheres to the literature. There are few products in this market sector which meet the criteria of the market with the necessary research backing.

Competitors

In the market sector of different ways of helping children with various disabilities, the following market segmentation were identified with competitors:

- Books (Educational Toys Shop, Kidz World, Toddlers Toys, Bright Kidz, Jozikids and All Edu-toys)
- Toys (Educational Toy Shop, Busy Bee Toys, Smile Education, Kidz World, Toddlers Warehouse,Toddlers Toys, Bright Kidz)
- Arts & Crafts (Educational Toy Shop, Busy Bee Toys and Toddlers Warehouse)
- Online Help (Childline and Koolkids)
- Therapy (Play therapy, Occupational Therapy and Remediation)
- Medication (Ritalin®, Concerta® and Strattera®)
- Sensory Product Development (new area created)

Closest Competitor: Educational Toy Shop

OWN PRODUCT DEVELOPMENT	EDUCATIONAL TOY SHOP
SITUATION	**SITUATION**
On-line Shopping with a possible retail outlet at a later stage of implementation	6 Retail Outlets and Online-Shopping
SIZE	**SIZE**
New Small Business	6 Retail Outlets 6 years in industry
PRODUCTS	**PRODUCTS**
Age Specific Addresses an actual problem in South Africa New, exciting and interesting product line Complete product range that consists out of one electronic unit with a new book edition available every six to twelve months.	Product ranges of books offer nothing new, exciting or interesting No specific age group No specific needs in society satisfied
MANUFACTURE OF PRODUCTS	**MANUFACTURE OF PRODUCTS**
Same, except for the specialist areas of laser die cutting, inserting of features (textures and electronics) and assembly of the final product	Mass production at a selected printer
QUALITY	**QUALITY**
High quality of printing and special features Cost-effectiveness (old book is replaced by a new book edition with a new story to be read) Durable	High quality of printing (does not have any special features) Durable
SERVICE	**SERVICE**
Good delivery service Variety of payment methods Customer Service Exclusive product range 14-day Return Policy	Good delivery service Variety of payment methods Free gift wrapping Customer Support Wide range of products

DISTRUBUTION	DISTRUBUTION
On-line shopping with counter-to-counter delivery via postal services or a fixed account with a courier service Possibility of publicist and introduction into retail outlets	Retail outlets in shopping malls On-line shopping with door to counter delivery
PRICE	**PRICE**
1st Edition of product range with electronic unit, SD card and colouring book R1800.00 2nd Edition of product range R400.00	Plain Books: R21 – R51 Normal Books with good quality illustrations: R88-95 – R230-95 Pop-up Books R199-95 – R311-95 Electronic Interactive Books/Toys R369-95 – R859-95

Protection of Product

There is a 50% chance that another company can copy my design, layout and type of the sensory product development. Without the necessary research to justify the beginnings of this type of product, the competitors will not be able to bring out new product ranges. The book, which is the main product, is copyrighted as it is a printed work.

Costs for the manufacture of the Product Lines

Retail price depends on the number of units manufactured at one time. The greater the number of units manufactured at one time, the lower the price per unit. Except for retail prices (as set out above) there will be shipping costs (applicable outside South Africa only). Please see Appendix B for the cost for the manufacture of the product line.

5. MARKET

Market analysis

Market size

In South Africa in 2006, 12 302 236 learners were enrolled from Grade R to Grade 12 (*Source: Schools Realities in 2006, National Department of Education*). If learners were divided by the 13 grades plus a 10% per year increase in number of learners, the total market potential of Grade 1 to Grade 3 is 3 778 679. From that number of learners, only 10 – 30% suffer from a learning disability (*Source: www.health24.com*). Total market potential of learners with a learning disability at 10% is 377 868 learners and at 30% it is 1 133 604 learners.

Consumer Profile

INDIVIDUALS	ORGANIZATIONS
Geographic Segmentation • Live in South Africa • Individuals with children in Preschool or Primary School	**Geographic Segmentation** • Live in South Africa • Provincial Government within the Department of Education
Demographic Segmentation • Nationality: All races and religions • Age: Individuals with children 7-9 years • Sex: Male and Female • Social Class: Average to High • Language: English, Afrikaans and Xhosa (the three languages mostly spoken in South Africa)	**Demographic Segmentation** • Nationality: All races and religions • Age: 7-9 years • Sex: Male and Female • Social Class: No specific social class • Language: English, Afrikaans and Xhosa (the three languages mostly spoken in South Africa)
Lifestyle Segmentation • Free time: Spending time with their children and children's education • Spend money on: Toys and games	**Lifestyle Segmentation** • Spend money on: Education
Buying Pattern • When will they buy the product? Two to three times a year	**Buying Pattern** • When will they buy the product? Annually

Competitor Analysis

There are no direct competitors for sensory product development. Indirect competitors in the South African market are categorized into their products/services: (1) toys, (2) books, (3) arts & craft, (4) on-line help, (5) therapy and (6) medication. The most direct of the indirect competitors is Educational Toy Shop. They specialize in educational toys, book and arts & crafts, whereas I specialize in sensory product development which is aimed at a specific target market.

Market Segmentation

The target market can be segmented into different ways of helping children: (1) toys, (2) books, (3) arts & crafts, (4) on-line help, (5) therapy, (6) medication and (7) sensory product development. If it is possible to serve only $^{1}/7$ of the target market or 10% of learners with learning disabilities, my target market will be 45 063 learners and at 30% it will be 135 189 learners.

Marketing strategy

Entering the Market

My entering point into the market will be the Free State Province. The Free State Province has 175 986 learners in 2006 (*Source: Schools Realities in 2006, National Department of Education*) in Grade 1-3 with and without Learning Disabilities. The product line can grow to different parts of South Africa such as Gauteng and Western Cape Provinces. The final outcome of this product line will be implementation in South Africa as a whole within the curriculum of schools. Exporting to the international market is also a possibility (see Appendix C for the complete Marketing Plan).

Consumers

Entering point into the market (individuals and organizations in the Free State):

$^1/_7$ of the target market = 25 146 learners in Grade 1 - Grade 3.

10% of learners with Learning Disabilities = 2 514

30% of learners with Learning Disabilities = 7 542

Expansion to Gauteng and Western Cape Provinces:

$^1/7$ of the target market = 64 839 learners in Grade 1 - Grade 3 in Gauteng

$^1/7$ of the target market = 35 856 learners in Grade 1 - Grade 3 in the Western Cape Province

10% of learners with Learning Disabilities = 10 071

30% of learners with Learning Disabilities = 30 213

Expansion to whole of South Africa

$^1/7$ of the target market learners in Grade 1 - Grade 3:

10% of learners with Learning Disabilities = 45 063

30% of learners with Learning Disabilities = 135 189

(*Source: Schools Realities in 2006, National Department of Education + 10% increase per year*)

The Statistics given above is only if $^1/7$ of the target market is served

Success Factors

The product line is of high quality, with research backing and tested on the specific age group of South African children before the product was developed. The price of the separate product lines is compatible with the competitors within the market.

Accepted into the market

Six months for entering phase, 18 months for implementation to expanded provinces and 24 months for implementation into the whole of the South African market.

Marketing of product

Marketing will be done as an online-directory, with wide exposure to the market through a search engine option such as Google and Aardvark. An advertisement campaign can be launched in magazines (written articles on the new product development), electronic magazines (an exchange of the product for a free advertisement via a reader competition), book launches at bookstores (if a publisher is used) and seminars that accommodate parents and teachers.

6. TEAM / INDIVIDUAL

Individual

Title: Ms
Name: Yolandi
Surname: Burger
Citizenship: South African
ID Number: 840505 0033 086
Responsibility in the project/business plan: Yolandi Burger
Qualifications: B.Tech. (Graphic Design) (completed)
Thesis article title: Product Development for Play Therapy: Stimulating children with Learning Disabilities through the use of their own senses.
M.Tech. (Graphic Design) (conclusion phase)
Thesis article title: The development of Sensory Products to Stimulate Children with Learning Problems
Tasks performed: Research, product development and design of products

Contractors (for full details of contractors please see Appendix D)

Electronic Unit Designers
Name: Product Development Technology Station (PDTS)
Tasks performed: Designing of electronic unit and sound board

Copywriter
Name: Ilde Roos
Tasks performed: Copywriter and proofreading

Marketing
Yolandi Burger
Tasks performed: Marketing campaign that includes advertisements, webpage and etc.

Accountants
Company Name: Havenga Rossouw en Viljoen
Tasks performed: Calculation of income tax, preparation of financial statements and tax returns

Printers
Company Name: Tien Wah Press Pty Ltd, Singapore
Tasks performed: Printing and manufacture of product line

Publishers
Company name: Struik Publishers
Tasks performed: Publishing of the product line

7. ENVISAGED BUDGET (see Appendix A)

The envisaged budget was calculated without any start-up capital (prize money or loan). As the world is currently in a recession, capital is not easily obtainable. If capital is not obtainable, other methods can be considered such as selling the license of the product to a toy company such as Mattel® or a partnership with another company such as a publishing company.

The market segmentation for the Free State, which will serve as the entering point into the market, identified that the minimum number of children with Learning Problems is 2 514 and the maximum number 7 542. The first production line which includes the electronic unit and 1st edition book will consist out of 1000 units. If the market is expanded another production of the electronic unit can be done and sold. Sales for the first year of production were based upon the numbers of children with Learning Problems in the Free State, Gauteng and Western Cape Provinces. Number of possible consumers with the expansion is a minimum of 12 585 and a maximum of 37 755. It must be noted that not only parents of children with Learning Problems will purchase the product line, but also parents of children without Learning Problems.

The manufacturing costs can be reduced by using other suppliers or contractors especially for the manufacture of the moulds for the electronic unit. Another supplier's cost that can be reduced is that of the electronic components which include an mp3 player. This is needed to play the songs and animal sounds but does not need to be state of the art equipment. The SD card that was quoted on is 4GB cards and the sound board only needs 256MB cards which will also reduce the cost. The forecasted sales used 1 000 units, which is the minimum of the 1st edition with a sales period of six months and 2nd editions also with the same period of sales.

Manufacturing costs of the 1st edition is R1171.00 and the unit is sold at R1800.00. The mark-up of the 1st edition is 154%. Ideally the mark-up should be 200%, thus R2342.00, but it is a unrealistic price. Manufacturing costs of the 2nd edition is R193 and the unit is sold at R400. The mark-up of the 2nd edition is 200%, which is ideal.

Summary *(all figures are x1000)*

Description	Jan	Feb	Mrt	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Sales	270	360	378	306	252	234	60	80	84	68	56	52
MC*	1366						10					
IC**	240	118	117	116	116	116	116	116	116	116	116	116
P/L***	-1120	348	366	295	241	223	-95	69	72	56	44	41
Cumulative	**-1120**	**-771**	**-405**	**-111**	**130**	**352**	**257**	**325**	**399**	**455**	**500**	**540**

* Manufacturing Costs
** Indirect Costs
*** Profit/Loss

8. RISKS

STRENGTHS	WEAKNESSES
• Research backing and tested with SA children in the specified target market • Stimulating senses of children • Design elements created for specific needs • Children's reaction and experiences with prototype will be documented • On-line directory & Retail outlet in near future • 14-day return policy • Illustrations for prototype can be designed by owner, thus no additional cost	• No direct selling point, except if a publisher is used • Limited for the first stage of production to only one book plus mechanism • Longer waiting period for book delivery (10 days) • New products may take longer because of the necessary research that have to be conducted • Big capital requirements for printing process
OPPORTUNITIES	**THREATS**
• The product addresses an actual problem in South Africa • Can be incorporated into play therapy, occupational therapy, remediation, parent-child interactions, part of a curriculum and individual play • New market range – no direct competitors • Specialist market • Addresses SA market needs • Wide variety of places for introduction	• New product lines for competitors (Probability: 8) • If organizations are not interested in the production line (Probability: 5) • If a publisher must be used – profit margin decrease (Probability: 8) • If production costs are high – profit margin decrease (Probability: 5)

Risks (for complete threat analysis see Appendix E)

Probability of Occurrence: Rated next to threats

Main Threat: Organizations are not interested in the production line

Cause: Production costs too high for implementation into the curriculum

Planned Action: Production costs can be cut if larger number of units is ordered at one time, fewer laser dies are used in products and lower quality of material is used for the manufacture of the product

Responsible person: Yolandi Burger

APPENDIX A

FINANCIAL FORECAST (page 1 of 2)

Production of 1000 units for the first edition book plus mechanism

Description	Unit Cost	Nr of units	Jan '10	Feb '10	Mrt '10	April '10	May '10	June '10	July '10	Aug '10	Sept '10	Oct '10	Nov '10	Dec '10
Sales*			**270000**	**360000**	**378000**	**306000**	**252000**	**234000**	**60000**	**80000**	**84000**	**68000**	**56000**	**52000**
Units sold per month (1st Ed)	1800	1000	150	200	210	170	140	130						
Units sold per month (2nd Ed)	400	1000							150	200	210	170	140	130
Manufacturing Costs			**1365527**	**0**	**0**	**0**	**0**	**0**	**143400**	**0**	**0**	**0**	**0**	**0**
1st Edition	*1171*													
2nd Edition	*193*													
Printing														
Printing + Die cuts: 1st Edition	31	1000	31000											
Printing of 2nd Edition book	10	1000							10000					
Electronics (15% discount)														
Circuit Board	79	1000	68696											
Electronic components	652	1000	566957											
Assembly and soldering	157	1000	136522											
New Software Development**	3000		3000											
Unit														
Manufacture of mould**	356820		356820											
Casting of mould	150	1000	150000											
SD cards														
2nd Edition of book	104	1000							104000					
Extra														
Font - Lexia Readable**	133		133											
Musical Instrument - Triangle	52	1000	52000											
Musical Instrument - Rhythm Sticks	29	1000							29000					
Sound for the 1st Edition	50	8	400											
Sound for the 2nd Edition	50	8							400					

FINANCIAL FORECAST (page 2 of 2)

Indirect Costs			**23970**	**11730**	**11630**	**11580**	**11580**	**11580**	**11580**	**11580**	**11580**	**11580**	**11580**	**11580**
Capex														
Laptop**	6000	1	6000											
Telephone			400	300	200	150	150	150	150	150	150	150	150	150
Salaries			4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000
Administration														
Electricity and Water			300	300	300	300	300	300	300	300	300	300	300	300
Postage			500	500	500	500	500	500	500	500	500	500	500	500
General Expenses			100	100	100	100	100	100	100	100	100	100	100	100
Repairs			100	100	100	100	100	100	100	100	100	100	100	100
Short Term Insurance			200	200	200	200	200	200	200	200	200	200	200	200
Auditing and Accounting			300	300	300	300	300	300	300	300	300	300	300	300
IT														
Internet Connection Fee			190	190	190	190	190	190	190	190	190	190	190	190
Software**	3000	1	3000											
Legal Fees**	1140	1	1140											
Marketing														
Local Travel			500	500	500	500	500	500	500	500	500	500	500	500
Advertisement			5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000
Website			200	200	200	200	200	200	200	200	200	200	200	200
Patent	2000	1	2000											
Staff Expenses														
UIF			40	40	40	40	40	40	40	40	40	40	40	40

Profit/loss			**-1119497**	**348270**	**366370**	**294420**	**240420**	**222420**	**-94980**	**68420**	**72420**	**56420**	**44420**	**40420**

Cumulative			**-1119497**	**-771227**	**-404857**	**-110437**	**129984**	**352404**	**257424**	**325844**	**398264**	**454684**	**499104**	**539524**

APPENDIX B

PRODUCTION COST OF PRODUCT LINE (as in Appendix A)

Manufacturing costs per unit - 1st Edition *R1171.00*
Manufacturing costs per unit - 2nd Edition *R 193.00*

Description	Unit Cost	Nr of Units	Total
Printing*			
Printing of 1st Edition book + Die cuts	31	1000	31000
Printing of 2nd Edition book	10	1000	
Electronics (15% discount)			
Circuit Board	79	1000	79000
Electronic components	652	1000	652000
Assembly and soldering	157	1000	157000
New Software Development**	3000		3000
Unit***			
Manufacture of mould**	356820		356820
Casting of mould	150	1000	150000
SD cards**			
2nd Edition of book	104	1000	
Extra			
Font - Lexia Readable**	133		133
Musical Instrument – Triangle****	52	1000	52000
Musical Instrument - Rhythm Sticks****	29	1000	
Sound for the 1st Edition	50	8	400
Sound for the 2nd Edition	50	8	

* Tien Wah Press (TWP) is a leading exporter of books and is well-known for it's educational books for adults and children. TWP is the only company that specializes in printing on cardboard and the type of dies that is required within the book.
** Once-off costs
*** Supplier: Iclix CC, 29A King Edward Street, Willows, Bloemfontein, 9301.
**** Supplier: Toys for Kids Shopping Site, URL: <www.toysforkids.co.za>.
***** Quotation obtained from local manufacturer, but manufacture and casting can be done cheaper in Johannesburg or Cape Town.

APPENDIX C
MARKETING PLAN

Entering point in the market

My entering point into the market will be the Free State Province. The product line can expand to different parts of South Africa such as Gauteng and Western Cape Provinces. The final outcome of this product line will be implementation throughout South Africa as a whole within the curriculum of schools. Exporting to the international market is also a possibility. The product line will be marketed as part of a newly registered closed corporation. The proposed company name is AGOG. AGOG means interesting and exciting to find out, and it is just what this product range is all about.

How will the market be entered?

The market will be entered as an on-line shopping directory, with a supporting marketing campaign to make the potential target market (individual product line) aware of this new and exciting product range. The search engine facility will also be incorporated to make it easier for on-line shopping. If a publisher is to be used, the publishing house will be required to organize book launches and a marketing campaign. Another method that can be utilized is a partnership with a company or selling the license of the product to a company such as Mattel®.

Marketing Campaign

The product range must be marketed in material that parents and children will buy and see. The following magazines can be used for printed advertisements or a written article on the product range by the editor:

- *Baba & Kleuter*
- *Living & Loving*
- *Your Family*

Search Engines to be used for on-line shopping:

- Google
- Yahoo
- Aardvark

Some electronic magazines offer a free advertisement for one of the advertiser's products to be offered as a winning prize of a competition. Advertisements can be placed in electronic magazines and popular websites such as:

- Jou wêreld e-tydskrif (www.jouwereld.co.za)
- The teacher (www.theteacher.co.za)
- Facebook (www.facebook.com)
- My Space (www.myspace.com)

Marketing Campaign with Publisher

The campaign with a publisher on board will include advertising in magazines as well as the search engine option. It will also incorporate marketing material such as fliers, posters, banners, book sleeves, book launches in specific book stores, complementary book signings by the author and maybe a competition. The competition prize can be decided upon, but it will increase purchases. Consulting can be done about seminars and speeches to attract parents and organizations who may be interested in the purchase of the different product ranges. A book review is another method that can be utilized.

The on-line shopping directory

The web-based directory will be bright and colourful, thus attracting adults as well as children who search for toys. It will have full colour images of the product line on display with prices.
Offer the following services:

- On-line Directory
- 14-day return policy
- Electronic payments
- Counter-to-counter delivery via postal services or a fixed account with a courier service
- 7-day delivery

Success Factors

The product line is of high quality, with research backing and tested with the specific age group of South African children for which the product was developed. The price of the separate product lines is compatible with the competitors within the market. The marketing campaign's success is also a factor. The product line must be marketed as high quality, durable and the research backing must be the upfront component for the product lines.

Suggested logo for Compnay

APPENDIX D
CONTRACTORS

Copywriter

Title: Mrs

Name: Ilde

Surname: Fenthum

Citizenship: South African

ID Number: 800307 0139 080

Qualifications: N. Dip. (Language study) (Central University of Technology Free State, 2001)
B.A. (Hons) (Language study) (University of Port Elizabeth, 2002)

Tasks performed: Copywriter and writing of the storyline

Marketing

Title: Ms

Name: Yolandi

Surname: Burger

Citizenship: South African

ID Number: 840505 0033 086

Responsibility in the project/business plan: Yolandi Burger

Qualifications: B.Tech. (Graphic Design) (Marketing 2-year subject)
M.Tech. (Graphic Design) (conclusion phase)

Tasks performed: Marketing Campaign
Ensure visibility of product line to the potential target market
Advertisements of the product line

Accountants

Company name: Havenga Rossouw en Viljoen

Address: 31 First Avenue, Westdene, Bloemfontein, 9301

Tel: +2751 448 8188

Fax: +2751 448 8179

Tasks performed: Calculation of income tax, preparation offinancial statements and tax returns

Printers

Company name: Tien Wah Press Pty Ltd

Address: 4 Pandan Crescent, Singapore, 128 475

Tel: +656 771 8892

E-mail: jimmylim@twpsin.com

Tasks performed: Printing and manufacture of product line

Tien Wah Press (TWP) is a leading exporter of books and is well-known for its educational books for adults and children. TWP is the only company that specializes in printing on cardboard and the type of dies that is required for the book.

Publishers

Company name: Struik Publishers (Cape Town Head Office)

Address: 80 McKenzie Street, Gardens, Cape Town, 8001

Tel: +2721 462 4360

Fax: +2721 462 4377

Tasks performed: Publishing of product line

Manufacture of mould and casting of units

Company name: Kopanang Converters (Pty) Ltd

Address: PO Box 31607, Fichardt Park, 9317

Tel: +2751 432 6028

Fax: +2751 432 2892

Tasks performed: Manufacture of mould and casting of units

Electronic Components and Final Assembly

Company name: Product Development Technology Station (PDTS)

Address: 20 Pres Brand Street, Bloemfontein, 9301

Tel: +2751 507 3253

Fax: +2751 507 3589

Tasks performed: Manufacture of mould and casting of units

APPENDIX E
THREAT ANALYSIS

Potential Threat: New product lines for competitors
Probability of Occurrence: 8
Cause: Pressure from losses of sales and pressure from consumers
Planned Action: The development of new sensory product ranges which will be patented and protected by copyright. Competitors can not develop new product ranges without the necessary research backing.

Potential Threat: Organizations are not interested in the product line
Probability of Occurrence: 5
Cause (1): Production costs to high for the implementation in the curriculum
Planned Action: Production costs can be cut if larger number of units is ordered at one time, fewer laser dies used in products and lower quality of material is used for the manufacture of the products.
Cause (2): Implementation into curriculum not possible
Planned Action: Implementation only into remedial classes as part of the curriculum or as a prescribed book range for playtime

Potential Threat: Publisher must be used OR partnership with Mattel® or another company.
Probability of Occurrence: 8
Cause: Product line does not have enough visibility in the market
Planned Action: An effective marketing campaign to accumulate a bigger potential target market. If the marketing campaign is not effective, the publisher will be used, but then book launches and marketing material must be implemented into book stores.

Potential Threat: Production costs are too high
Probability of Occurrence: 5
Cause: The use of specialist printers with the manufacture of dies, lamination and high quality materials that will be used
Planned Action: Production costs can be reduced by reducing the quality. Another possible option will be to market it as a high quality, durable product for children.