Opening Eyes

Volume 2

Teaching Learners with Visual Impairment

Edited by

Maximus M. Sefotho & Ronél Ferreira

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Volume 2

Teaching Learners with Visual Impairment

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Peer review declaration

The publisher (AOSIS) endorses the South African 'National Scholarly Book Publishers Forum Best Practice for Peer Review of Scholarly Books.' The manuscript was subjected to rigorous two-step peer review prior to publication, with the identities of the reviewers not revealed to the author(s). The reviewers were independent of the publisher and/or authors in question. The reviewers commented positively on the scholarly merits of the manuscript and recommended that the manuscript be published. Where the reviewers recommended revision and/or improvements to the manuscript, the authors responded adequately to such recommendations.

Research Justification

The importance of understanding the implementation of the White Paper 6 (inclusive education policy) and accommodating learners with disabilities (such as visual impairment) in all schools are continuously emphasised. Studies in this field however remain limited, requiring ongoing research. Questions regarding teachers' apparent hesitancy to implement inclusive education policy and their uncertainty about the accommodation of learners with visual impairment remain evident, thereby necessitating research in this field. Based on a broad scale research project in the field of inclusive education, learners with visual impairment, and teachers' needs and expectations in accommodating these learners in the classroom, this series of books (of which this one is the second volume) were conceptualised and written. In addition to the findings obtained from the research project undertaken by the University of Pretoria during 2017 and 2018, selected experts in the field of visual impairment were involved as authors, to make contributions based on their own research and experience on case studies gained over many years. The first volume in the series, titled *'Opening eyes: Understanding education for the visually impaired'* focused on an understanding of the visually impaired learner, inclusive education policy and support provision to this group of learners in accordance with existing policy. This book, *'Volume 2: Teaching learners with visual impairment*', focuses on holistic support to learners with visual impairment in and beyond the classroom and school context. Special attention is given to classroom practice, learning support, curriculum differentiation and assessment practices, to mention but a few areas of focus covered in the book. In this manner, this book makes a significant contribution to the existing body of knowledge on the implementation of inclusive education policy with learners affected by visual impairment. The scholarly contribution is emphasised by the fact that no such South African authored book is available on this specific topic, implying a ground-breaking contribution which may pave the way for follow-up research and publications.

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Contents

Abbreviations, Boxes, Figures and Tables Appearing in the Text and Notes

List of Abbreviations

AIDS	Acquired Immunodeficiency Syndrome
AT	Assistive Technology
CAPS	Curriculum and Assessment Policy Statement
CCTV	Closed-circuit Television
CSE	Comprehensive Sexuality Education
DBE	Department of Basic Education
DBST	District-based Support Team
DoE	Department of Education
ECC	Expanded Core Curriculum
GPS	Global Positioning System
GUI	Graphical User Interface
HIV	Human Immunodeficiency Virus
HSASA	Handicapped Scuba Association South Africa
IBSA	International Blind Sports Federation
IEP	Individual Education Plan
ISP	Individual Support Plan
LGBTIQA2S+	Lesbian, Gay, Bisexual, Transgender/Sexual, Intersexed, Queer/Questioning, Asexual/Ally, Two Spirited and Other
LTSM	Learning and Teaching Support Material
NSC	National Senior Certificate
O&M	Orientation and Mobility

OCR	Optical Character Recognition
PDF	Portable Document Formats
RNIB	Royal National Institute for the Blind
SBST	School-based Support Team
SETT	Student, Environment, Tasks and Technology
SIAS	Screening, Identification, Assessment and Support
SNA	Support Needs Assessment
TSBVI	Texas School for the Blind and the Visually Impaired
TTS	Text-to-Speech
UN	United Nations
UNESCO	United Nation's Educational, Scientific and Cultural Organization
WATI	Wisconsin Assistive Technology Initiative
WHO	World Health Organization

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Ann Heard's initial qualification was obtained from the University of Lancashire in special education. On immigrating to South Africa in her early twenties, she started the first school for Autistic children in Pretoria which later became the UNICA School. At a later stage, she trained as an orientation and mobility practitioner at the South African Guide Dogs College for Orientation and Mobility. She has subsequently had a long career of almost 51 years in assisting people with cognitive challenges, with autism, of which 29 years have included people affected by low vision and blindness to achieve independence. In her private practice, Ms Heard assists people of all ages and capabilities. Currently, she has a special interest in people who experience visual difficulties and/or are multiply challenged. Based on her expertise and years of experience in the field, Ms Heard has been invited to present papers at national and international conferences and workshops. In addition, she has taken part in many outreach projects in South Africa, focusing on people affected by low vision and blindness in especially rural areas. Most recently, she has been involved as consultant in the development of an Advanced Diploma in visual impairment studies by the University of Pretoria.

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Lindokuhle Ubisi is a lecturer at the University of Pretoria and part of the core project team focusing on research in the field of visual impairment. He is also a PhD candidate in Psychology at the University of Witwatersrand, with a focus on performance of masculinity in a high-status setting, while occupying a low status job amongst black male cleaners at a higher education institution. His research interests are mainly directed to the psychology of sexual minority groups, equality and social justice.

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Hestelle Viljoen retired as principal of Prinshof School for the Visually Impaired in Pretoria in 2008, after starting her career as a mathematics teacher. Following her retirement, she has been involved as an expert consultant in the field of visual impairment in many projects on the national level. She served as a consultant for the Department of Basic Education to complete an audit of 22 schools for learners with visual impairment in 2009/10; was involved in the adaptation, translation and modification of workbooks for braille; and has written numerous training manuals for working with learners with visual impairment, the adaptation of learning and teaching support material and assessment, and technical guidelines for brailling Mathematics and Science. Closely related, she has been involved in the training of teachers and officials on curriculum differentiation for learners with visual impairment as well as the development of tertiary programmes. More specifically, she has recently been involved in the development of an Advanced Diploma in visual impairment studies by the University of Pretoria as well as the development of a Mass Open Online Course on the teaching of learners with visual impairment by the University of Cape Town. Ms Viljoen's expertise in the field has been recognised widely, as evident in her receiving the St Dunstan's Association for SA War-Blinded Veterans award for Teaching Mathematics (blind and visually impaired learners), the Presidency of SA award for Expanding Learning and Teaching through Technology, and the Gauteng Department of Education (Tshwane WEST) award for Excellence in Leadership as Principal of Prinshof School.

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Preface

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In this second volume of an envisioned series of books in the field of visual impairment, there is a strong focus on practically supporting learners in school, the classroom and even in the broader community. The publication stems from the need for practical guidelines that teachers may implement in class when supporting learners with visual impairment[1], whether in mainstream, full-service or special needs schools. In response to this need, leading scholars in the field joined hands with practitioners with years of experience and research as background, to put this publication together.

Learners with visual impairment, especially in low-resourced contexts, often receive education and general treatment in schools that are not on par with their sighted counterparts. For instance, a scarcity of textbooks that are accessible through other means such as braille, audio books or even daisies, is evident in South Africa, resulting in many learners with visual impairment receiving the same textbooks as sighted learners, thereby forcing them to be reliant on others to be able to learn. Because of limited specialised training, teachers may furthermore experience difficulty in applying suitable curriculum differentiation, which will in turn lead to some learners not being able to access learning material in equitable ways when compared

1. Throughout this publication, the concept 'learners with visual impairment' is used as synonym for 'learners with vision impairment' and 'learners affected by blindness and low vision'.

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to their peers. Learners with visual impairment often take a long time to complete their grades and may subsequently progress to the next level without passing a certain grade.

High attrition rates amongst learners with visual impairment may be ascribed to various reasons. These include that learners become too old to attend school because of them not being able to fully benefit from learning experiences in and outside the classroom, as a result of their disability. In addition to learning material often not being accessible to them, any transitioning between subjects, classes and schools will also present great challenges to learners with visual impairment.

In this publication, some strategies are put forward to address some of the challenges faced by learners with visual impairment. Firstly, the transformation of a school as basis for effectively supporting such learners is discussed in terms of the management and leadership of schools. Based on the broad research project conducted with teachers and expert stakeholders in South Africa as well as smaller scale research and experience of practitioners, the need for training teachers and administrators is emphasised, in specific areas of potential support. In response to this need, the second section of the book focuses on holistic support and the teacher's role in developing and implementing individualised support plans for learners with special needs, after completing the necessary screening, identification, assessment and support (SIAS) process that is prescribed in South Africa.

In the third section, the focus falls on classroom practice and the use of braille when teaching learners with visual impairment. In addition, practical approaches to curriculum differentiation, teaching of the expanded core curriculum and differentiated assessment strategies are discussed, in support of teachers working with learners with visual impairment. The selection and potential use of assistive technology (AT) forms part of the discussion. Finally, in the last section of the book, the focus falls on the holistic development of learners with visual impairment. Examples of participation in sport, cultural, art and recreational activities are provided and the importance of such activities for learners with visual impairment is explained, in terms of them working towards independence and enjoying development on different levels. In the last chapter, the importance of sexuality education is foregrounded, which is important in the case of learners with visual impairment yet remains to be a controversial topic that is still often debated.

By focusing on the practical teaching and support of learners with visual impairment, this publication builds on the content included in Volume 1, where the focus fell on an understanding of the phenomenon of education for learners with visual impairment. Following on this understanding, the aim of this volume is thus to provide teachers and practitioners with knowledge and practical guidelines to more effectively support these learners in and outside the classroom, thereby guiding them to become independent individuals in future.

SECTION 1

Transforming the school

Chapter 1

Instructional leadership for transformational change, learner achievement and care

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Keywords: Braille; Learners; Impairment; Visual; Needs.

Introduction

This chapter is loosely structured around the key themes included in the title. The status quo of low learner achievement, poor curriculum delivery and access to suitable and accessible learning and teaching support material (LTSM), inequality and social injustice by a positive view on what is possible, even when working in challenging contexts is challenged in this chapter.

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More specifically, the focus falls on the school principal as instructional leader who can influence and drive transformational change, setting a clear direction to improve quality achievement, support and care for learners with visual impairment by focusing on the professional development of the self and fellow individual teachers. Thereby, strengthening curriculum delivery and learner achievement, yet also supporting teachers to become leaders within their schools and in the field of visual impairment in the wider community.

This chapter is based on research conducted by two higher education institutions in South Africa – one in partnership with an international colleague, interviews with senior researchers at national institutions and interviews with school principals, which is supported by the author's experience as principal of a school for learners with visual impairment. This is furthermore supported by an evaluation (*Development of a Strategy for Quality Education and Support to Learners with Visual Impairment in Special Schools*) conducted by the author for the national Department of Education (DoE) of the 22 special needs schools for learners with visual impairment in South Africa in 2009/10, hereafter referred to as the 2009/10 Audit.

Overview of the chapter

The discussion in this chapter focuses on addressing the following questions:

- How can school principals improve the education of learners with visual impairment in their schools?
- Which challenges do South African principals generally face and how can they respond to such challenges?
- What does successful instructional leadership in the 21st century entail and how can this facilitate transformational change and learner achievement?
- How can principals attend to the capacity building and professional development of themselves and the teachers at their schools?

- How can a culture of care, supporting self-esteem and self-efficacy be created?

Definition of key concepts

Capacity building

A process and actions that focus on professional development, improved resources and infrastructure, and the appointment of suitably qualified personnel.

Care

The provision of whatever support is needed for the human dignity, respect, inclusion, health, wellness and protection of learners with visual impairment.

Curriculum differentiation

'A key strategy for responding to the needs of learners with diverse learning styles and needs. It involves processes of modifying, changing, adapting, extending and varying teaching methodologies, teaching strategies, assessment strategies and the content of the curriculum' (*Guidelines for Responding to Diversity in the Classroom through Curriculum and Assessment Policy* 2011:7).

High expectations

Having expectations for learners with visual impairment to achieve optimal individual academic success and social inclusion in the various areas of life.

Instructional leaders

Leaders who build a system or 'enabling an environment that may support and enhance the core work of teaching in schools' (Witten 2017:18), for example, by guiding the processes of curriculum differentiation, implementation, delivery and instruction.

Learner achievement

The extent to which individual learners perform or achieve the knowledge and skills required/prescribed by the curriculum.

Safety and security of learners with visual impairment

Includes physical, emotional, gender, health and social security, as well as the honouring of the human rights of individuals.

Schools for learners with visual impairment

Includes ordinary schools, inclusive/full-service schools and special needs schools/special needs schools resource centres.

Shared/distributed leadership

A collaborative undertaking where people who trust each other share responsibilities and respect each other's contributions.

Support

To provide assistance by making reasonable accommodations for learners with a visual impairment.

Transformational change

Change that occurs over a period of time and affects the whole organisation or school.

The school principal as key to improve the education of learners with visual impairment

The July 2015 Section 27 Report (Fish-Hodgson & Khumalo 2015), *Left in the Dark: Failure to Provide Access to Quality Education to Blind and Partially Sighted Learners in South Africa*, states that:

> The conditions at schools for learners with visual impairment throughout South Africa are in a state of crisis. The interviews conducted with all 22 schools for the visually impaired in South Africa tell the story of neglect and denial of visually impaired children's rights to basic education and equality – which amounts to a fundamental impairment of their human dignity. (p. 11)

More specifically, challenges centre around the impoverished blind children from rural areas to be enabled, through quality education, to thrive and cope in society. Other challenges are the lack of expertise and knowledge of teachers, principals, district officials for inclusive education and provincial officials about the education of learners with visual impairment. Included are the dismal and often unsafe and outdated infrastructures of schools and hostels, as well as the inability to use the resources provided by the state and donors. A further challenge is the poor delivery of appropriate, accessible curriculum because of a lack of braille learning support material and the inability of schools to produce their own daily needs in braille and large print.

All principals of schools for learners with visual impairment are required to address these challenges by transforming their schools. To be able to do this, principals firstly need to know and understand their current status and specific school context. As school leaders in South Africa (as in many other countries) come from very different backgrounds and work in various different contexts, from affluent and successful to under-resourced and dysfunctional schools, their expectations and critical, creative thinking to find solutions for problems are vastly different. By analysing and assessing the specific school context in which a principal works, the status of the school can be determined and areas for improvement identified.

Secondly, in the same manner, it is important for a principal to know what they lack in knowledge and where their limitations lie – from something as simple as not having prior knowledge and experience in the field of visual impairment, to more specialised knowledge on, for example, curriculum differentiation. A lack of knowledge implies the inherent possibility of acquiring new knowledge and facilitating positive change by becoming a 'student instructional leader', being eager to learn, leading by example with passion, dedication and vigour, influencing others and continually aspiring towards better performance. Some cornerstones to succeed include the actions of asking advice from others who know, doing research, learning, trying out new things, discussing issues with staff members, building partnerships, getting to understand the system as well as its strengths and shortcomings, and using it to the advantage of the whole school community and education authorities.

Thirdly, a belief that the school can be transformed into a centre of excellence is key. In this regard, the principal should be proactive, make suggestions and assist those supposedly not doing what they can rather than awaiting the assistance of others such as governmental organisations. Once understanding the unique context and challenges of the school, what is known and not known, and having a basic belief that positive change is possible in the school, a principal can start planning for and working towards the establishment of a centre of excellence.

Being a principal in a challenging school context

As many other countries, South Africa is a signatory to Education for All (EFA 2000), the Salamanca Statement (1994) and the

United Nations Convention on the Rights of Persons with Disabilities (UN 2006), which states in Article 24 that:

> In realising this right (of education), States Parties shall ensure that … 'persons with disabilities can access an inclusive, quality and free primary education and secondary education on an equal basis with others in the communities in which they live'. (art. 24, 2b)

McKenzie and Shanda (2019) however, argue that:

> [*T*]his right [*of learners with Visual Impairment*] is not being fully met as most learners do not have access to the curriculum on an equal basis with non-disabled learners because their teachers were not trained or supported to meet their specific learning needs. (p. 86)

The National Planning Commission (2011) of South Africa similarly links teacher performance and the quality of school leadership (the principal as instructional leader) to poor school performance in this country, which is characterised by a high incidence of challenging school contexts.

In this regard, ongoing research indicates effective, energetic, knowledge-based instructional leadership as a key factor that may influence transformational change. Closely related, research by McKenzie et al. (2019) indicates that teachers in schools for learners with visual impairment generally require better training in order to demonstrate the ingenuity and volition demanded by the South African educational context. To this end, teachers are required to be better informed of the specific needs of learners with special needs, based on the nature of their disability and the implications thereof. Teachers are for example required to have insight into the difficulties learners may face as a result of their impairments, such as accessing information or dealing with stigma (McKenzie & Shanda 2019).

The author's own experience as a principal of a school for learners with visual impairment confirms the importance of the principal (as instructional leader) understanding the educational needs of the learners as well as the teachers, as well as the difficulties often faced by poorly trained teachers in low-resourced schools, and what may be required to overcome these inadequacies. Only an informed principal (e.g. through workshops, conference attendance, individual discussions with staff members, etc.) will be able to empower and effectively support teachers to understand learners' needs and provide quality education. It follows, that skilled, dedicated teachers at the school, an excellent team of professional support staff, experienced financial officers and others who may mentor or coach peers can contribute to the transformation process of the school to adapt to the 21st century. Throughout, it remains important to ask and obtain information when needed.

According to Witten (2017:1), 'the challenges to school improvement are both internal (school-based) and external (from the broader environment)'. Unfortunately, school leaders are often not sufficiently trained to deal with these challenges, more specifically in terms of improving the functioning of the school. School principals may at times even be 'overwhelmed' (Witten 2017:1) by the challenges they face, spending a significant portion of their time and energy on solving problems or responding to unforeseen crisis situations. As a result, principals may experience feelings of 'despair, frustration and helplessness' (Witten 2017:1).

Furthermore, Witten (2017) states that principals often focus strongly on external demands rather than the what and how of teaching at ground level, which in turn will affect learner performance. As a result, many schools may face the challenge of not having sufficient writing or braille paper, textbooks or assistive devices – finding themselves in a situation where effective teaching and learning cannot be supported. Watermeyer, in a private discussion in Cape Town 13 May 2019, confirmed Witten's work by stating that:

> 'Leadership is mixed, some impressive, some seemingly distant and out of touch with the classroom. … leadership seemed to not understand or act upon the gravity of access issues in the classroom. In other words, lack of accessible LTSM was regarded as an issue, but not a crucial (enough) one. … Without a basic recognition that accessible LTSM and teaching methods are pivotal to success, leadership will not take the necessary decisive action required.'

In support of Watermeyer and Witten's views that current school contexts do not always support meaningful teaching and learning, and that leadership in schools can make a difference, the 2009/10 Audit conducted in South Africa indicates that many schools were dysfunctional at the time, amongst other reasons because of weak leadership, limited vision and ambition of principals, as well as poor education, discouraged school communities and no motivation by principals to find innovative ways on improving themselves and others. Closely related is the fact that principals may follow an approach of merely waiting for external forces such as the government to provide solutions and support. On a practical level, schools in challenging contexts often face the challenge of limited discipline and high levels of absenteeism amongst both teachers and learners. Inadequate computer literacy which is important for braille and large print LTSM production, and no or little curriculum differentiation and learner support are added challenges. In this regard, the curriculum is often very visual and for successful implementation with visually impaired learners the curriculum needs to be differentiated and LTSM adapted into an accessible format. In addition, often schools do not have the necessary skills, staff and equipment to produce these materials for assignments, notes and assessments for learners with visual impairment. As a result, learners cannot be sufficiently accommodated or supported.

Finally, limited subject knowledge and pedagogical skills of teachers, scarce in-service training and peer support, and a lack of mentoring may add to the challenges experienced by poor performing schools. In these schools, assistive devices are often scarce, with the money that is available not always being spent wisely. A closely related challenge is that teachers often lack experience and training in the use of assistive devices and technology. As an underlying factor, hostels in challenging school contexts do not always provide nutritious food, impacting learners' performance. In addition, these schools may have a poor infrastructure and insufficient safety and security measures. As many of these challenges are internal (school-based), better informed instructional leaders (principals) may be able to address and resolve these by implementing transformational change.

Successful instructional school leadership in the 21st century

Karen Cator of the United States DoE (2010) argues that:

> Success in the 21st century requires knowing how to learn. They [*learners, teachers and principals*] must develop strong critical thinking and interpersonal communication skills in order to be successful in an increasingly fluid, interconnected, and complex world. Technology allows for 24/7 access to information, constant social interaction, and easily created and shared digital content. In this setting, educators can leverage technology to create an engaging and personalised environment to meet the emerging educational needs of this generation. The opportunities afforded by technology should be used to re-imagine 21st century education, focusing on preparing students to be learners for life. (p. 3)

This is particularly true for learners with visual impairment. Despite an array of new technologies that can support learners with visual impairments, these are not optimally utilised, with learners falling behind in the age of knowledge generally being accessed digitally. However, for learners to benefit from these developments, instructional leaders and teachers need to have up to date knowledge. It is true that learners will always need the three Rs (reading, writing and arithmetic), yet they also need to acquire the skills of accessing digital knowledge, collaborating, investigating and solving authentic problems, developing critical thinking, communicating, exploring their creativity and computational thinking. Claims of the curriculum being 'too visual' or 'not suitable' can no longer be used as an excuse for not attempting to make it accessible. Learners with visual impairment want to and should be able to access and know all of what their sighted peers learn and talk about. Even though this may not be easy, reasonable accommodations for access should be arranged whenever possible. In this regard, Watermeyer (2014) movingly describes the dire consequences of insufficient access in the following way:

> As the age of digital information embeds itself, it is tempting to believe that the problem of print access for people with visual and other disabilities is fast becoming a thing of the past. Unfortunately, this is not true. Gross inequalities in access to the internet, IT skills training, devices, affordable and accessible literature, as well as the basic educational levels required to engage with the printed word, remain massive obstacles to provide disabled people with the freedom to read. As with so many barriers to participation, technological remedies are available, but not implemented … Obviously, reading is how we learn. Not being able to read through poor literacy, poverty or disability is a potential death blow to advancing economic participation. In a very real sense, it is hard to take part in the world without access to the printed word … By reading I taste the world, and develop my tastes for it, growing insight into that which makes my existence meaningful. Without a world of ideas and things to stir my inner sounding board it is harder to know who I am … To not experience that relatedness is, in a real sense, to not belong. (p. 1)

The principal needs to develop and build a system that enables, supports and enhances the core function of teaching learners with visual impairment. This requires the leadership in the school to not only be instructional but equally so, to be transformational. The instructional leader works for transformation and change, while the transformational leader knows that instructional leadership is required for transformation and change.

■ Relying on instructional leadership to facilitate transformational change

According to Witten (2017) and Day (2015), for a leader to give direction and facilitate transformational change, they need to imagine a desired future, be a positive and empowering visionary champion of what is possible, make sense of the complexities of education in the relevant context, act upon the formulated vision, and set strategies and plans in place with a strong instructional focus.

The *Policy on the South African Standard for School Principalship* (2015:5) states that '[t]he purpose of transformation in any education system is to bring about sustainable school improvement and a profound change in the culture and practice of schools'.

To this end, principals need to change their thinking about their work as leaders in order to be able to change their own behaviours and attitudes, and to influence those of the teachers and learners at their schools, rather than to control them. For this purpose, principals need to make decisions on the contextual realities they face and seek a deeper understanding of these realities through dialogue within their schools and communities, as well as through collaboration with others in similar circumstances and those who hold expertise. In doing this, a sound, positive and creative mindset and strategy for change can be established.

As an outcome of transformational change, social disadvantages and dysfunctionality can be addressed, with all learners gaining access to neighbourhood schools (both mainstream and special needs) in an inclusive education system. In such a system, learners with high support needs, such as those with visual impairment, will be able to access functional, well-resourced schools or resource centres, where teachers possess sufficient subject knowledge and skills for curriculum differentiation, know the braille code for their subjects and language, practice good teaching strategies and uphold a strong sense of responsibility towards their learners, colleagues, the community and future of the country. In this scenario, schools and communities will join hands to create safe and caring spaces for learners with visual impairment in order for them to reach their full potential, by having access to sufficient resources such as libraries, laboratories, the latest technology and good nutrition. Social wellbeing will be prioritised, and responsibility and accountability abound from the lowest- to the highest-ranking officials in the education system.

General profile of a transformational leader

The transformational leader inspires idealism and high expectations through charisma and a strong long-term vision with clear goals, challenges the status quo and stimulates intellectual and critical thinking. They also recognise the qualities and capabilities of others to develop individual excellence and respect their needs and emotional wellbeing. The transformational leader knows how to self-manage personal vulnerabilities, strengths and weaknesses.

The vision of schools cannot be separate from the vision of the nation or country, as schools and government are 'inextricably bound together in the transformation process', shaping the future of a nation (Northouse & Lee 2016:73). As such, the mindset and framework of school leaders and teachers, and the way in which they speak, teach and lead to transform should be committed to justice, inclusion, diversity, democracy, fairness and equality. In this regard, Constandius and Bitzer (2015) argue that:

> Marginalising, exclusion, stigmatising and 'othering', as played out during the colonial and apartheid years in South Africa, are some of the challenges that gave rise to the social transformation and critical citizenship education. The importance and urgency of transformation within a post-colonial, post-apartheid society, its educational institutions, their curricula and individual citizens cannot be denied or ignored. (p. 3)

Critical citizenship education aims to find strategies to reflect on the past and work towards a future of respect for diversity, to develop an awareness of shared values, tolerance for 'otherness', human rights, democracy and social justice, and to combat complacency. In reaching this goal, transformational leaders will strive to instil the following attributes in both learners and teachers:

- **Enquiring mind:** This attribute implies that teachers and learners will become lifelong learners, and critical and creative thinkers who exercise responsibility for learning and the use of knowledge.
- **Engaged citizenship:** Engaged citizens are leaders, collaborators and social entrepreneurs who can function effectively in diverse environments.
- **Dynamic professionalism:** This attribute implies that teachers and learners will become innovative problem solvers who can effectively use and sustain technology.
- **Well-roundedness:** This attribute will enable teachers and learners to expose themselves to various levels of life such as cultural, intellectual and sporting activities, taking responsibility for their own personal development, while making informed and well-considered decisions (adapted from Constandius & Bitzer 2015:50).

To bring about the expected change in the direction and management of the school for better inclusion of learners with visual impairment, an *instructional leader* needs to firstly understand the values, principles and goals which inform the country’s inclusive schooling system, specifically in terms of learners with visual impairment. Next, the leader needs to possess knowledge and skills on the principles and processes of strategic thinking, planning and implementation. Thirdly, the leader needs to be able to effectively lead dynamic change processes related to improving inclusivity. Fourthly, the leadership should understand and implement approaches to building, communicating and implementing a ‘shared vision’ (cf. Martin et al. 2014), and strategies for inspiring, challenging, motivating and empowering people. Fifthly, methods to instil positive values and a culture of learning should be created based on the knowledge of the support needs of learners with visual impairment. Lastly, the leadership should know who are the experts in visual impairment and where to access such information on the Internet.

Transformational change and curriculum delivery

The role that instructional leadership plays in curriculum delivery is particularly important for learners with visual impairment, because of the special support needs of these learners. In South Africa, the Curriculum Assessment Policy Statement represents the national school curriculum; however, learners with special needs also have to be taught the Expanded Core Curriculum (ECC). Some elements of the ECC have to be infused into the Curriculum Assessment Policy Statement because there is no provision for this expanded learning on the timetable, while other aspects of the ECC can be covered by support staff such as a psychologist, occupational therapists or a nursing sister, should the school be fortunate enough to have such staff members.

In terms of this aspect, situational leadership is important, as the context in which learners learn plays a distinct role in the degree to which their impairment-specific needs are met. Schools differ, and school management teams are expected to work with their specific situations or contexts. To this end, schools may have to reach out to other schools or community members for services such as skills of daily living, psychological support, etc. The principal and school-based support team (SBST), or the support teacher in an inclusive school or a full-service school with only a few learners with visual impairment, may experience some resistance from certain teachers in fulfilling this role. However, to the learner with visual impairment this is vitally important for successful independent living, employment, school-to-work transition, self-determination and socialisation.

When teaching these skills to learners with visual impairment, it is important to consider the whole life span of the child, more specifically 'considering the development of individuals over the course of their lives and ensuring that their needs and rights are met at every stage' (McKenzie & Kelly 2019:13). As such, it is important that every staff member is inspired to buy in and take ownership of this important component of instruction. Both the principal and teacher should be held accountable, as well as the learner and their parents.

Due to administrative duties many school principals tend to leave curriculum management to the school management team. Even though it cannot be expected of the principal to have in-depth knowledge of every subject and grade, in a model of shared instructional leadership, a whole pool of knowledge exists that can be drawn from. It however remains important that the principal is available to lead informed discussions, plan and implement skillful and creative curriculum delivery and curriculum differentiation and have the necessary knowledge to make the right decisions on the acquisition of suitable assistive devices and LTSM. Included, the principal needs to understand the implications of different eye conditions on learning and employment options, as well as the special learning styles and support measures that can be implemented for learners with visual impairment. Once the principal is familiar with such disability-specific knowledge, they will feel empowered to make informed decisions about whole school development, budgeting and advising the School Governing Body about what is needed for high learner achievement. As stated, this process will require a driven, courageous and knowledgeable leader who in turn can inspire and positively influence the other staff members. Gurr's writes in his book *Finding your Leadership* (2014) cited in *A Model of Successful School Leadership from the International Successful School Principalship Project* (2015) that for any instructional leader, one of the most difficult tasks relates to addressing poor teacher performance in a non-confrontational, discreet manner by, articulating a set of core ethical values, building trust, being visible in the school, building a safe and secure environment, introducing productive forms of instruction to staff, coalition building and the promotion of equity, care and achievement.

Learners' needs

The needs of learners with visual impairment are captured below:

- '[T]he teachers need to know braille … they must learn to read and write braille so that they can mark our work, they often ask other teachers who might not have the knowledge of the subject and they mark us down' (Fish-Hodgson & Khumalo 2015:10).
- 'There [are] up to four learners sharing an outdated textbook which is a problem for learners in higher grades as they need enough time to study' (Anonymous girl, Grade 12, Fish-Hodgson & Khumalo 2015:52).
- 'And what the teacher also does sometimes is she tells us to work with sighted learners. I think it is not their responsibility. It is [the teacher's] responsibility to give us the work fully and give it to us so that we can do it on our own. We should not depend on someone to read or to explain to us what is happening' (McKenzie et al. 2019:36).
- 'It is very important [that each learner has their own Perkins machine]. [Not having examinations in braille] is a huge disadvantage … When I have my question paper in braille, I can read a question again and again until I can properly understand it' (Fish-Hodgson & Khumalo 2015:15).
- '[I feel] that the entire curriculum only caters for sighted persons' (Anonymous learner, Fish-Hodgson & Khumalo 2015:67).

Despite the needs for accessible material, when schools are unable to provide notes to learners for any variety of reasons, teachers typically dictate to learners who then type out their own notes and exercises on their Perkins Braillers. Sometimes even exam papers are dictated to learners. Such practice will inevitably have a negative effect on learner performance and it is certainly not ideal. At the other end of the spectrum, many examples can also be found of schools receiving technology equipment such as computers and software or fully equipped laboratories, however, not using the equipment because of teachers not being trained and not knowing how to use such equipment.

Even though learners with visual impairment place a high emphasis on accessible LTSM, whether this be through braille, large print or assistive technology (AT), they often feel disregarded and disrespected when these needs are not met. Over and above this, their additional impairment-specific curriculum adaptation needs include the development of accessible materials in a range of subject areas, smaller class sizes, taking into account the differing learning needs of low vision and blind learners, and materials thoughtfully adapted to their specific needs (McKenzie et al. 2019:73). Based on his own experience, Watermeyer (2014):

> Experiences of unequal resource provision are never subjectively neutral. Instead, it is in our nature to make sense of social contradictions in personal terms. When others are provided for and we are not, somewhere inside the question emerges 'what is it about me which means I must be left out?' The question plays with the idea that I am less deserving. (p. 3)

Finding solutions and ways to address learners' needs

Conditions such as those described in the section 'Learners' needs' are not acceptable and by no means insurmountable under a motivated, committed and energetic instructional leadership team, who should in such instances identify ways of addressing such challenges. The Department of Basic Education (DBE), for example regularly provides training opportunities for teachers, principals, district and provincial staff members as well as unions on curriculum differentiation and adaptation of LTSM, and assessment for all disability groups. People who have received training can then go back to their provinces and roll this out in additional schools. However, for this to occur, teachers need to work together as a team, practise what they have been taught and mentor each other.

Some of the strategies for success in terms of instructional leadership, effective operations and learner performance, as identified by people on ground level in the 2009/10 Audit, include providing clear direction and inspiring teamwork by the principal, SBST and the school management team taking shared responsibility for instructional leadership and curriculum management. They set the example of being resilient in facing challenges and being adaptable and proactive in bringing about transformation and change creating an enabling environment for both teachers and learners. Teachers are trained and mentored to be braille and computer literate, to understand curriculum differentiation and the ECC and to be able to produce their own braille and large print LTSM. The auxiliary team (psychologists, occupational therapists and the nursing sister) assist and train teachers and hostel staff to infuse aspects of the ECC into all interactions with learners.

Learner achievement is founded on good discipline, early identification of interventions needed to maximise learner support, as well as providing each learner with a textbook, assistive devices and all other LTSM in the correct format to suit their degree of vision loss, and ensuring that teachers have in-depth subject knowledge and understand how to differentiate the curriculum, LTSM and assessment for learners with visual impairment. Exposing learners to experiences they might not have had access to by taking them on educational outings, inviting special services staff like the police and emergency services, their favourite television stars and celebrities to the school forms part of curriculum differentiation and infusing the ECC into the curriculum. A wide variety of subjects are offered, and leadership fosters high expectations for learners, teachers and the whole school community.

Even though the relevance of braille is often debated, a recent media release by the Australian Royal Institute for Deaf and Blind Children (Brauner 2019) emphasises the importance of braille, also for teachers and even parents who may be able to better support braille-using learners once trained to use this language themselves. When able to use braille, professionals and parents may better understand and be able to connect language, literacy and mathematics development in children with vision impairment, and to plan learning experiences that are inclusive of those children who use this medium of communication. Such support may in turn enable learners to better perform and pursue careers in subjects such as mathematics, subsequently making a positive contribution as future citizens. In addition to the possibility of better performance, the ability to use braille will allow parents to share the joys of reading and writing with their child and become more involved with, for example, homework support. According to Brauner (2019), the same applies to the broader sighted community. For the instructional leader, it is important to remain aware of such options for empowerment and provide direction to teachers and parents to pursue these, in support of better performance.

Managing access to support material

It is a constitutional right of learners and teachers with visual impairment to have access to the same LTSM as learners with no disabilities and to receive it on time and in the correct format, for example, braille or different font sizes of large print. It is, however, internationally accepted that the production of braille is time-consuming, expensive and requires skills, in addition to thorough planning for on-time delivery.

In South Africa, many schools are still being challenged to provide their learners and staff members with accessible LTSM. Despite the national DoE commissioning printing houses to transcribe textbooks for all subjects from Grade 1 to 12 in braille and to provide large print in 2012, this route has still not been pursued by all schools in the country, resulting in many learners not yet having access to braille textbooks. In this case, strong instructional leaders are expected to proactively work with the government, instead of merely waiting for external support to be provided. Positive intervention and interaction by knowledgeable, solution-oriented, motivated, instructional leaders in schools can result in great progress when facing such challenges.

It follows that a persuasive leader who cares about staff and learners, and builds relationships of trust with the whole school community as well as private donors and support organisations, can provide accessible LTSM, professionally adapted assessment and training opportunities for teachers and administrative staff members for computer and braille literacy. Such principals are generally able to ensure that when donor funding is appealed for, the correct equipment and software will be installed, that teachers are trained to use the equipment, and that continuous monitoring of the quality of implementation and use of material will follow. In addition, the principal in such a case, will implement the necessary monitoring measures in support of implementation of newly acquired material and the development of both learners and teachers.

In the same way, good instructional leaders will keep teachers informed of support, for example, in the form of available braille books, thereby avoiding situations where books are available but teachers are not aware of the books. This has been the case in many South African schools over the past few years, thereby limiting the learning opportunity offered to learners with visual impairment. The same applies to the implementation of Perkins Braillers in schools, where good instructional leaders will ensure that financial assistance is managed effectively and sponsorships applied as intended, for example, for the purchase of braillers or other assistive devices, in support of learner performance. It follows that a good instructional leader will also be a sound financial manager and a manager who is informed of development opportunities for teachers, actively pursuing these and ensuring that opportunities, support and available equipment are put to the best possible use.

Importance of capacity building and ongoing professional development

One aspect that a good instructional leader should always invest in, is the capacity building and professional development of staff members, despite budget cuts or financial constraints. When a teacher walks into any class with a diversity of learners, they must be able to optimally teach the learners or alternatively be mentored and trained by the school to be able to do so. It is the responsibility of the leadership and management of a school to ensure that teachers are equipped to deliver the curriculum successfully with reasonable accommodations so that learners can learn successfully. If professional development is required, it must thus be sought and provided by, for example, accessing the knowledge and expertise of more experienced teachers, support staff, online courses and short courses offered by universities or non-governmental organisations, the community or even private individuals, consultants or volunteers.

The capacity building of teachers of learners with visual impairment includes braille training and competence (also refer to ch. 5 by Viljoen). Even though some teachers may seem resistant to learn braille, the principal needs to manage such resistance in order to ensure that teachers are well-trained to support learners in the best possible way. Only if braille competent, a teacher will be able to meaningfully mark learners' homework, examinations and tests and give sensible feedback, in support of quality education provision to all learners. A principal of a school at which all the educators are braille literate put it bluntly in the Section 27 report, *Left in the Dark*: 'If educators do not know braille, they are of no assistance to learners' (Fish-Hodgson & Khumalo 2015:46). In the same way, learners who show resistance for braille should be managed and supported to become competent and use this communication medium to their benefit.

Closely related, teaching methods and the improvement of curriculum content knowledge should remain a priority in all schools. The same applies for computer literacy of teachers in order for them to be able to effectively deliver the curriculum to learners with special needs, such as visual impairment. Watermeyer (pers. comm., 13 May 2019) captures this concept in the following way:

> I'd like to impress on them that accessible LTSM, teaching methods and classroom organisation are not a 'goal', but an essential point of departure – these are basic requirements, basic rights. There is not enough recognition of this. I would also like to tell them that their visually impaired staff are a valuable resource and should be at the very centre of conversations about access and teaching at their school. The availability of options for accredited professional development is increasing dramatically through internationally sponsored courses on teaching learners with Visual Impairment. (B. Watermeyer pers. comm., 13 May 2019)

■ Instructional leadership and learner achievement

According to Witten (2017):

> [*S*]chools serving poor and marginalised communities that have performed well despite tremendous challenges have leaders who are visionary and teachers who believe in the ability of their learners, who work as a team, and are committed to learner success. They refuse to sink into a state of helplessness and blame poor learning outcomes on factors beyond their control. (p. 64)

These ideas support the belief that quality instruction will be a priority for a good instructional leader. Mestry (2017) regards the core responsibility of an effective instructional leader as embedded in a clear understanding of teaching, learning and assessment. As such, the principal has the responsibility to manage issues on the curriculum, teaching and instruction as well as assessment in such a way that learner performance is supported. The need for broad-based knowledge, yet also specific expertise, is increasing as the complexity of schools grows. Currently, the focus falls on maximising human resources by empowering individuals with 'pockets of excellence and skills', to share responsibility for certain tasks or projects within the school context, for schools to be able to become 21st century centres of excellence.

However, this may not always be easy, because of, for example, old traditions, authoritarian personalities and very diverse cultures, convictions and views. It has as a result become unavoidable to distribute or share leadership amongst more people in the school, by, for example, strengthening the School Management Team and Institutional Level Support Team in order for them to fulfil a bigger role in leadership and management. Shared leadership can be regarded as a mechanism for empowering future leaders, which should be a focus of any principal. Marks and Printy (2003) summarise this view in the following way:

> As a transformational leader, the principal seeks to elicit higher levels of commitment from all school personnel and to develop organisational capacity for school improvement. As an instructional leader, the principal collaborates with teachers to accomplish organisational goals for teaching and learning. Whereas these leadership dimensions are analytically distinct, they may cohere in practice in an integrated model of leadership. Integrated leadership, then, reflects the transformational influence of the principal and the shared leadership actions of the principal and teachers. (p. 9)

Shared leadership therefore implies that the principal will also rely on the expertise and potential of teachers when making decisions about resources, planning curriculum adaptations and setting teaching and learning guidelines (Berg 2019). Such an approach will ultimately contribute to the development and performance of teachers and the achievement of learners. Attention should be paid to this across the various developmental phases, involving all teachers in preparation of the performance and transition of learners between different phases.

Throughout, the principal should however keep in mind that they are ultimately responsible for creating the culture of quality teaching and learning in the school. As such, the principal should have a vision and drive the processes, yet should also actively engage with teachers and learners about the curriculum, instructional matters, LTSM, the curriculum and assessment, curriculum differentiation and adaptations as well as, how effective instruction is, how it is impacting learner achievement, improving results, problems teachers experience as well as problems and difficulties learners generally experience and with whom. In addition, the principal should evaluate and review teacher and learner performance on an ongoing basis, being closely involved with all teachers and learners, treating them with trust and respect, and teaching them how to strategise and prioritise. In this manner, the principal can support the self-management of teachers and learners, instilling ambition, discipline and an understanding of the value of collaboration within them. Where suitable, the principal can also involve the parents of the respective learners.

Creating a culture of care

As a former principal of a school for learners with visual impairment it has been a soul-searching experience to listen to people with visual impairment when they relate their experiences of past schooling. Such reports are almost without exception negative and are often linked to the perception that teachers and principals have limited and low expectations of learners with visual impairment, not granting these learners sufficient opportunities to prove themselves. As a result, these learners generally feel that they underperformed at school, did not have sufficient exposure to the outside world and were not prepared and appropriately skilled for the opportunities they could have pursued when transitioning from school to the work/study environment.

Establishing a caring school

As indicated, learners with visual impairment often experience the circumstances at school as negative, frustrating, sad, disadvantaging, upsetting and unfair. These feelings can be ascribed to the school setting and environment on the one hand, yet also to the human factor of peers and others not accepting and respecting the learner for who they are. Additional factors that may add to negative experiences include separation from the family when a child is, for example, placed in a hostel, dealing with the identity and implications of having a visual impairment, limited acknowledgement of emotional expression and experiences, limited encouragement of learners to pursue higher education and future dreams, limited subject choices and implied constraints for career opportunities, and ongoing problems with availability of accessible LTSM and books in accessible format (Watermeyer 2019).

School premises are often difficult and dangerous for learners with visual impairment to navigate, particularly in the absence of expert orientation and mobility (O&M) practitioners. As a result, the safety and security of learners themselves and their confidence in moving around freely may be compromised by the school buildings. In addition, the possibility of insecure perimeter fences may imply exposure of learners to dangerous animals and people who may enter the premises unencumbered (Fish-Hodgson & Khumalo 2015:12–13). The employment of unskilled house mothers in hostels may pose further challenges for creating a caring school environment, as these people may not have knowledge of the educational and psychosocial needs of learners with visual impairment and how to, for example, administer medication or monitor and supervise the wellbeing of the learners under their care.

As such, the principal should put the necessary measures in place to ensure the safety and security of the learners in the school. Both the emotional and physical dignity and safety of learners are important, in addition to their academic performance and the availability of opportunities for development and preparation for transition and a good future. This inevitably asks for a culture of care for individuals, where each unique learner is supported to build self-esteem and foster self-efficacy beliefs. Furthermore, such a caring school asks for caring teachers, peers and community members, who will do the necessary to provide quality teaching and support learners to reach their potential.

Building the self-esteem and self-efficacy of learners

Whereas self-esteem refers to general feelings of self-worth or self-value, self-efficacy (or confidence) entails a belief in one's capacity to succeed at tasks (Bandura 1994):

> People with high assurance in their capabilities approach difficult tasks as challenges to be mastered rather than as threats to be avoided, while people who doubt their capabilities shy away from difficult tasks which they view as personal threats. People who are persuaded verbally that they possess the capabilities to master given activities are likely to mobilise greater effort and sustain it than if they harbour self-doubts and dwell on personal deficiencies when problems arise. Successful efficacy builders structure situations for them in ways that bring success and avoid placing people in situations prematurely where they are likely to fail often. They measure success in terms of self-improvement rather than by triumphs over others. (p. 2)

Creating a culture of care, which can in turn support self-esteem and self-efficacy and provide learners with situations where they are likely to succeed, can to a large extent be achieved by following an ethical code of conduct that specifically applies to learners with visual impairment. This approach is built on and prioritises respect, dignity, justice, encouragement and motivation, as well as personal and physical safety and privacy, non-discrimination, good eye care and nutrition, and attending to the mental, emotional and physical wellbeing of learners. It poses distinct challenges in under-resourced environments. However, the principal and teachers should remain focused on making a visible, noticeable effort that learners can respond positively to. By attending to the needs of learners and the requirements for a safe school environment, the principal may create a setting where learners are invited to try their best, believe in their abilities and perform according to their potential.

In terms of the infrastructure provided at schools for learners with visual impairment, hostels often pose challenges, with hostel experiences having a negative effect on learners. Some aspects that school principals may attend to for hostels include the provision of social and psychological support, effective discipline measures, the correct placement of learners in rooms, fostering a positive attitude towards learners, provision of a safe blind-friendly environment that can support learning and development, provision of good living conditions and the provision of opportunities for entertainment (Kelly et al. 2019:34–40). In striving to reach these goals, the principal should remain cautious of limiting factors such as staff and parents potentially not sharing the goal and having to be motivated to collaborate in working towards goal achievement.

Preparation for the transition to post-school life

Lourens and Swartz (2016) explain how learners with visual impairment may be challenged to successfully transition to the adult world because of various factors often present in their lives. In addition to being marginalised and excluded from full participation in all-inclusive environments, these learners' disability in itself may result in bodily challenges and feelings of being different, which can in turn complicate their chances of optimally achieving in life. Adding to this, peer acceptance (or the lack thereof) and related feelings of inferiority is a harsh reality that will inevitably have an influence on these learners.

Lourens and Swartz (2016) suggest that uncertainty and possible social isolation may be addressed through participation in social activities such as sports, choir or chess (also refer to ch. 9 by Heard). Such participation may add to feelings of self-worth and provide an avenue to form and build friendships and be accepted by peers. In knowing this, transformational school leaders should formulate goals that may address these challenges and subsequently support learners to be successful when transitioning to post-school life. Refer to Chapter 11 by Sefotho and Chapter 12 by Heard in Volume 1 of this series of publications for more detailed discussions on the transitioning process.

Conclusion

Research is conclusive that poor learner achievement in South African schools in general, but also for learners with visual impairment, is often related to ineffective instructional leadership and/or poor teacher education and training and related teaching practices. As many principals are not well-informed about the essential needs of learners with visual impairment, they may find it difficult to convincingly and successfully take on the role of leading a process of transformation and change, which is required for improved learner achievement, support and care.

A school principal's time is typically taken up by managerial and administrative duties, which may result in them paying less attention to the important responsibility of skillful and appropriately supported curriculum delivery, the creation of a supportive context of care and the capacity building and development of teachers and learners. As a possible solution, instructional leaders can however distribute some of their administrative functions, making the paradigm shift to focus more on engaging with instruction in the classroom and the professional development of themselves and staff members.

Teachers can be empowered by creatively developed opportunities for customised, school-initiated activities, study groups with peers, collaborative exercises with each other and other schools, university- or community-based courses and qualifications, or any other achievable, accredited activities. In a similar manner, principals can empower themselves through formal well-constructed leadership courses offered by universities, reading about the teaching of learners with visual impairment or through informal collaboration with more experienced peers, rather than to sit back and await external intervention, for example from the local government.

SECTION 2

Assessment and support

Chapter 2

Assessment, screening, diagnosis and referral of learners with visual impairment

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Introduction

Although all the senses are important for growth and development, a preponderance of learning occurs through visual systems. Good eyesight facilitates learning in school and development in general. To the extent that if sensory input – the ability to see clearly – is less than optimal, youth may be more likely to become demoralised, fatigued, and avoid learning tasks that require good eyesight. It is

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> axiomatic that academic success in school will be more difficult for a child who cannot see well. But even if a child can see well, vision-related learning problems may still impede learning. (Basch 2011:601)

Vision problems are experienced by school-going learners on a global level. In America, in 2011, one in five school-going learners were estimated to be living with visual impairment (Teerawattananon et al. 2014). In South Africa, the 2011 census (Statistics South Africa 2011) report indicated that at the time 11% of the population were living with visual impairment. Further to this, access for learners with visual impairment to basic education has been found to correlate with the severity or the difficulty of seeing, with the incidence of learners not accessing education being higher in the case of severe visual impairment. According to the 2011 census report (Statistics South Africa 2011), while the percentages of mild difficulty in seeing for 5–6-year olds, 7–13-year olds and 14+ year olds were 12.5%, 3.7% and 14.2%, respectively, these percentages were 19.5%, 7.4% and 17.9% for the same pre-primary, primary and secondary school levels.

The implementation of an inclusive education policy and the mainstreaming of learners with disabilities by attending to environmental barriers and increasing meaningful participation in school activities has resulted in additional demands being placed on teachers in all schools. Amongst other tasks, it has, for example, become important for teachers to be able to identify, assess, diagnose and refer learners with visual impairment, in both mainstream and special needs schools. These processes typically coincide with the development of an Individual Support Plan (ISP) for any learner with special needs, in collaboration with a multidisciplinary team of professionals as well as the parents of the learner.

■ Overview of the chapter

In this chapter, various assessment approaches and strategies are described that may be implemented with learners with visual impairment. The approaches and strategies are suitable for implementation by teachers in mainstream and special needs schools, to identify and diagnose learners with visual impairment. Special focus is given to the South African Screening, Identification, Assessment and Support (SIAS) process and its application with learners who are visually impaired, as this is the assessment strategy required by the national DoE when identifying and screening a learner who potentially has special educational needs. Furthermore, attention is given to referral options that may be implemented after assessing and diagnosing a learner as visually impaired.

Definition of key concepts

This section defines key terms used in this chapter.

Assessment

Assessment refers to checking both the degree of learning of the learner according to a set standard as in examinations as well as the ability of the learner to use their eyes for learning.

Barriers to learning

Barriers to learning refers to difficulties that arise within the education system as a whole, the learning site and/or within the learners themselves which prevent access to learning and development (DBE 2014:vii).

Diagnosis

Diagnosis denotes a judgement made after screening, assessment and analysis of the visual impairment. The diagnosis then guides the intervention given to the learner.

Referral

Referral means transferring the learner for further and appropriate support, either to a different environment or to a professional because the current environment or professional are not able to meet the needs of the learner.

Screening

Screening means checking the prevalence of visual impairment amongst learners. However, screening in this chapter may also mean a quick assessment of visual impairment that does not involve complex methods.

Support

Support means provision for interventions that allow a learner to access the curriculum and other activities that empower them for life in and beyond the classroom. Support might be low-, medium- or high-level and may also be specialised.

Visual impairment

Visual impairment denotes any form of weakening or loss of eyesight that may be biological or a result of damage from accidents or ill health.

Early identification of common vision challenges

According to Basch (2011:599), children and adolescents may experience a variety of vision problems that range from 'mild refractive errors to permanent vision impairment and blindness'. Some of these challenges comprise of disorders of the eyes and visual system, amblyopia, strabismus or significant refractive error such as far or near sightedness, including associated risk factors (Basch 2011; Cotter et al. 2015). If left untreated, these eye conditions may hinder access to education especially where there is a lack of integration between visual sensory perception and the brain.

As a result, early detection of visual impairment and the provision of support and intervention cannot be overemphasised, as this may alleviate the deterioration of the eyes as well as the negative impact it may have on access to learning or educational outcomes. Early childhood development programmes are important for many areas of development, including the establishment of the cognitive, physical, communication and social aspects of young minds (StatsSA 2011).

School-based and entry level vision screening programmes can provide valuable information about the visual impairment a learner may be facing early on in their educational life (Basch 2011; Toufeeq & Oram 2014). Once known, intervention can be planned and provided as early as possible in support of the learner's development and performance. Furthermore, early intervention may help address other potential disorders which may be worsening the learner's vision, in the case of multiple disabilities (UNICEF 2013).

Even though the diagnosis of visual impairment is performed by a team of health professionals, parents and teachers play a significant role in identifying the possibility of such an impairment through observation of the relevant signs and symptoms. Teachers, who are generally informed of typical expectations in learner development, should thus be on the look-out for developmental milestones that are not reached or expectations that are not met by individual learners, in order for them to refer such a learner for a formal diagnosis where needed. In this way, the classroom teacher forms part of a team which works with such a learner and can support the learner in- and outside the classroom. Early identification of potential challenges and disabilities represent the first level of support provided to a learner with visual impairment.

General approaches to the assessment, identification and diagnosis of learners with visual impairment

Based on the different forms of challenges that can be associated with vision and visual impairment, the assessment, screening and diagnosis of learners with visual impairment can take on different forms. The type of screening depends on the person conducting the screening, where the screening is carried out and which resources are available (Cotter et al. 2015; DBE 2014). In addition, the ages of the learners, their cognitive functioning, medical reports, any additional disabilities and when the assessment is carried out may determine the specific assessment protocol (Shaw et al. 2009).

Depending on the existing policy and current practice in a country, as well as parents' and other stakeholders' schools of thought, standardised tests, medical models or systemic, multidimensional and social approaches may be utilised when supporting a learner with visual impairment, of which assessment forms a part. For example, a mere interview with caregivers, observation or the completion of simple tasks by a learner with visual impairment can serve as a screening or an assessment strategy.

On the other hand, based on the specific nature of visual impairment, application of the medical model when assessing a learner is still often preferred. As already indicated, the early diagnosis of vision problems may prevent associated diseases or conditions that can ultimately cause blindness. In general, two screening practices are typically used when assessing young children, namely the monocular vision acuity test and the instrument-based test using autorefraction or photo-screening. Applications of these instruments are performed by trained professionals in the field (refer to vol. 1, ch. 1 by Mays for more detail).

Community-based clinics (medical doctors) and parents are said to typically take care of the first round of assessments and the identification of an impairment experienced by a learner. However, it is clear that medical personnel and parents need to work together with other professionals such as educational psychologists, occupational therapists and teachers in order to assist any such learner. A multifaceted person with a multi-stakeholder approach to assessment is encouraged as no single professional can identify nor address everything that a learner with visual impairment experiences. Thus, a multi-pronged approach should be followed by all relevant stakeholders (Moodley, Loughman & Naidoo 2015). According to Teerawattananon et al. (2014), teachers can, for example, collaborate with health personnel in refractive error screening programmes if trained and given clear instructions and guidance.

Once being informed of a specific medical diagnosis, teachers can process and use the collected information to develop appropriate tasks for learners (functional vision assessment), if trained to do so. According to Shaw et al. (2009:367), 'functional vision assessments determine how well a student uses his or her vision to perform tasks throughout the school day' in order to develop personalised interventions. In addition, teachers may use learning media assessments to assess and understand the learning style of a learner with visual impairment in order to select appropriate literacy media such as braille, print objects or pictures (see Paths to Literacy 2005; McKenzie 2007).

It follows that a team of people is typically involved in the diagnosis and formal assessment of a learner who is potentially visually impaired. Because of the fact that not all learners with special needs are necessarily assessed by health practitioners, teachers should be on the look-out for any signs that a learner may be experiencing challenges because of vision-related functioning. As a way of reaching many children across the various socioeconomic strata, the South African DoE developed a policy document requiring teachers and schools to screen, assess and diagnose learners in schools (as initial assessment strategy) when suspecting the possibility of an impairment or disability of any nature.

South African policy on screening, identification, assessment and support

The South African DBE: White Paper 6 (2001) foregrounds the idea that, given the right conditions (which include resources, the curriculum, placement and support), every child, youth and adult should be able to learn to the best of their abilities. According to the White Paper 6, the identification of special needs and suitable placement of learners with special needs is to ensure the effective implementation of a framework for supporting diverse learners. However, Cotter et al. (2015) emphasise the importance of such a screening process not being costly, not requiring significant training to implement and not placing unnecessary demands on the learner. As a result, the national DoE has developed a screening process, which schools are expected to implement when suspecting that a learner may have special educational needs.

Although the national policy on SIAS (DBE 2014) recognises the roles fulfilled by different specialists such as medical professionals, psychologists and other stakeholders, this policy assumes a multidimensional or systemic approach to addressing learners who experience learning difficulties. The idea of the policy is to provide an avenue for teachers to identify learners with special needs, with the ultimate goal of equal access to support for all learners in the country at an age as early as possible, within their existing educational environments and settings, and at reasonable costs.

In this manner, the SIAS strategy (DBE 2014) supports implementation of inclusive education and together with the White Paper 6 (DBE 2001) define the process of identification, assessment, and enrolment of learners in schools where they can be supported. In addition, identification of special needs will result in a support plan for the learner in the school of choice – whether it is a mainstream or special needs school (Dalton, McKenzie & Kahonde 2012; DBE 2014). The SIAS policy (DBE 2014) encourages educational settings to use non-formal testing techniques and approaches to assess, diagnose and support learners with visual and other impairments, rather than specialised tests. Learners with visual impairment should be assisted as much as possible to access learning opportunities and resources within the available school budget, in support of their learning and development. A summary of the SIAS process is given in Figure 2.1.

Distinguishing between screening and assessment

Screening and assessment are related terms. In the broad sense of the word, assessment entails the process of judging against a set standard (Aiken 2000; Lombard & Nel 2014). In this case, the assessment of learners with visual impairment implies the process of checking the degree to which learners can see and process the information they see based on set standards of human beings' ability to see. Furthermore, assessment may entail the process of determining how learners with visual impairment can achieve in terms of certain learning subjects measured against either national or global standards.

Dreyer (2015) summarises these ideas in describing assessment as the identification, gathering and interpretation of information based on the achievement of a learner against a set standard. Lombard and Nel (2014:69) elaborate and reason that assessment can be regarded as diagnostic if conducted to determine the nature of barriers to learning, or as authentic or performance-focused if used to determine the learner's growth, level of knowledge, skills and values acquisition and application.

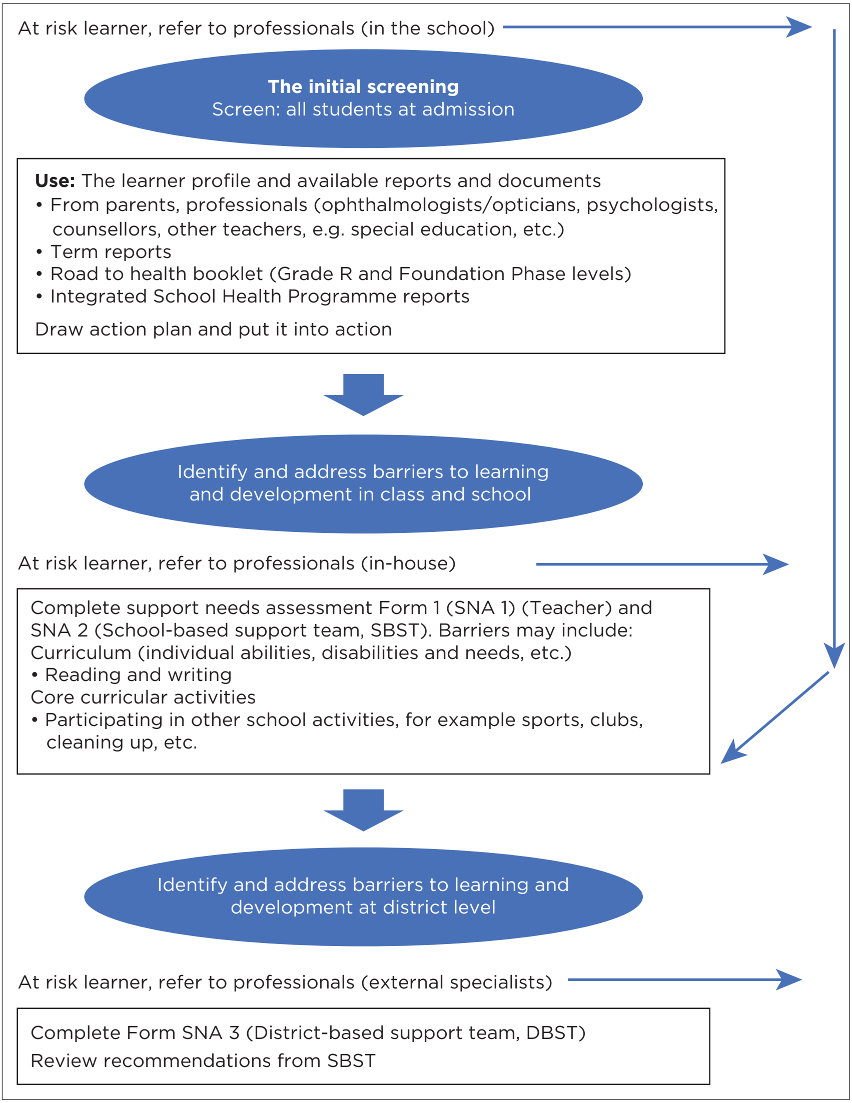

FIGURE 2.1: Summary of screening, identification, assessment and support process.

Assessment can furthermore be formative or summative depending on the learning being determined at the beginning or end of a learning experience. Other than broadening an awareness of how a learner with visual impairment is coping, assessment can be used to identify available resources (internal and external) and barriers to learning, and also allow learners to voice their needs. Assessment can thus be used as an intervention tool (Ungar 2011). Although assessment can be informal and based on the experiential knowledge of the teacher, it may also follow a formal route in order not to disadvantage those being assessed.

Assessment should be comprehensive and holistic to allow for an intervention that can address a range of issues that form barriers to learning, including but not limited to the functioning and participation of learners with visual impairment. Assessment is not a once-off activity, but an ongoing process involving the organisation of the lives and environments of learners with visual impairment (Ungar 2011). Closely related, screening involves the process of conducting a simple and quick test to check if the learner has eye problems or not. The screening is not meant to establish the vision challenge or diagnose a condition, but to inform if there is a need for further assessment by vision impairment professionals. Screening is usually performed by primary caregivers of the learner, such as healthcare providers in clinics or at school.

Process of screening, assessment, identification, diagnosis and support

Adequate and appropriate screening and diagnosis of visual impairment can lay a foundation for access to learning for learners with such an impairment. Regardless of continuous screening for visual impairment, poor visual acuity and binocular problems are, however, often still observed amongst learners in schools (Bodack, Chung & Krumholtz 2010). According to these authors, screening and rescreening for poor visual acuity, hyperopia, binocular vision difficulties and distance visual acuities are critical.

Lagrèze (2010) explains that screening implies the use of tests to identify a disorder that may elude a lay person or a person who is not trained, qualified or experienced in visual impairment, but is visible when using sensitive and specific tests. As indicated in the 'Distinguishing between screening and assessment' section, unlike other impairments, formal screening for visual impairment is therefore usually performed by people trained to conduct the relevant tests or use the relevant screening methods.

However, screening and identification can also be performed in a non-technical way by parents and teachers, who work and interact with the learner on a daily basis. Other than noticing the simple systematic struggle of a learner to see things on the black board or other learning platforms, the identification and diagnosis of a learner who may be struggling with visual impairment may be based on a teacher observing the following in a learner in the classroom environment (Nel & Grosser 2016:84):

- Poor attention, memory and organisational skills.
- Poor sensory integration.
- A significant difference between academic potential and achievement.
- Difficulties with reading and writing, which may be because of not receiving information correctly and lead to difficulty in comprehending and responding appropriately.
- Taking time cognitively.
- Social and emotional problems.
- Following a slow work pace or rushing through work.

Even though the identification of these criteria does not necessarily require a teacher to be specialised, some basic training will make the process of identification easier.

When looking at the indicative criteria as identified by Nel and Grosser (2016), some insight may be gained in terms of the frustration that a learner with visual impairment may experience when working at something that is difficult or impossible to succeed in. For this reason, the learner may rush through work or be noticeably slow in performing activities, especially those that require good eyesight. Rushing through activities may in turn deny the learner of the opportunity to develop optimally on a cognitive level as can be expected, while slowness will generally indicate a difficulty to see or understand a task.

As a result, the learner may find it difficult to read or even write. Additionally, a learner with visual impairment may exhibit a decent level of understanding and potential in class, but this is not aligned with the learner's achievement when assessed academically. Hence, such a learner may withdraw from peers and find it difficult to acquire interpersonal and communication skills, resulting in possible low self-esteem as an outcome of feeling isolated. Finally, in terms of sensory integration, it is crucial for teachers to be aware of the fact that other conditions, such as diseases or environmental conditions may cause or result in visual impairment. Consequently, teachers need to note that a learner not seeing well may also result in them not hearing well. In the same manner, not hearing well may impact on sight. Other senses, if not working well, may also negatively affect vision.

Ethical considerations when providing support

Both the parent and the learner are central to the SIAS protocol. Thus, consent and assent from both are necessary for all decisions that are made regarding the learner (DBE 2014). Parents, however, need to trust teachers for effective implementation of the SIAS procedures and may find confidence not only from the teachers but from all stakeholders tasked with helping learners with visual impairment. Furthermore, parents should be guided to understand their role in ensuring that their children receive quality education. Additionally, learners themselves need to be aware of their progress and inform the parents and the teachers about it.

There are a few ethical concerns related to the screening, assessment and diagnosis of learners with visual impairment. These include the professional expertise of those administering the tests or who do the assessment, as some level of training is required for screening, assessment and diagnosis as well as the interpretation of both standardised and non-standardised tests. For instance, 'an orthoptist-led, time-of-school-entry vision screening service is ideal for successful childhood vision screening and is thus, a valuable source of information regarding the prevalence of common visual problems among children' (Toufeeq & Oram 2014:210). However, this test can only be administered by someone trained to do so.

Based on the South African SIAS procedures, support of learners with visual impairment includes the provision of well-trained teachers and suitable resources that can support learners with visual impairment in their learning. In addition, remedial education, assistive devices, counselling, rehabilitation and therapeutic services should be provided at district and circuit level. Support should address both external and internal (to the learner) barriers to learning equitably, rather than only concentrate on the diagnosis of shortcomings of the learner that require specialist attention. For instance, because of the diversity of the South African population, if standardised tests are used, they should be measured against a similar group to which the test is being carried out. Teachers can also develop their own classroom and non-standardised tests which do not need norms. However, it should be noted that a variety of assessment strategies can provide more informed results than a single method.

Fair assessments and diagnosis, followed by appropriate intervention and support are likely to bring trust for the teacher, health professionals and other stakeholders involved with the parent and the learner. It should be noted that whatever visual impairment condition a learner has, which results in them being treated differently from other learners, will bring up some strong emotions in both the parents and the learner. Individualised counselling by a professional counsellor in the school might be necessary to address such emotions. A learner must feel that whatever intervention is put in place for them, fits them, and not the other way around, for instance, engaging mentors or partnering with older students from other schools with similar experiences (Fisch 2019; Leard 2019; O'Mally & Antonelli 2016). Data, which might include assessment data from the learner, parents and home of the learner, must be kept confidential at all times and at all levels. Information about the learner should only be released if the reason for the release of the information is going to benefit that learner. Sometimes some critical data sources may prefer to stay anonymous and it may not be necessary to include actual names in public reports. However, it is also crucial for the parents and the learner to know, that in order to receive decent help, some information cannot be kept hidden from other people.

Implementation of the screening, identification, assessment and support process

The SIAS strategy varies according to the different levels or phases of the learner and different levels of the visual impairment, as per the SIAS protocol (DBE 2014). For example, a learner can experience low, moderate or severe visual impairment at any level of schooling. The SIAS protocol identifies three stages of which only the first two are directly relevant to teachers and school teams. These are discussed below in order to assist teachers in implementing the SIAS process.

Stage 1: Initial screening, guided by learner profile

During this stage of the SIAS process, the teacher uses the learner's profile as a screening tool by recording all information collected regarding the learner – from admission reports to reports from stakeholders, including the parents and/or other teachers. The information collected may directly indicate a visual impairment, based on, for example, a diagnosis as explained by Nel and Grosser (2016). It is important that throughout the process, both the parent and the learner should take part equally in the decision-making process that will affect the learner.

Stage 2: Identification of barriers to learning and development of the learner at school level

The initial screening phase should, amongst other things, indicate whether the learner is vulnerable or not. If vulnerability is indicated during stage 1, the teacher is expected to drive and coordinate a support process, taking on the role of case manager. In the case of a susceptible learner, a Support Needs Assessment form 1 (SNA 1), should be completed by the teacher. This form captures information on the areas of concern as well as the strengths and needs of the learner in an array of aspects. The needs may include, but are not limited to, the ability to read and write, level of communication, behavioural and social issues, the mere fact that the learner is unable to see (vision) when seated at the back or the front of the classroom, or cannot see at all, information on the home and school environment, and health concerns. All noted information should be verified with the legal guardian or parent of the learner, according to the SIAS protocol. Based on the facts collected, the teacher then develops a plan to support access to learning for the specific learner (individualised support plan – refer to ch. 3 by Ramaahlo), which should be reviewed periodically, but at least once a term.

The teacher may intervene by differentiating the curriculum content, modifying assessment procedures or changing teaching methods, learning or the learner's physical environment. Differentiation of the curriculum involves the modification of the curriculum without watering it down (DBE 2001). A learner with visual impairment should also acquire career competencies as per the curriculum. That is, in addition to instruction that includes visual issues affecting the learner, lessons should embrace the core curriculum for learners with visual impairment (Opie 2018). An example includes the breaking down of curriculum content into small chunks and allowing more time for learners to complete the tasks. It should be noted, however, that different learners will require different accommodation strategies and that they themselves should play a role in deciding and using what works for them. As such, the system must change to accommodate the learner rather than the other way around.

The teacher can, for example, provide support in the classroom by allowing the learner to video-record all proceedings in class, use large print and/or provide adequate lighting (Dreyer 2015). In addition, a teacher who is qualified can utilise braille, alternative script, augmentative and alternative modes, means and formats of communication, O&M skills, as well as mentoring and peer support as strategies (Opie 2018). Even though it is impossible for a severely visually impaired or blind learner to read and write on ordinary paper, the system can thus change the environment by providing access to braille for reading and writing exercises. A possible intervention by the teacher may therefore be the need for in-service training or specific educational workshops on differentiating the curriculum for learners with visual impairment. It follows that both the needs of the learner and the teacher are important. To summarise, some of the most generally implemented supportive classroom strategies that can be used with learners with visual impairment include the following:

- Large print material.
- Moving the learner closer or further (e.g. from the board).

- Providing adequate time during assessments.
- Breaking down the curriculum content into manageable chunks.
- Facilitating peer support.
- Mentoring.
- Visiting visual impairment specialists.
- Using braille.
- Providing and using ATs (e.g. computers with diverse functions).

Following implementation of the support plan, the teacher should manage and monitor the outcome. If the teacher finds that the intervention or support does not have the desired effect, the SBST should be consulted. As learners differ, the support strategies used in one case may not necessarily have the same (positive) effects in another case. Based on this, expert advice may be required in certain cases, for example when learners have visible visual abnormalities, or parents have visual challenges or claim that their children have vision problems, these learners need not be screened but can be referred directly to eye specialists for a comprehensive eye examination (Cotter et al. 2015; DBE 2014; Lagrèze 2010). Whenever the teacher is uncertain or cannot identify what the exact challenge is, assistance can be requested from expert professionals or the SBST.

When involving the SBST, form SNA 2 will be used to guide the process of reviewing the learner's information and taking appropriate action following the referral by a teacher. The SBST will review what the teacher identified and has experienced as a barrier to learning as well as the action/s that have been taken to mitigate the challenge. A review date for progress, or a lack thereof, will also be set to inform the way forward. If a higher level of support such as assistive devices or medical intervention is required for a learner, the challenge will be escalated to the District-based Support Team (DBST) by completing form SNA 3. At this stage, psychometric tests may be implemented if it is necessary for a learner to obtain high-level support, which will be authorised by the DBST. This will be performed in further support of the learner in an attempt to avoid the learner being placed away from their locality.

Stage 3: Identifying and addressing barriers to learning and development at district level

During stage 3, further review and assessment, followed by the necessary intervention will be facilitated based on the available information from the teacher and the school. To be able to do this, all teachers and officers involved in the provision of early intervention should have knowledge on child development and the potential challenges that may be brought about by the loss of vision (Anthony 2014). On a broader level, the DBST will address issues of budget, training, counselling, mentoring and the monitoring, evaluation and management of cases. Moderate to severe cases of visual impairment are a direct concern for DBSTs as these cases may need funding beyond what the school can manage on its own, especially when external resources such as health professionals are required to intervene.

Regardless of all efforts, teachers, however, need to remain aware that 'In spite of legislation and the desires of parents, the development of inclusive educational practices in South Africa does not always reflect the values of equity and individual rights' (Engelbrecht et al. 2005). Hence, learners with visual impairment may continue to experience these challenges and inequalities regardless of the efforts of the teachers and the support team (Engelbrecht et al. 2016).

Checklist for teachers

The following is a list of ideas for teachers to follow in addressing a visually impaired learner. It should be noted that a parent and a learner should be consulted throughout and appropriate referral should be made when necessary.

1. Why am I conducting the assessment/screening?:

- Instinct that the learner is not accessing learning.
- Learner has other visible disabilities that may affect vision.
- Other ... specify.

2. Based on my experience as a teacher, can the learner:

- See my writing?
- See work written on the blackboard?
- Read and write?
- Complete assignments without becoming frustrated?
- Play or interact with others comfortably?
- Understand simple educational concepts?
- Follow written instructions without difficulty?

Based on the answers to these questions, discuss possible decisions with the parent/guardian and the learner.

3. What is obviously visible about the learner's vision or eyes?:

- Does the obvious visual problem seem to be affecting the learner's learning?

Based on the findings, discuss possible decisions with the parent/guardian and the learner.

4. What are those connected to the learner saying about the learner's ophthalmic state?:

- Parents.
- Health records.
- Other teachers.
- Peers.
- Other records.

Based on the findings, discuss possible decisions with the parent/guardian and the learner.

5. Complete the learner's profile form
6. What can I do to address any observed challenges?

Firstly, develop an individualised plan:

- Adjust the curriculum content for the learner?
- Change how I teach the learner?
- Change how I assess the learner's learning?
- Nothing? Escalate the case to the SBST?
- Does the learner and the parents require professional counselling?
- Refer to health professionals or educational psychologists?
- Complete the relevant forms(s).

Based on the findings, discuss possible decisions with the parent/ guardian and the learner.

Secondly, set an appointment with the SBST:

- Present the case to the SBST.

Based on the findings, discuss possible decisions with the parent/ guardian and the learner.

Thirdly, SBST reviews teacher's observations:

- Evaluates what the teacher has done.
- Provides relevant training to the teacher.
- Provides the necessary resources to the teacher.
- Monitors and evaluates learner's progress.
- Completes the relevant form.
- Refers the issue to the district level.

Based on the findings, discuss possible decisions with the parent/ guardian and the learner. Fourthly, set up an appointment with the SBST. Fifthly, monitor and evaluate what worked and what did not work.

Conclusion

Unlike many other disabilities, Thurston (2014) recommends that schools should have qualified teachers to support learners with visual impairment on a one-on-one basis, enable access to appropriate technology and have teaching assistants available for the learners. In addition, these learners should be allowed to interact with learners who are not visually impaired in order to enhance their social interaction skills.

Non-specialised teachers can receive in-service training to conduct assessments, diagnosis and interpretations of tests that may enable them to provide learners with visual impairment the necessary access to educational learning. Teachers may, for example, benefit from training in functional vision assessment, media assessment and adaptation of the core curriculum. As teachers act as case managers when implementing the SIAS process, they should take responsibility to develop individualised education plans for the learners in question. In this way, the SIAS stipulation is that all learners with disabilities should be able to access support in schools and communities within their regions, a multi-stakeholder approach can be used to meet the stipulation, amongst other strategies, through early assessment and intervention. Finally, it is of the utmost importance that all decisions affecting the learner with visual impairment should be made in consultation with and endorsed by the parent(s) and the learner.

Chapter 3

Assistive technology assessment and the development of an individual support plan

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Keywords: Assistive technology; Individual support plan; Assessment; Visual impairment; SETT framework.

Introduction

In South Africa, great strides have been made towards the inclusion of learners with disabilities in education settings. The democratically elected South African government has revitalised its focus on the education system in support of an inclusive education system and lifelong learning at all levels. This has been evidenced by the development and implementation of inclusive

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legislatures and policy framework aimed at the promotion of inclusion (also refer to vol. 1, ch. 4 by Ferreira-Prevost). In addition to South Africa's legislative and policy framework, the school, district and community-based support teams form key pillars of the re-engineered education system aimed at ensuring that learners with disabilities can access inclusive and quality primary and secondary education on an equal basis with their peers (DoE 2001).

Implementation strategies of inclusive policies such as the Education White Paper 6 and Policy on SIAS (DBE 2014) prioritise the use of AT for the inclusion of learners with (visual) disabilities (also refer to ch. 2 by Mokgolodi). Assistive technology is often considered as an equaliser for learners with disabilities, especially for learners with visual impairment (Kelly & Smith 2016), as this may provide such learners with access to information, educational content, employment opportunities and social interactions.

Teachers who use only traditional classroom instruction and materials may find that learners with visual impairment often have difficulty accessing the general education curriculum without curriculum differentiation. However, AT can assist teachers to overcome this challenge. Per definition, AT refers to any device or service that can help a learner with a disability to meet the goals of their ISP and to participate in the general education setting to the greatest possible extent (DoE 2011d; Kelly & Smith 2016; McNear & Farrenkopf 2014). Simply put, AT can improve the functional performance of a learner with visual impairment.

In this chapter, some basic approaches that any teacher can use to start integrating AT for curriculum differentiation are explored, in line with the Universal Design for Learning. The tools and strategies discussed within this chapter are intended to serve as a resource for teachers to select, implement and evaluate AT (collectively termed decision-making), in order to support learners with visual impairment to achieve the goals set out in their ISPs and to facilitate progress in the extended core curriculum. The chapter specifically focuses on assessments for AT decision-making relative to the ISP.

■ Overview of the chapter

In this chapter, the focus falls on the following topics:

- How AT can be used to increase the functional capabilities of learners with visual impairment.
- The nature and value of AT assessment as a continuous and individualised process for learners with visual impairment.
- How AT assessment can be used as a key element in individualised support plans for learners with visual impairment.

Figure 3.1 provides an overview of the various sections of this chapter.

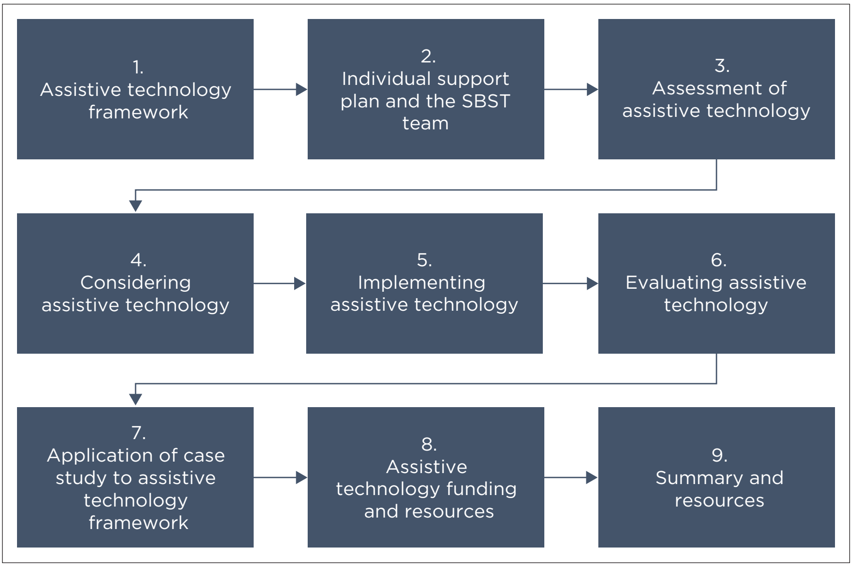

FIGURE 3.1: Overview of the chapter.
SBST, school-based support team.

Definition of key concepts

Assistive device

Any device that is designed, made or adapted to assist a learner in performing a particular educational task. It is intended to compensate for any form of functional limitation that makes it difficult for a learner with a disability to access the curriculum. Assistive devices and technologies such as wheelchairs, prostheses, mobility aids, hearing aids, visual aids and specialised computer software and hardware can increase mobility, hearing, vision and communication capacities. With the aid of these technologies, people with a loss in functioning are in a better position to live independently and participate within their societies.

Assistive technology

An umbrella term that includes assistive, adaptive and rehabilitative devices for learners with disabilities and also includes the process used in selecting, locating and using them in an education context. Assistive technology promotes greater independence by enabling people to perform educational tasks that they were formerly unable to accomplish, or had difficulty with, by providing enhancements to, or changing methods of interacting with the technology needed to accomplish such tasks.

Barriers to learning

Difficulties that arise within the education system as a whole, the learning site and/or the learners themselves which prevents access to learning and development.

Case manager

Someone at school, circuit or district level who coordinates the assessment process and decision-making on support packages for learners, as well as support provision for and monitoring of learners.

Curriculum differentiation

A key strategy for responding to the needs of learners with diverse learning styles and needs. It involves processes of modifying, changing, adapting, extending and varying teaching methodologies, teaching and assessment strategies, and the content of the curriculum, taking into account the learners' levels of functioning, interests and backgrounds.

District-based support team

A management structure at district level, with the responsibility of general management to ensure that schools within the district are inclusive centres of learning, care and support. Leadership is provided by the District Senior Management that could designate transversal teams to provide support.

Full-service schools

Schools that are inclusive and welcoming of all learners, offering support to learners to develop their full potential irrespective of their background, culture, abilities or disabilities, gender or race. These schools can be strengthened to address a full range of barriers to learning in an inclusive education setting, serving as flagship schools of full inclusivity.

Individual support plan

A plan designed for learners who need additional support or expanded opportunities, developed by teachers in consultation with the parents and the SBST.

School-based support teams

Teams established by schools in general and further education, as a school-level support mechanism, whose primary function is to put a coordinated school, learner and teacher support system in place. Leadership for the SBST is provided by the school principal to ensure that the school becomes an inclusive centre for learning, care and support.

Special needs schools

Schools equipped to deliver a specialised education programme for learners who require access to high-intensive educational and other support, either on a full-time or a part-time basis.

Special needs schools resource centres

Special needs schools equipped to accommodate learners who need access to high-intensity educational support programmes and services, as well as providing a range of support services to ordinary and full-service schools.

Support needs assessment

Process of determining the additional support provision that is needed by a learner. The process is guided by the various sections of the SNA form (DBE 2014).

Assistive technology framework

Prior to the use of AT by learners with visual impairment, an assessment of the AT identified in the ISP must be conducted. The collaboration of transdisciplinary professionals who have compiled the ISP and subsequently support the learner is important for this assessment process. An AT framework can assist such professionals in the selection of the AT (Bouck 2015). It is important that the framework does not start with the presumption of a particular AT, but rather guide the process for understanding a learner's capabilities and environmental factors before determining the AT that will be implemented.

The student, environment, tasks and technology (SETT) framework was developed by Joy Zabala (2005) and provides a methodology to ensure that ISP goals are met through the use of AT. Although a wide array of AT assessment guides exists, the SETT framework provides teachers with a guideline for considering whether or not a learner needs AT, and if the learner does, what would the most appropriate technology would be to provide them with (Zabala 2002).

As such, the SETT framework (see Box 3.1) allows for a teacher to match the technology that is selected for the learner, to their environment and tasks, rather than merely selecting a technology and then trying to make it work, even though it may not be the best fit. In a study conducted by D'Andrea (2012) about the 'Preferences and practices among students who read braille and use assistive technology', the importance of learners being able to make choices regarding tools and strategies for completing their classwork is emphasised because if a learner does not prefer the AT selected, abandonment may occur.

It should be noted that SETT is a framework and not a protocol that requires specific implementation practices (Zabala 2005). Thus, the use of the SETT framework should rather be embedded into existing processes such as the SNA and ISP development, as well as the consideration, implementation and evaluation of AT. In Table 3.1, the key principles of the framework are summarised as well as their application to the South African context.

BOX 3.1: Student, environment, tasks and technology framework.

Learner

- What is the learner's attitude towards technology?
- What is the learning medium of the learner?
- Which capabilities does the learner possess?
- Does the learner present with multiple disabilities?
- What impact does multiple disabilities have in combination with visual impairment on current learning?
- What are the learner's expectations and concerns?
- What are the learner's interests and preferences?

Environment(s)

- What is the learner's restrictive environment?
- How is the learner able to access and interact with the environment(s)?
- What level of independence does the learner display in the learning environment?
- Is the learner making use of devices, software, materials or equipment to access the learning environment?
- What areas of expertise do the teachers, related service providers and other professionals that support the learner possess?
- What are the current institutional, instructional and physical arrangements at school?
- What are the attitudes of teachers, professional support system and family of the learner towards assistive technology?

Task(s)

- Which specific tasks occur in the learner's natural environment(s) that can enable progress towards mastery of the ISP goals and objectives?

Box 3.1 continues on the next page→

BOX 3.1(Continues...): Student, environment, tasks and technology framework.

- Which specific tasks are required for active involvement in the identified environments (related to communication, instruction, participation, productivity and environmental control)?
- What are the core learning activities the learner will require to participate in via the curriculum?
- Which expanded core curriculum learning activities will the learner be engaged in?
- What are the most important aspects of the learning activities where assistive technology may be implemented?
- What impact will assistive technology have on the learner's ability to access the curriculum?
- How is the ISP used in relation to assistive technology use?

Tool(s)
- Which type of tools will be used to create an accessible learning environment?
- Which instructional strategies can be used to increase the use of assistive technology in the learning environment by the learner?
- How can the selected assistive technology be used beyond teaching and learning activities?
- How can assistive technology be used to foster independence within the learner?

Source: Kelly and Smith (2016) and Zabala (2005).
ISP, individual support plan.

Individual support plan and the school-based support teams

All learners, regardless of their school placement, are required to meet a grade level proficiency standard at the end of each academic year as per the National Curriculum Standards

TABLE 3.1: Key principles of the student, environment, tasks and technology framework as applicable to the South African context.

Key principle	Description	Application to learners with visual impairment within the South African context (DBE 2014; DoE 2011)
Shared knowledge	The devices and actions that are needed for the learner and others to succeed – are most valid when they are made based not on the knowledge that one person has (or believes to have), but based on a mutually agreed-upon valid shared knowledge of the learner, the environments and the task	The SBST team should collectively develop strategies to address barriers to learning, drawing on resources from within and outside the school. For example, if the SBST team only relies on the input of an ophthalmologist and does not consider the input of an orientation and mobility specialist, assistive technologies for activities of daily living and achieving independence may be neglected
Collabo-ration	The SETT framework both requires and supports the collaboration of those involved in decision-making and those who will be impacted by the decisions. Collaboration is critical for the SETT framework, and for gaining buy-in for effective implementation of decisions	The SBST team should collectively develop strategies to address learner support needs. This should include a focus on teacher development and parent consultation and support. Effective implementation also negates assistive technology abandonment
Communi-cation	The SETT framework requires that people communicate actively and respectfully. Shared knowledge can only be developed if opinions, ideas, observations and suggestions are respected and are respectful	It is the responsibility of the principal to establish the SBST team and ensure that the team is functional and supported
Multiple perspec-tives	Everyone involved brings different knowledge, skills, experiences and ideas to the table. Multiple perspectives are critical to the development of shared knowledge. Not only are multiple professional perspectives important to include, but also those of the learner and the parents	In addition to the core SBST team who meet on a regular basis, additional people could be brought into some of the meetings and processes to assist with challenges. Primary caregivers (which includes parents) play a vital role in the early identification of barriers and understanding the nature of these. Additional members can include members from the district-based support team, surrounding special/resource schools or the local community
Pertinent information	Although a lot of information is pertinent to decision-making, other information may not be relevant	Members involved in the decision-making process must be organised in a practical and cost-effective way, following a structured process

Table 3.1 continues on the next page→

TABLE 3.1 (Continues...): Key principles of the student, environment, tasks and technology framework as applicable to the South African context.

Key principle	Description	Application to learners with visual impairment within the South African context (DBE 2014; DoE 2011)
Flexibility and patience	When working through the SETT framework or using other means to identify concerns and seek solutions, possible solutions may be suggested before the concerns have been adequately discussed. It is important that collaborators remain patient to make a decision when a possible solution comes to mind, until all important factors have been discussed	While a solution-focused mindset is important, the SBST team must engage in robust discussions when identifying barriers to learning. This could ensure well thought through recommendations to address the areas of concern. Furthermore, solutions that were recommended for one learner may not be applicable to another learner with the same diagnosis
Ongoing processes	Decision-making in educational settings involves ongoing processes, based on the levels of success in addressing barriers to learner achievement. As such, it is important to revisit the SETT framework information periodically to determine if the information that guides decision-making and implementation is accurate, up to date, and clearly reflecting the shared knowledge of all involved	The process of considering, selecting and implementing assistive technology is a reiterative process. It is important that the selected assistive technology is relevant to the current environment and tasks. For example, reading software must be compatible with an updated version of an operating system. Furthermore, learner support needs need to be re-evaluated from time to time

SETT, student, environment, tasks and technology; SBST, school-based support team.

(DoE 2014). Learners with visual impairment access the National Curriculum Standards in an inclusive setting (this includes full-service or special needs school settings). While teachers need to determine how they will teach towards the standards in a way that the curriculum is meaningful to each and every learner, the SBST team needs to guide learners' progress towards meeting these standards. The DBE has created a template for which to complete the ISP (see Figure 3.2). The class teacher and the SBST team gather information and coordinate the completion of the ISP (also refer to ch. 2 by Mokgolodi).

Although AT is not explicitly stated in the ISP plan as per the SIAS policy, the SBST team should always consider possible

3. Individual support plan (completed by class teacher and SBST)

List the area(s) in which the support needs to be provided: Communication; learning; behaviour and social competence; health, wellness and personal care; classroom and school; family, home and community; teacher development/training, etc. (See SNA1)

Area(s) in which support is needed	**Target to be achieved**	**Strategy of intervention** *(If the learner needs concessions, or is an immigrant who needs exemptions use Annexure B if a medical condition must be investigated by a medical or other specialist, use Annexure D)*	**Responsible person**	**Time frame**	**Review date** (to assess achievement of the target)	**Comment on progress made in achieving target(s)**
E.g. Behaviour and social competence	*Stop bullying behaviour*	• *Assign a mentor teacher to support learner* • *Raise awareness during assembly* • *Review school conduct policy* • *Call in the parent/legal caregivers*	*Principle*	*Within a week*	*15 April 20...*	

Source: DBE (2014).
SBST, school-based support team; SNA1, support needs assessment form 1.

FIGURE 3.2: Individual support plan required by the screening, identification, assessment and support policy.

AT that may be used by a learner with visual impairment, in order to meet the stipulated standards. Furthermore, it is important that the SBST team considers AT not only to be used during classroom activities but also for examination purposes, and to document the related decisions and recommendations (refer to Figure 3.3). This will, for example, include concession support (academic accommodations) required for tests and examinations, additional time, the use of a computer, the use of text-to-speech (TTS) software and a separate venue within a computer lab setting.

As indicated, the consideration of AT for use in classrooms, or during examinations and other daily activities, is the responsibility of the SBST team. Each member of the team will serve a specific function and provide input in many different ways in order to

ANNEXURE B

Application by the SBST/DBST for an Accommodation, **Exemption or Endorsed NSC** to alleviate the learning barrier(s) experienced by the learner

SCHOOL: ______________________________

LEARNER: ______ ______________ GRADE: ______ ______________

Attach a copy of the Learner Profile and SNA 1 — 3 as background information when applying to the relevant district/ provincial structure. Please follow your provincial guidelines in terms of extra information and documentation needed.

LIST OF ACCOMMODATION(S)/EXEMPTION(S) YOU ARE APPLYING FOR:
(Mark your choice with an X)

TYPE OF ACCOMMODATION REQUESTED	**SUBJECTS**						
Adaptation of questions							
Additional Time							
Digital Player/Recorder							
Braille							
Computer/voice to text/text to voice							
Enlarged print							
Handwriting							
Medication/food intake							
Oral examination							
Personal assistant							
Prompter							
Reader							
Rest breaks							
Scribe							
Separate venue							
Sign language interpreter							
Spelling							
Transcription of Braille							
Video/DVD recorder/Webcam							
Other e.g.: Endorsed NSC							

Source: DBE (2014).
DBST, district-based support team; NSC, National Senior Certificate; SBST, school-based support team; SNA, support needs assessment.

FIGURE 3.3: Academic accommodations application, Annexure B, Screening, identification, assessment and support policy.

ensure that the learner can equally participate and be engaged in teaching and learning activities. In Table 3.2, the potential members of an SBST team are summarised, which aligns with the SIAS policy and (draft) National Guidelines for Resourcing an Inclusive Education System (DBE 2018).

TABLE 3.2: Possible school-based support team members.

SBST team member	Typical role for assistive technology consideration
Learner	Helps to identify unique preferences and areas where the learner needs support in order to achieve their learning goals or access the environment
Caregiver/s	Provides input on the learner's home and community environments
Teacher/s	Offers input on expectations for the learner regarding the curriculum, shares strategies that have already been tried, suggests ideas for instructional strategies, adaptations, modifications, accommodations and assistive technology devices or services
School principal	Qualified to provide or supervise inclusive education services, is familiar with resources available at the school and is able to commit these resources to meet ISP goals
Registered health professional qualified to interpret evaluation results (e.g. an educational psychologist)	Explains what the outcome of evaluations means in terms of designing appropriate instructional goals and objectives for the learner. This person may serve a dual role on the team
Occupational therapist	Offers suggestions for assistive technology with regards to motor abilities of the learner, mobility issues and transporting devices
Person familiar with assistive technology	Able to provide information to other team members about potential assistive technology options that are available, search for and identify new assistive technology options
Others, as appropriate to the needs of the learner (e.g. O&M specialist)	Offers specific information related to the strengths and needs of the learner

ISP, individual support plan; O&M, orientation and mobility; SBST, school-based support team.

Considering assistive technology

School-based support teams should consider whether ATs are required to accomplish the ISP goals for a learner with visual impairment, when supporting such a child. It is important to remember that during this consideration process, the learner with visual impairment is the primary focus and not the AT (Bryant & Bryant 2011). As one AT device may not be applicable for use towards all the ISP goals, a device should not be overlooked just because it may only address one area in the ISP. Devices should also not be considered only because they seem nice to have – especially in the case of high-tech devices. For instance, a Grade 6 learner with low vision who requires magnification may benefit from a desktop magnifier with high-tech features; however, this device is not easily transferable from classroom to classroom, nor from school to home. Thus, this learner would benefit more from a handheld magnifier, that can be used in more than one environment.

The SBST team should follow a systematic approach to ensure that when AT is considered, the needs of learners with visual impairment are being met and that resources are being used wisely. Some checklists exist that may be used in conjunction with the SETT framework for this consideration. One of the most commonly used or adapted AT checklists is the Wisconsin Assistive Technology Initiative Assistive Technology Consideration Guide (WATI) (2004). However, it is important to adapt these checklists to the South African context when wanting to use them as not all aspects may be applicable to all contexts.

According to the WATI (2004) checklist, only the following four general types of conclusions can be reached by the SBST team when considering a learner's need for AT:

- The team can conclude that current interventions are working and that no additional support is needed, including AT. This may be the case if the learner's progress in the curriculum is satisfactory or the learner is exceeding the grade proficiency level outcomes.
- The second possibility is that AT may already be implemented either permanently or as part of a trial period to determine applicability. In that case, the SBST team should include specific AT into the ISP to ensure that it continues to be available for the learner. Thus, a Grade 9 learner could for

example already be using Nemeth Braille code for Mathematics, with the SBST team deciding if this technology should also be used for other Science Technology Engineering and Mathematics subjects.

- Thirdly, the SBST team may conclude that new AT should be tried. In this case, the SBST team will need to describe in the ISP the type of AT to be tried, including the features they think may help, such as using a braille display keyboard to support the completion of assignments. As the SBST team may not know all device specifications they should not attempt to include a product by name, but rather describe the features required for the specific situation.
- The last possibility is that the SBST team may find that they do not have sufficient shared knowledge to make a decision. In this case, they will need to gather more information by, for example, searching online resources to help them in considering which AT might be useful or including other members in the SBST team. They may also decide to refer the learner or schedule an assessment of the learner's need for AT.

Once it has been determined that a learner will benefit from AT to meet the ISP goals, it is essential to conduct an assessment of the AT under consideration.

Assessing assistive technology

During the AT assessment process, checklists can be utilised to evaluate the learner's ability to access print, produce written communication, access the computer and use various ATs. Some of the information requested may be obtained from the psycho-educational assessment or functional vision evaluation by the optometrist or ophthalmologist. The SNA form (DBE 2014), provided in Figure 3.4, is a referral template for such a functional assessment.

Dr Jaroslaw Wiazowski (2009) from WATI, developed an AT checklist specifically for learners with visual impairment, that is

Vision

Condition Diagnosed*: ______________________________

The minimum requirement for a learner to be classified as a visually impaired learner is as follows:

Tick when applicable	Area of functional limitation	Recommendations of support that could be provided at school
☐	Visual acuity in the better eye with best possible correction, less than 6/12 (0.3). <3/60 Snellen in the better eye, after maximum corrections, constitutes blind 6/60 to 3/60 Snellen in the better eye = severe visual loss (partially-sighted learner, sometimes considered blind, depending on complicating specific eye conditions)	
☐	Visual Field 10 degrees or less around central fixation. 6/6 – 6/18 = normal vision 6/18 to 6/60 Snellen = moderate visual loss (partially-sighted learner);	

Notes:

- "6/18" means that what a person with normal vision can read at 18 metres, the person being tested can only read at 6 metres.
- "Best possible correction" refers to the position after a person's vision has been corrected by means spectacles, contact lenses or intraocular (implanted) lenses.
- Support recommended: assistive technology, adapted LTSM, orientation and mobility or Braille instruction, educational or physical support by peers, teacher, assistant, ophthalmic nurse, therapist, etc.

When did your patient meet the above criteria for the first time?	YY/MM/DD

Source: DBE (2014).
LTSM, learning and teaching support material.

FIGURE 3.4: Functional vision assessment: Screening, identification, assessment and support policy.

based on the SETT framework. Complimentary to this, the AT assessment checklist developed by the Texas School for the Blind and Visually Impaired (TSBVI) (2014) can be used, which focuses predominantly on the functional capabilities of learners and task performance when accessing print, producing written communication and in terms of computer access. These AT assessment checklists are jointly discussed in this section as per the SETT framework.

❑ SETT: Learner's capabilities

Similar to reading print, when learners with low vision need to interact with pictorial information, they may need some type of magnification. Learners with low vision and cortical visual impairments may require changes in terms of print size and typeface (e.g. Arial, Tahoma, Verdana, etc.). All such changes when accessing print will be contingent on the vision condition and the learner's preferences, and should be delivered based on an evaluation and functional vision assessment, focusing on the following aspects.

What is the learner's most effective media for accessing printed material(?):

- For a learner with visual impairment, the primary reading mode could be through the use of braille, screen readers, magnification software and/or TTS software.

When accessing information through braille and tactile graphics, is the:

- learner is able to use simple tactile graphics
- learner is able to read materials in braille
- learner's oral braille reading rate is ______ wpm
- learner is able to read braille on an electronic/refreshable braille display.

When accessing printed information auditorily, the:

- learner is able to demonstrate comprehension by answering simple questions and relating details about a passage when it is read to them
- learner is able to paraphrase information presented orally (sentence or story)

- learner is able to write, type, or braille what is heard (sentence dictation) without having it repeated more than twice
- learner is able to activate play, pause, stop, fast forward and rewind functions on a digital recorder or notetaker
- learner is able to understand and comprehend compressed or 'fast' speech
- learner is able to manipulate variable speed and pitch controls
- the learner is able to read regular print materials at ______cm without adaptations
- the learner is able to read printed materials with adaptations
- the learner is using prescribed glasses or contacts lenses
- materials are enlarged – specify (i.e. 130%, 3 times; A4 – A3)
- the learner is able to read print materials with or without adaptations for ______ min before experiencing either visual or physical fatigue.

When accessing large print with prescribed optical aid (if appropriate) the learner's preferences when reading is:

- learner's font preference ____ Arial, ____ Tahoma, ____ Verdana
- learner's preferred point size without prescribed optical aids
- ____ 16 ____ 18 ____ 24 ____ 30 ____ 36____ 48____ 60.

Is the learner's print legible(?):

- Writing can be problematic because of specific learning difficulties with handwriting, poor visual acuity and/or hand-eye coordination. Some learners with low vision may be able to write but the shape and size of the letters might make the handwriting illegible. In such cases, unless a learner is a braille user, typing needs to be considered. Depending on the grade of the learner, typing is an essential skill that allows for written communication.

When using standard writing tools, the following applies to the learner's writing:

- writing is legible
- spacing is intact

- writing is laboured and difficult
- able to read their own writing
- for writing the learner prefers to use
- ______a screen board ______bold line paper ______raised line paper ______a white board and erasable marker.

Can the learner access and navigate the computer system independently(?):

- Learners with visual impairment will require various types of operating system accessibilities to complete computer-based assignments. For some, built-in accessibility features will suffice, while others will need full-fledged specialised software such as a screen reader.

When accessing electronic information on a stand-alone computer or in the computer laboratory:

- the learner is able to read menus and other system text items on a large screen monitor
- screen enhancements are provided with computer operating systems
- the learner is able to execute navigation commands with instruction, when accessing computer-based information auditorily
- when accessing computer-based information tactually:
    - the learner is able to read braille text displayed on an electronic refreshable braille display
    - the learner is able to execute navigation commands with instruction
    - the learner is able to enter text through the braille keyboard
- the learner is able to use a standard keyboard without adaptation
- the learner is able to utilise a standard computer keyboard with adaptations (seeking assistance from occupational and physical therapists when needed).

Is the learner photophobic (extremely sensitive to light)(?):

- Learners that are photosensitive may require tools that allow them to adjust colour schemes. Additionally, consideration must be given to learners with colour deficiencies.

When accessing information through the use of non-optical aids, the:

- learner reads materials produced with felt-tip pen on bold line paper
- learner prefers:
  - o incandescent lighting
  - o fluorescent lighting
  - o window lighting
- learner experiences glare problems from:
  - o overhead lighting
  - o window lighting
- learner prefers less lighting than what is currently available
- learner prefers to have materials placed on a reading stand or copy holder.

Can the learner participate in co-curricular activities(?):

- Many sporting codes involve the use of a ball. Depending on the sport played, the balls differ in size and weight. Learners with visual impairment may require adapted sporting equipment tools. The way games are played may also be modified to include learners with visual impairment.

Does the learner present with multiple disabilities(?):

- It is important to determine if there are any other physical or related issues that need to be considered. Certain motor impairments may affect a learner's ability to interact with Braille or to navigate the environment effectively.
- If the learner presents with specific learning disabilities, ATs to overcome these barriers to learning will need to be considered. Technologies used to support learners with other learning

disabilities often overlap with those used by learners with visual impairment (e.g. TTS).
- Different environments have different levels of sensory stimulation. If the team is convinced that sensory impacts will support learning, the sensory level in each environment that the learner will function in needs to be determined. As environmental noise is a universal phenomenon, a learner who is distracted by background noises may need to learn coping strategies or have the environment modified while learning how to prioritise surrounding sounds.

What does the learner need to focus on in the ECC(?):

- Learners with visual impairment should participate in an ECC (also refer to ch. 6 by Viljoen) that includes orientation and mobility (O&M), social interaction skills, independent daily living skills, leisure skills, career and vocational education, and need for/use of AT.

☐ SETT: Environmental considerations

The SBST team needs to assess factors in the environment that may impact on the use of the AT, attending to aspects as listed:

- Are the classrooms ergonomically configured? Is there, for example, sufficient desk space available for AT placement as white/chalkboard work might be inaccessible for learners with visual impairment without specially designed access tools.
- If a learner needs to individually adjust the light level in the classroom, they may need a table light. In this case, does the learner require a desk that is positioned near a power outlet?
- Because learners with visual impairment rely on their hearing to gather information during class, are unnecessary external noises eliminated or reduced?
- Which ATs have been used by the learner? If some have been discontinued, make note of the reasons, as effective devices may occasionally be discontinued or abandoned for various reasons. Never discount AT that was previously tried and

discarded, as there may have been a mere mismatch between the AT and the specific learner's skills and/or preferences at the time.
- Consider Internet connectivity for AT or an app that requires Wi-Fi or mobile data to run key features. If a learner uses AT in the home environment that might be without connectivity, will the AT work in an offline mode?

❑ SETT: Tasks

One of the most important questions when assessing a learners' need for AT relates to the tasks that must be accomplished by the learner in order to fully participate in the standard curriculum? Learners with visual impairment need to be able to participate in real-time interactive learning in the preferred medium through the use of AT (McNear & Farrenkopf 2014). The following questions may provide guidance to the SBST team when assessing learners' AT needs:

- Tasks that involve reading and/or writing: Is there evidence of difficulty with textbooks, worksheets, Science Technology Engineering and Mathematics subjects, laboratory work and completing assignments, tests and examinations? Is the student able to compose sentences, fill out forms, and complete worksheets? Does the learner have a functional system or efficient medium for note-taking? Can the learner prepare accessible text to match the reading medium?
- Accessing work displayed at a distance: Can the learner independently access distance presentations such as board work or multimedia presentations?
- Other subject-related visual activities: Is this learner accessing visual activities related to science experiments, graphing, etc.?
- Use of programmes and resources: Is the learner able to use word processing programmes, visual presentation programmes, email and/or online research?
- Extra-curricular activities: Is this learner taking part in extra-curricular activities?

SETT: Tools

To complete the AT assessment, the SBST team should brainstorm strategies and AT tools that may be of benefit for the learner to complete the identified tasks in the given environments. Learners will use a variety of tools, depending on the task. For example, some students with low vision will read short passages visually but may require an electronic format for longer readings.

Implementing assistive technology

Once the SBST team has determined that AT is necessary, this team needs to develop a plan for guiding the implementation process that will ensure that the activities related to the AT are completed. These plans include information related to the following questions (WATI 2004):

- Who is the case manager for the learner?
- What AT will be used either as a trial or permanently?
- How will the AT be used across environments?
- How will the learner, teachers and parents be trained on the AT?
- How will the AT be monitored and evaluated?

New equipment does not always have to be purchased for trial purposes, as AT can sometimes be obtained on a temporary basis from resource/special needs schools or from an AT supplier. After the SBST team completes the ISP plan, it has to be implemented. At this point, it is critical to start monitoring the process in order to ensure that the learner receives the maximum benefit from the selected AT. As teachers and/or caregivers implement AT for learners in their respective environments, they should always keep in mind that resources and support are available. For example, the implementation plan should list – who maintains the equipment, or who to call if there is a problem.

Presley and D'Andrea (2009) provide an extensive guide of AT and methods often used by learners to access and produce information. These are summarised in Table 3.3.

Evaluating assistive technology

As already mentioned, once the implementation of the AT has begun, it is critical to gather information, for the SBST team to be able to make informed decisions about what is working for the learner. Some of the information that should be collected includes:

- Learner feedback to determine their preferences (or not) for the AT.
- Establishing whether or not the learner uses the AT and appears engaged and interested in using the device.
- Determining whether or not the AT is helping the learner to perform the intended task(s) in the respective environments (WATI 2004; Wiazowski 2009).

TABLE 3.3: Types of assistive technology and access method for learners who are blind or visually impaired.

Types of technology	Access method		
	Visual access	**Tactile access**	**Auditory access**
Technology for accessing print	Non-optical devices: • Large print • Reading stands • Acetate overlays • Lighting optical devices • Handheld and stand magnifiers • Telescopes video magnification systems • Scanning and optical character recognition systems • Electronic whiteboards	• Braille reading • Tactile graphics • Tactile mathematics tools	Readers • Audio recording • Digital talking books • Other audio formats • Specialised scanning systems • Stand-alone electronic reading machines • Computer-based reading machines • e-Book readers • Talking calculators • Talking dictionaries

Table 3.3 continues on the next page→

TABLE 3.3 (Continues...): Types of assistive technology and access method for learners who are blind or visually impaired.

Types of technology	Access method		
	Visual access	**Tactile access**	**Auditory access**
Technology for accessing electronic information	Computers: • Screen-enlarging hardware • Large monitors • Adjustable monitor arms • Software options: ○ Operating system display property adjustments ○ Computer accessibility features ○ Cursor-enlarging software • Screen magnification software • Specialised scanning systems • Accessible portable word processors • Accessible PDAs • e-Book readers • Large print and online calculators • Online dictionaries and thesaurus	• Refreshable braille displays • Accessible PDFs • Touch tablets	• Talking word processing programs • Text readers • Self-voicing applications • Screen reading software • Accessible PDAs • Specialised scanning systems • e-Book readers • Talking dictionaries • Talking calculators • Digital voice recorders
Technology for producing written communications	Manual tools: • Bold- or raised-line paper • Felt-tip pens and bold-markers • Bold-lined graph paper for math • Electronic tools • Dedicated word processors • Accessible PDAs • Imaging software • Drawing software • Talking word processor • Computer with word processing and screen magnification software • Mathematics software and spreadsheets • Laptop or notebook computers	Manual and mechanical braille writing devices: • Slate and stylus • Braille writers • Electronic braille writing devices • Electric and electronic braille writers • Computer with word processing software • Braille translation software • Braille embosser	• Accessible computers with word processing software

Table 3.3 continues on the next page→

TABLE 3.3 (Continues...): Types of assistive technology and access method for learners who are blind or visually impaired.

Types of technology	Access method		
	Visual access	Tactile access	Auditory access
Technology for producing materials in alternate formats	• Scanning and OCR system • Computer with word processing software • Laser printer	• Scanning and OCR system • Computer with word processing software • Braille translation software • Graphics software • Braille embosser • Equipment and materials for producing tactile graphics • Materials for collage • Manual devices for tooling graphics • Fusers and capsule paper	• Digital and analogue audio recording devices • Scanning and OCR system

OCR, optical character recognition; PDA, personal digital assistant; PDF, portable document formats.

Case study: Application of the student, environment, tasks and technology framework and assistive technology assessment

Thabang is a learner with multiple disabilities, including low vision (as a result of trauma to the eye) and a learning disability. He previously attended a special needs school for learners with learning disabilities as he presented with persistent difficulties with reading and writing. Following a recent car accident, Thabang sustained an injury to his eye, which resulted in him being visually impaired. At the request of his grandmother, Thabang was transferred from the special needs school to a full-service school in Mamelodi that caters for all learners, including learners with visual impairment.

After Thabang was referred for additional learning support, the SBST team completed a SETT AT checklist (adapted from Wiazowski 2009), as captured in Table 3.4. Information from Thabang's ISP was used to update the checklist, implementation and evaluation of the AT.

Before the SBST team meeting for completing the SNA forms and ISP, the case manager Mr Sontonga asked Thabang's teachers for information that will help the SBST team determine Thabang's capabilities and areas of need. During the meeting, the SBST team reviewed and briefly discussed Thabang's current academic performance. Thabang's grandmother was pleased that he was adjusting well to his new school. She reported that he continued to read independently at home with the assistive device he received from his new school, which was a relief to her as she used to have to get someone to read everything to him. Additionally, Thabang said that he could read on his own at school and at home with the support of his reading software and computer. Despite the use of a computer to type, Thabang was still struggling with writing and was still supported by his older brother to organise his ideas.

Ms Tambo, who is Thabang's Social Sciences teacher, reported that Thabang was able to complete his reading assignments despite the assistive device's limited capabilities, which can magnify yet has no voice-over features. Ms Tambo also reported that Thabang was struggling with written assignments. Thabang's Sepedi teacher reported his difficulty in organising his thoughts and getting them down on paper. Thabang also struggled with grammar and spelling. Although she was unable to attend the meeting, Thabang's Mathematics teacher submitted a written statement indicating that Thabang was doing well in Mathematics.

With this information about Thabang, and knowing his established ISP goals and objectives, the SBST team next used the AT assessment sheet adapted from the SIAS policy, SETT framework and WATI guidelines, to assess his AT needs

TABLE 3.4: Application of assistive technology assessment checklist as per the student, environment, tasks and technology framework.

Thabang's capabilities/ difficulties	Environmental considerations	Tasks
• Thabang has difficulty reading in printed medium • Teachers indicate that his handwriting is illegible • He is able to navigate the computer in the laboratory and at home • He presents with photosensitivity because of his eye injury • Activities of daily living: he appears to have achieved a number of compensatory and independent living skills	• In most of his classrooms, he will require desk space for a portable keyboard and a tablet for typing • Visual access to and of board work • His main types of learning medium: print and enlargements • Type of light and level of illumination will need to be adjusted in some classrooms • Consider the use of portable devices that can be used at home • AT: past (none at school, however, Thabang has access to his brother's PC at home) and present (Thabang will be provided with AT at school)	• Reading • Writing • Note-taking • Large group distance presentations (visual activities) • Computer-assisted tasks • Converting print into electronic format • Activities of daily living • Thabang expressed an interest for playing chess at school
Sensory considerations Which sensory challenges does the student have that may impact learning? (i.e. visual, auditory and tactile) • Visual impairment following trauma to his eye • Photosensitivity due to an eye injury		
Tools		**Implementation plan**
Brainstorming only – no decisions yet • Review solutions in respect of the type of visual impairment and the area that requires additional support • Additional learning support to improve reading • Consider typing of written assignments • Use AT: enlargement, reading, spelling and grammar	Use a feature match process to discuss and select idea(s) from Solution Generation • Screen readers • Writing-support software (e.g. word prediction, spell checker) • Graphic-organiser software • Portable DAISY reader • Ruby handheld magnifier	• AT trials/services needed: contact school supplier and O&M specialist • Formulate specific task objectives to determine effectiveness of trail: • Training needed: grandmother requires basic training on navigating the screen reader • Date: August XXXX • Length: Half-day training • Person(s) responsible: school supplier of AT devices and case manager

Table 3.4 continues on the next page→

TABLE 3.4 (Continues...): Application of assistive technology assessment checklist as per the student, environment, tasks and technology framework.

Thabang's capabilities/ difficulties	Environmental considerations	Tasks
		Monitoring follow-up plan Who and when: case manager Mr Sontonga to follow up Set specific date now: beginning of Term 4

AT, assistive technology; O&M, orientation and mobility; PC, personal computer.

(see Table 3.4). They took into account the tasks he struggled with (e.g. using his peripheral vision, reading and writing), the environments where he will be performing these tasks (e.g. home and school) and Thabang's preferences and capabilities. They reviewed the type of AT Thabang had used at his previous school and discussed whether or not he might require additional AT. They determined that Thabang's struggles with reading and writing were pervasive and not limited to one subject area. He often experienced difficulty completing tasks that involve reading and writing. They further determined that Thabang's low vision had not been catered for and that attention was mostly paid to his learning disability. The team agreed that Thabang required AT to compensate for these difficulties but they also discussed the need to continue trying to remediate these skills.

During Thabang's SBST team meeting, an AT implementation team – including a contact person – was identified. The team met to ensure that all of Thabang's AT needs would be addressed. As they reviewed the ISP, they noted that he was able to complete the readings with his screen reader. He continued to struggle with organisation and expressive writing tasks in Sepedi. Although the SBST team recognised that many of Thabang's current AT needs were being met, they identified some areas where he needed additional AT support. Ms. Gumede, the O&M specialist and Mr Sontonga, the case manager, led the team in a discussion to explore AT options. They identified a manageable number of products for Thabang to try out in a timely manner that could potentially support him with his reading and writing goals. They also built time into the plan for training and monitoring.

Funding and resources for assistive technology

Obtaining funding for AT is not always easy. A justification for the necessity of the requested technology is required when applying for third-party funding. Creating a well written, compelling justification will however give the applicant a better chance to obtain funding (University of Iowa n.d.). Thus, to improve the chances of the proposal being considered for funding, the statement should be written by a professional within the SBST team for example by the school principal. Furthermore, third-party funders may not fund AT without adequate documentation, proof of need and the fundamental answer as to how the requested AT will improve the learner's functioning. A proper justification statement will generally describe the learner/s needs, why the requested AT is regarded as necessary, and how it will help the learner/s. This statement is the most important aspect of the application because it will provide the reviewer with a clear description, as this person is likely to not have met the learner and may also not have experience with learners with visual impairment.

Golinker and Mistrett (1997) identify six general components that can support a justification statement and should be answered when describing the learner's situation. These are namely:

- A description of the specific functional capabilities that the AT can address.
- A detailed description of the assistive device, including the features, accessories and any customisation that applies.
- A specific description of the effect of the assistive device such as how it can improve the previously described functional capability.
- A description of the evaluation process, how the recommendation was arrived at and which other alternatives had been considered.

- An explanation of why the assistive device that is recommended is the least costly solution (either in terms of current costs or long-term costs).
- A description of the expertise of the SBST team recommending the services or equipment, including general professional experience and specific experience in AT services.

Conclusion

The use of AT can enable learners with visual impairment to overcome barriers to learning and to equally participate in the learning environment. Once AT is written into the ISP, the SBST team has a critical role in identifying and then supporting the use of appropriate AT for different learning needs.

The discussion on AT for learners with visual impairment was guided by the SETT framework in this chapter, in terms of the various components of the process of identifying and utilising AT. The TSBVI checklist and WATI guidelines for consideration, assessment, implementation and evaluation of AT were also explained, as possible guides to teachers and SBST teams when deciding on this route in support of a learner with visual impairment.

Chapter 4

Teachers providing learner support to learners with visual impairment in challenging contexts

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Keywords: Learner support; Visual impairment; Systems; Proximal processes; Optimal functioning.

Introduction

Learner support is often understood as a checklist of strategies and activities that teachers with specialised training should do when supporting learners in school with reading, writing,

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spelling and mathematics. Many people, furthermore, believe that this will require specific resources. In challenging contexts, the quality and the extent of learner support may as a result be compromised because of a perceived lack of resources in the school and/or teachers not feeling competent to take on this task.

This chapter aims to foreground the multitude of possibilities for providing learner support to learners with visual impairment, in all contexts, including challenging ones. A theoretical basis for understanding learner support for learners with visual impairment in challenging contexts is provided as background for practitioners who are required to make decisions about learner support which could potentially impact future academic, social, emotional and vocational goals. The conundrum of identifying learner support needs, providing such support and ensuring that the support actually addresses the needs experienced, is also addressed by referring to some results of a study exploring visual impairment in South Africa. To conclude, some strategies and activities that teachers may employ in providing learner support to learners with visual impairment are suggested.

Overview of the chapter

The broad goals of the chapter are diagrammatically captured in Figure 4.1.

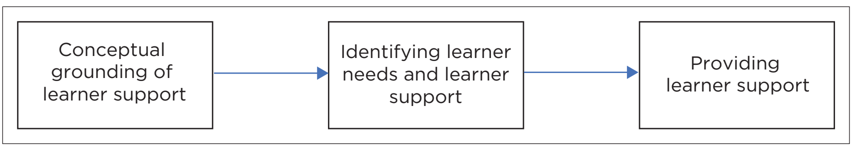

FIGURE 4.1: Goals of the chapter.

Definition of key concepts

Learner support

Learner support is often regarded as the academic support that a learner requires from a teacher in order to achieve the curriculum goals. Relevant and appropriate learner support involves role players in all capacities, supporting learners in physical, cognitive, emotional, social, vocational and/or other areas, in order for them to learn and develop according to their fullest potential.

Teachers

Teachers are adults who per definition have had at least four years of training at a tertiary institution in the field of education and hold the responsibility of facilitating processes in class for learners to achieve the learning outcomes stipulated in the curriculum. In challenging contexts, teachers may however not hold any formal qualifications or may have little training, even perhaps in another field. Learners who support other learners through strategies such as cooperative learning can also be regarded as teachers; however, it is ultimately the adult teacher who shoulders the responsibility of reaching learning outcomes.

Bio-ecological systems theory

Bronfenbrenner's bio-ecological systems theory (Bronfenbrenner 1979; Donald, Lazarus & Lolwana 2010; Swart & Pettipher 2019) explains the interrelation and reciprocal interactions amongst the various systems which can influence a learner with visual impairment, as well as the smaller interpersonal interactions called proximal processes, where learner support often takes place.

Resilience

Resilience is the ability to bounce back following adversity. Factors that may promote resilience include any person, resource and/or interaction that can promote the process of bouncing back after experiencing adversity.

Conceptual framework for providing learner support

Bronfenbrenner's bio-ecological theory of development (Bronfenbrenner 1979; Donald et al. 2010; Swart & Pettipher 2019) superimposed with resilience theory (Ungar, Ghazinour & Richter 2013) are applied in this chapter, to ground the learner support of learners with visual impairment in challenging contexts.

Bio-ecological theory of Bronfenbrenner

According to Bronfenbrenner's bio-ecological theory (1979; Donald et al. 2010; Swart & Pettipher 2019), development (in this chapter applied to learner support) can be understood in terms of the interactions and resulting reciprocal interactions between various levels of systems. The systems are all connected, with influences in one system affecting one or more of the other systems, resulting in reciprocal interactions in turn again influencing the original system (Bronfenbrenner 1979; Donald et al. 2010; Swart & Pettipher 2019). Interactions and reciprocal interactions can occur harmoniously if influences are incorporated; however, when influences are not incorporated, disharmonious interactions may occur.

The smallest system where a learner function is known as the microsystem. The individual learner, family, peers and the school can each be regarded as microsystems. When microsystems interact, a mesosystem is formed (Donald et al. 2010; Swart & Pettipher 2019). A learner with visual impairment who attains independent mobility at school can be used as an example to demonstrate these interactions. More specifically, the influence of independent mobility at school might be independent mobility in the family; however, if the family is not ready for such changes, they may foster dependence by refusing that the learner with visual impairment moves independently. Such doubts about the learner's independence can result in feelings of inadequacy and lack of self-confidence, which can contribute to dependent mobility both at school and at home. On the other hand, if the family is ready to accept independent mobility, their support can foster even more self-confidence for independent mobility, contributing to independent mobility at home, at school and possibly in other contexts as well. Not only does self-confidence relate to mobility, but having self-confidence to be independently mobile may open career possibilities in the economic system. Having employment, the learner, now an adult with visual impairment, can contribute to the health and social systems through, for example, paying tax. This example demonstrates that learner support may have a vast influence across various systems.

According to Bronfenbrenner (1979), the system further from the micro- and mesosystems which can still influence the micro- and mesosystems is the exosystem (Donald et al. 2010; Swart & Pettipher 2019). For example, parents' income based on their employment as farm workers, or a family's access to healthcare at a clinic will be located in the exosystem. Systems with an even less direct influence, but which can still influence development, and thus learner support, are located in the macrosystem. National policy regarding disability in general, and visual impairment in particular, will be located in the political system which, according to Bronfenbrenner, will, for example, form part of the macrosystem (Bronfenbrenner 1979; Donald et al. 2010; Swart & Pettipher 2019).

The chronosystem is prevalent across all the systems and has to do with the influence of time on learning and development (Donald et al. 2010; Swart & Pettipher 2019). The time when a visual impairment occurs or was diagnosed, can for example influence the learner support provided. Early diagnosis with appropriate learner support can enhance scholastic progress. In the same manner, learners with visual impairment who do not receive learner support, may easily fall behind with achieving the stipulated learning outcomes. Their results will inevitably not be a true reflection of their potential.

According to Bronfenbrenner (1979), development will take place when there is interaction between a person and the environment, also known as a system. These specific interactions are called proximal processes (Donald et al. 2010; Swart & Pettipher 2019), which are important as learner support will typically take place during these processes. As such, proximal processes entail continuous reciprocal interactions, gradually increasing in complexity, that happen regularly and over time between a learner and others (such as teachers) or things in other microsystems. For learner support to be effective, the interactions between the learner with visual impairment and the teacher must thus happen regularly and become more complex over time. Teachers making sure that they also verbally say everything which they have written on the blackboard during all lessons can serve as an example of learner support taking place during proximal processes.

As with interaction amongst any of the systems, interaction during proximal processes can also occur harmoniously or disharmoniously. The interaction can be influenced in several ways to cast up barriers in the way of learner support. Some of the barriers can be located within the teacher, such as teachers being ignorant of the nature of the visual impairment and ways to provide support, teachers with a demeanour that does not encourage and elicit questions from learners, attitudes of teachers that do not accept diversity and disability, and/or lack of time because of other duties at school. Some of the barriers can be located within the learner with visual impairment, such as other disabilities, especially intellectual impairment, which can compound the learner support; unwillingness to engage with the learning material; other challenges associated with barriers to learning, such as inadequate attention and concentration; and/or emotional barriers such as anxiety and feelings of inadequacy.

One advantage of using Bronfenbrenner's theory (1979) to ground learner support is that the involvement of micro-, meso-, exo- and macrosystems can accordingly be accounted for, but also elicited, implying that all these systems can (and should) be incorporated in learner support. A tenet of Bronfenbrenner's theory relates to changes in one system having a ripple effect across most of the other systems. It follows that the involvement of more systems in learner support may lead to better results. Another advantage of applying Bronfenbrenner's theory is that this theory is deemed suitable for the Southern African continent and its people (Pillay 2014). In this regard, a leading scholar (Nsamenang 2005, 2010 in Pillay 2014) argued that, except for adding a social, ancestral and spiritual selfhood, Bronfenbrenner's theory can explain development, and thus learner support, from an indigenous point of view (Pillay 2014).

Resilience theory

Superimposing resilience theory onto Bronfenbrenner's bio-ecologic systems theory (1979) attempts to address the potential of a limited focus on deficits and inadequacies. In line with the aim of resilience theory to explain the reason/s why some people flourish despite adversity (Van Breda 2018), it seems that the presence of promotive factors in the various systems and the interactions between the systems may explain some of the reason/s why some people will flourish despite adversity (Zimmerman 2013). These promotive factors relate to strengths inside a person, such as a willingness to do homework, perseverance, curiosity and self-esteem – with all of these called assets. However, promotive factors can also relate to strengths outside of a person, called resources, such as a caring and/or knowledgeable teacher, supportive parents, access to an optometrist and access to assistive devices such as glasses.

Van Breda (2018:5) described resilience in a manner that aligns with the bio-ecological approach, describing the processes that systems on various levels engage in as aiming 'to obtain better-than-expected outcomes in the face or wake of adversity'. Resilience theory superimposed on Bronfenbrenner's bio-ecological theory (1979) therefore implies the importance of identifying the strengths inside the individual and other systems, as well as the interaction amongst the various systems and the proximal processes. More specifically, Ungar's social ecology of resilience theory (2011) emphasises family relations, social structures, services and culture as important resources that can promote resilience (Bottrell 2009 in Van Breda 2018; Ungar et al. 2013); thereby making this theory especially applicable to challenging contexts where resources are limited.

Another characteristic of the social ecology of resilience theory which makes it especially applicable to challenging contexts is that it allows for the uniqueness of the learners, systems and contexts. This means that there is not only one way in which to support learners with visual impairment, but that there may be many ways, based on context, unique culture and resources, that may lead to many different, but equally possible, ways of learner support (Ungar et al. 2013). Based on this theory, all the suggested ways of learner support discussed in this chapter can thus have their own unique ways of supporting learners with visual impairment. Also, what works in one context, may not necessarily work exactly the same in another context, as the perceptions of the learners and teachers as well as the difference in context and culture, may lead to other results.

To conclude, involving the systems and looking for strengths in all the involved systems may provide learner support for learners with visual impairment. However, the ultimate responsibility to facilitate such learner support remains with the teacher, as stipulated in their professional code. Similar to many professional codes of practice for teachers, the South African code of professional ethics for teachers requires educators to be knowledgeable of emerging education trends, which includes ways to provide support and requires educators to acknowledge specific learner needs, while supporting the learners to optimal development of potential (South African Council of Educators 2019).

Role of the teacher in providing learner support to learners with visual impairment

The discussion in this section is based on the section 'Conceptual framework for providing learner support' discussed earlier in the text, as well as existing studies in the field and research undertaken in 2018 with South African teachers in both full-service and special needs schools (refer to vol. 1, ch. 6 by Manis for more detail on the study). The focus falls on ways in which teachers may provide support to learners with visual impairment, in as many systems as possible. The discussion is structured in accordance with Bronfenbrenner's bio-ecological systems theory (1979; Donald et al. 2010; Swart & Pettipher 2019), commencing with support on the individual system, and then progressing through the other micro-, meso-, exo- and macrosystems.

Individual system (microsystem)

Both the learner with visual impairment and the teacher of these learners can be viewed as individual microsystems which interact with each other through proximal processes. When considering the learner, support can be directed at the physical, emotional, social, cognitive and vocational levels.

Physical support

Although teachers usually do not provide physical support to learners, some physical support may be required by learners with visual impairment. As part of the ECC for learners with visual impairment (a curriculum focusing on skills that need to be taught to learners with visual impairment in addition to the regular academic curriculum containing reading, writing, spelling, mathematics, etc.) (Perkins Schools for the Blind n.d.; TSBVI 2017), the subjects O&M (Fazzi 2014; Jacobson 2013), daily living skills, and recreation and leisure are offered to these learners. As background to the rationale for teaching these skills to the learners, it needs to be kept in mind that learners with visual impairment do not learn through incidental learning but rather through verbal descriptions and direct instructions.

As such, even though teachers of learners with visual impairment are not required to be O&M specialists, it is always beneficial if a teacher knows the basic concepts and skills taught by these professionals. The reasons for the importance of basic O&M knowledge and skills are multiple, such as the fact that many schools and learners with visual impairment do not have access to O&M specialists. By knowing some skills and concepts which are taught in O&M, teachers can thus continue the learning process by incorporating or infusing the skills and concepts in general classwork. Teachers can also provide general support and encouragement with O&M for learners, as well as specific support when they see learners applying the skills and concepts incorrectly. By encouraging O&M, teachers will ultimately support the independence of learners with visual impairment. Furthermore, by modelling appropriate attitudes and behaviour, other learners in the class (in mainstream settings) may acquire the appropriate supportive behaviour towards learners with visual impairment. For more detail on the basic components of O&M, refer to Volume 1, Chapter 7 by Heard.

Although O&M are two crucial skills for independence, O&M specialists are scarce, with approximately only 40–50 qualified specialists in South Africa. When one considers that one O&M specialist can train 40 to 45 people with visual impairment in one year, a maximum of around 2250 people can be supported to independence every year by these professionals. Comparing 2250 people per year with O&M skills to the estimated 388 000 people in South Africa who are blind and require O&M skills, emphasises the need in this area. As such, committed teachers can become a promotive factor and fulfil a role in supporting these learners to independence (Guide dogs Association South Africa n.d.).

Daily living skills (also called independent living skills) are closely related to O&M. Without certain skills, social blunders and/or injury can easily take place. In this regard, in well-resourced areas, itinerant teachers often visit schools to teach learners with visual impairment the skills of daily living, typically supported by the parents. However, in challenging contexts the presence of such teachers is scarce, resulting in situations where classroom teachers and parents are required to support such learners in this field (Bardin 2014; TSBVI 2017). Components of daily living skills include organisational skills; personal hygiene and grooming; dressing; care of clothing; management of time and money; eating, cooking, cleaning and other general household tasks; and telephone use (Bardin 2014; TSBVI 2017). Examples of instructional strategies that teachers may follow include hand-under-hand guidance, where the teachers place their hands under the hands of the learner with visual impairment, or hand-over-hand guidance, where the teacher's hands are over the learner's hands (Bardin 2014).

Recreation and leisure activities are a third way in which teachers can provide physical support to learners with visual impairment, which are important for physical and mental health but can also promote social interaction. School sport and other activities, such as athletics (track and field items), swimming, cycling, hiking and jogging, weight lifting, aerobics, skipping rope, dancing and martial arts, can easily be adapted for learners with visual impairment (also refer to ch. 9 by Heard). Ways in which teachers can support learners include the provision of opportunities for the learner to participate with a learner without visual impairment; using other equipment, such as a tandem bicycle; using equipment specifically adapted, such as balls with bells or goal posts in contrasting colours; and modifying boundaries such as indicating the boundaries of a track by contrast, through physical objects such as ropes or with auditory warning (Allman et al. 2014; TSBVI 2017).

Therefore, the class teacher, other teachers, support staff, supportive peers, parents, siblings, and/or members of the community can all be involved in providing physical support to the learner with visual impairment. In this regard, it remains important for teachers to guide parents in terms of physical support to their children, more specifically in contexts where specialised services are unavailable. In deciding on a specific activity(-ies), various aspects need to be considered such as the physical ability of the learner, his/her interests, and the resources available in the form of equipment and expertise (Allman et al. 2014). Throughout, teachers should remember that learners with visual impairment require support, encouragement and praise during the learning process, in order to foster independence.

Emotional support

Emotional support to learners aims at them regaining emotional equilibrium. In addition to the expected emotional ups and downs of most other learners, learners with visual impairment may require specific support in terms of self-esteem, self-confidence and self-determination. In terms of self-esteem, or feeling satisfied with oneself (Wolffe & Rosenblum 2014), research indicates that learners with visual impairment are sometimes not satisfied with themselves, because of them finding it hard to come to terms with the loss of sight and feeling different from other people (TSBVI n.d.d). Depression often features in the lives of learners with visual impairment as well as their perception of having a lower quality of life. Depression and feeling stuck in a situation which one does not like can detract a learner from optimising his or her potential. Loneliness and isolation are other possible factors that may contribute to dissatisfaction (TSBVI n.d.d). For some learners with visual impairment who experience a low self-esteem, encouragement to persevere, compliments for past achievements and successes, and the facilitation of friends are enough; however, some other learners may require professional psychological support or counselling in order to deal with their emotions.

Even though teachers cannot fulfil the role of lay counsellors without proper training, they are often the only persons to whom learners, and often their parents, voice their heart ache, worries and fear. In addition, counselling services are not available in all areas, requiring of teachers to provide support and act in the best interest of the learner. More specifically, teachers may provide knowledge, support, encouragement and empathy, implementing good listening skills to portray the necessary feelings of care. Teachers can furthermore support learners by facilitating contact with other people with visual impairment and who are in the position to understand and provide support to the learner with visual impairment. In addition, the teacher can identify role models in different spheres of life nationally (or internationally) to whom the learner (and/or parents) who require support can be introduced or granted access, in an attempt to encourage them to become the best that they can be and provide them with hope for a fulfilled life.

In supporting the leaners with visual impairment to gain a better self-esteem, their self-confidence, or the 'belief and expectation that one will typically perform well or be successful in most circumstances in one's life' (Wolffe & Rosenblum 2014:475), can also be enhanced. Self-confidence, or the lack thereof, can be self-perpetuating in the sense that self-confidence breeds self-confidence. By supporting learners to perform well and by praising learners for successes and for becoming more independent with, for example, orientation, mobility and daily living skills, teachers can contribute to learners' levels of self-confidence.

A positive self-esteem and healthy self-confidence can in turn contribute to independence, or interdependence for some learners, which is essential for learners with visual impairment. As opposed to a learner staying dependent on, for example, a person providing support towards skills acquisition and not trying out new challenges (Sacks 2014), signs of independence can be seen in learners' self-determination which in essence refers to the ability to make independent choices (TSBVI 2016; Wolffe & Rosenblum 2014). Components of self-determination include knowledge of the self, self-advocacy and empowerment, assertiveness, informed decision-making, problem-solving and goal-setting, and behaviour which is self-directed and self-regulated (Wolffe & Rosenblum 2014). It is important to note that although some learners with visual impairment may remain dependent on physical support, their independence in decision-making should be respected.

In addition to the responsibility of teachers supporting learners with visual impairment emotionally, teachers should also attend to their own needs and mental health as consistent demands on them may adversely affect them on an emotional level. To this end, teachers can for example join a teacher support group (by attending sessions, or accessing support via Facebook or WhatsApp), relying on regular journaling and reflection, finding a mentor, maintaining healthy lifestyle habits, and setting boundaries in terms of their involvement and the expectations of others.

☐ Social support

As children typically acquire skills for social interaction by observing and imitating others, learners with visual impairment require specific support from teachers and parents in this area of development. More specifically, social skills need to be taught, opportunities for interaction need to be provided, and responses of others need to be favourable to facilitate social inclusion for the learner with visual impairment.

Self-awareness may pose a challenge to the acquisition of social skills, for some learners with visual impairment are often unaware of themselves, not being able to see themselves or the space that they occupy. In such cases, teachers need to support the learners to become self-aware, in order for them to be able to learn socially accepted behaviour. Without socially accepted behaviour, learners with visual impairment may become even more excluded and isolated (Sacks 2014).

The basic components of socialisation include body language, social communication, effective communication patterns, skills to cooperate, social interaction and etiquette, relationships across the life span, knowledge of the self, interpretation of the social behaviour of others and monitoring of the own social behaviour (Sacks 2014; TSBVI 2016). When, for example, teaching learners with visual impairment appropriate body language when communicating, the teacher should attend to aspects such as the correct posture, maintaining eye contact by directing the head in the direction of the sound of voices, keeping a socially acceptable distance between people, using appropriate facial expressions in different situations (such as smiling for photos), attending to gestures and being aware of inappropriate mannerisms such as nose-picking. Therefore, these socialisation skills need to be taught to learners with visual impairment who cannot learn through observing others and who are not always aware of the fact that others can see them.

Although most of these skills can and should be addressed by the parents of learners with visual impairment, the teaching of social interaction skills is especially relevant in schools for learners with visual impairment who stay in school hostels or residences. Furthermore, without friends, learners with visual impairment cannot develop appropriate relationships, neither are they able to explore gender roles and sexual preferences. As such, teachers can fulfil a meaningful role in the development of socialisation skills of learners with visual impairment, through direct teaching, role play or through the support of peers. More detail on gender roles and sexuality is included in Chapter 10 by Ubisi.

Cognitive support

Cognitive support that is provided to learners with visual impairment can be located in the individual system, yet also in other systems containing the classroom, school and curriculum. As such, the possibility of providing cognitive support to learners with visual impairment is addressed separately further on in this chapter.

In preparation, teachers in special schools for learners with visual impairment should ensure that they gain in-depth knowledge of visual impairment and these learners through, for example, experience, observation, mentorship and guidance by experienced colleagues, and/or training. In the same way, teachers in full-service and mainstream schools who teach learners with visual impairment need to gain sufficient knowledge by, for example, consulting reputable websites (including Open Education Resources), reading and following guidelines provided by the DoE, attending accredited workshops, short courses or training opportunities, consulting the school support team, and asking for help from peers at schools for learners with visual impairment (also called resource centres). Furthermore, visiting such schools and observing some of the classes, consulting local clinics, hospitals, optometrists or medical doctors, contacting official organisations for the blind, consulting lecturers at medical or education faculties of universities, having a mentor, becoming reflexive practitioners, or joining virtual or real support groups for teachers can also assist a teacher in gaining knowledge.

Vocational support

Generally, it is often believed that learners with visual impairment will go into jobs related to arts and crafts, such as weaving baskets, pottery and beading, in order to earn a small income. Even though not all learners with visual impairment can pursue the careers and lifestyles they aspire to, just as in the case of learners with sight, the available career options for learners with visual impairment are, however, much wider than years ago. This is because of, for example, the availability of technology in support of people with visual impairment when entering their careers. Yet, because of the fierce competition for job openings and the high unemployment rate in countries such as South Africa, many people and graduates, with or without visual impairment, turn to entrepreneurship and are self-employed. As such, teachers should encourage learners with visual impairment to think outside the box and pursue innovative options.

Unlike counselling, many teachers are indeed able to provide basic career education to learners with visual impairment, as required by the ECC (TSBVI 2017; Wolffe 2014). Wolffe (2014) stated that, in essence, career education involves the promotion and development of career awareness, knowledge and skills. As in the case of acquiring other skills, learners with visual impairment are dependent on parents, teachers and others to expose them to different options in terms of possible careers. In terms of the underlying components of career education (Wolffe 2014), career awareness typically takes place in younger learner's lives when they realise that adults occupy different forms of employment to earn an income. Career-related knowledge and skills required at this stage include organisational skills, following directions, information about work, positive work habits, basic work skills (such as doing chores), and incidental information about the world and how it operates (Wolffe 2014). Next, career exploration is usually undertaken by older learners when considering various options and preferred careers, paying attention to personal interests as well as areas where knowledge and skills need to be developed further in order to pursue the selected option. Knowledge and skills required of the learner at this stage include time management, advanced content, skills and techniques understanding related positions within a profession, refinement of work habits and the ability to express job-related interests, abilities, skills and values (Wolffe 2014).

The third component of career education, namely career preparation, typically involves high school learners, with the learner at this stage learning to apply skills in real-life situations, for example, contacting a university to explore study options. Teachers can support learners with visual impairment during this phase by allowing them to participate in formulating their ISPs and by discussing the universal values underlying community and world events. Teachers should also guide learners to gain knowledge on the resources that are available when pursuing studies and careers after school and how to access these. Complex interpersonal skills are expected and required for this process, such as teamwork, leadership, working with different kinds of people, and setting people at ease about the visual impairment. In addition, knowledge and availability of suitable technology are important such as laptops, computers, mobile phones and office equipment, as well as low-tech equipment such as mechanical braille writers and other tools. At this stage job shadowing, where the learner with visual impairment spends time with a person in a specific career, is important for the learner to be able to match the required abilities, interests, skills and values with his or her own profile, in order to subsequently pursue the selected career with self-confidence (Wolffe 2014).

The teacher can thus support learners with visual impairment during all three of these stages of career education, by, for example, talking to them about their interests and values, or by encouraging them to do job shadowing. Teachers can furthermore arrange for presentations on different careers to the learners at the school. However, the final phase of career education, namely career placement, falls outside the responsibility of the teacher. This component involves the exposure of learners to different careers during, for example, holiday times and may be fulfilled when a learner does volunteer work, which may influence future decision-making (Wolffe 2014).

Classroom system (microsystem)

The classroom can also be considered as a microsystem that interacts with individuals through proximal processes. Both Landsberg (2019) and Arter (1999) make some suggestions for teachers to adapt to the classroom environment in support of learners with visual impairment. These authors, for example, suggest that seating can be arranged according to the vision strength of the learners, lighting can be adjusted for optimal vision by considering both task lighting and/or curtains, and obstacles should be removed as far as possible, such as half open doors and schoolbags between passages.

In addition, these authors recommend that teachers should attend to appropriate workspaces, for example, by including furniture of a contrasting colour, reading stands, bigger desk spaces and plugs near electrical equipment. Teachers should also attend to acoustics and sound control by using carpets and curtains to ensure a quiet environment, as many learners with visual impairment rely on sound for additional cues to understand content and context. Furthermore, teachers should create environments that will support learners by reducing the glare on laminated posters, keeping the classroom layout consistent throughout the year and cleaning blackboards to sharpen the contrast between the writing and the background (Arter 1999; Landsberg 2019).

If learners with visual impairment require assistive devices, the schools should furthermore ensure that the timetable supports their learning. When the learner with visual impairment, for example, needs to carry equipment from class to class, much teaching and learning time can be lost if the equipment has to be unpacked and packed during classes. Another option would be for teachers to move between classes, allowing learners to stay in one place for the duration of the school day.

School system (microsystem)

Although the classroom system can be considered as part of the school system, the school system can also be regarded as a separate microsystem. Landsberg (2019) and Arter (1999) provide some suggestions for teachers to adapt to the school environment to support learners with visual impairment. According to these authors, teachers can, for example, acquaint the learners with the school grounds; use noticeable signs, in braille if possible; ensure good lighting on stairs and in corridors or use contrasting colours such as yellow paint to indicate potential obstacles (such as poles, edges of stairs and walkways, and glass doors), and blue paint to indicate potential support (such as handrails and light switches), or yet another colour to indicate walkways (by painting the skirtings in a colour or adding a guiding line). Teachers should furthermore ensure that floor surfaces will not lead to learners falling or tripping; that floor coverings indicate different parts of the school (such as cement for outside, linoleum for inside and grass for playgrounds); and that play areas are shaded and/or safe from rough games and ball play. Finally, teachers can keep in mind that fragrant plants can also be used to indicate changes in location (Arter 1999; Landsberg 2019).

In addition to adapting the school environment, most schools also have systems of support in place for learners who experience household, academic, social, emotional, behavioural and/or physical challenges. Generally, in such cases, the class teachers will first provide support as far as possible. However, if the teachers find that the expected outcomes are not reached despite their efforts, or that input from someone else is required, the SBST will be approached. The SBST usually consists of the class teacher, other senior staff members, and whoever is relevant and involved in the learner's life, such as a therapist, a previous teacher and/or the parent/s. The SBST may in response make further recommendations to the teacher and parents, refer the learner to specialists for assessments or find someone in the community that can support the learner DoE 2014b). Also refer to Chapter 2 by Mokgolodi and Chapter 3 by Ramaahlo for discussions on the responsibilities of the SBST.

Curricular support and differentiation

By providing curricular support, teachers will by implication provide cognitive support to the learner with visual impairment. Such curricular support for learners with visual impairment can relate to several components of the curriculum, as also discussed in Chapter 6 by Viljoen. In order to provide a comprehensive view of the support provided to learners with visual impairment, the various components of the curriculum that learner support can relate to, are included in this section.

The content of the subjects at school cannot be changed; however, learners with visual impairment will often require differentiation of the curriculum. Curriculum differentiation does not imply a watered-down or inferior version of the real curriculum (DoE 2011) but implies some changes to the curriculum that can support accessibility to the subject content. Some learning content will, for example, have to be changed according to the level of abstraction (DoE 2011), as learners with visual impairment may not have had exposure to concepts such as rainbows, oceans, colours, bacteria and venomous animals. Models of animals, real objects or verbal descriptions will have to accompany such descriptions.

Some learning content, on the other hand, may require changes in terms of the level of complexity, for example, a metaphor in poetry containing a flower in bloom, implying that the learner who has never seen a flower in bloom may not be able to understand the poem. Other content may have to be adapted to include familiar examples, for example, South African learners with visual impairment may not understand snow, but will probably be able to understand cold, windy and rainy. As such, differentiation of the curriculum does not imply that learners with visual impairment cannot learn about rainbows or snow – it merely requires alternative ways of presentation of the same content, and that assessments should not contain any content that may prevent accessibility to the content, as this will result in unfair assessment.

In an attempt to provide learners with visual impairment with an equal opportunity to access the curriculum, the ECC (Perkins School for the Blind n.d.; TSBVI 2017) was compiled, which includes areas of the educational needs of learners with visual impairment. These needs consist of skills related to braille, O&M, using a long white cane, social interactions, career education and planning, AT including technical devices, independent living skills, recreation and leisure skills, self-determination, and sensory efficiency. Although teachers may not be specialists in any of these areas, they still need to try and infuse the curriculum with content of the ECC as this can enable learners with visual impairment to access the core curriculum (Simalalo 2017).

For example, teaching learners with visual impairment how to use assistive devices (as part of the ECC) to record lessons can result in learners becoming independent from peers to remind them of homework that needs to be done. In the same way, when teaching learners with visual impairment how to interact in a socially acceptable way (as part of the ECC), group work and academic growth can be supported, while also enhancing individual learners' self-esteem, self-confidence and independence, which in turn can strengthen their academic achievement.

Language of learning and teaching

Even though language acquisition does not (only) rely on vision, learners with visual impairment may experience a range of challenges in school which are related to language (Landsberg 2019), such as a slower understanding of abstract words, difficulty to form hypotheses about words' meanings and limited experiences that may support the understanding of words in context. As a result, learners may use words without a clear understanding of their meanings.

In addition to the challenges with language acquisition, learners with visual impairment usually use braille to read and write by means of touch; however, a specific type of braille sometimes applies to mathematics and sciences, called the Nemeth code which is slightly more complex than general braille and often uses more than one braille cell in writing a mathematical or scientific symbol or concept. Depending on the type and degree of the visual impairment, some learners use a combination of the Latin alphabet and braille when reading and writing (Landsberg 2019; TSBVI 2017, n.d.a, n.d.b).

Another factor often compounding the language challenges, is that many learners with visual impairment are taught in their second language because of the complexity of languages in South Africa, as well as the fact that teachers are often not being skilled in braille, resulting in these learners often having to contend with the acquisition of both braille and an additional language, on top of managing an impairment while being schooled and attempting to achieve. Multilingualism then becomes an additional barrier to learning.

Incorporating multilingualism in classes to support comprehension and learning is currently being researched, even though most of that research does not yet incorporate visual impairment. In line with theories underlying reading comprehension, the content of the text must be familiar to the contexts of the readers (Janks 2011; Luke, Dooley & Woods 2011). This implies that teachers should ensure that the content of the text will not contain abstract words or situations which are unlikely to have been experienced by the learners with visual impairment. Teachers can also make use of code-switching whereby words in the language of learning and teaching are translated into a language the learners are familiar with (Nel & Nel 2019). Often in challenging contexts, peers can do code-switching as many of them are familiar with more than one language (Omidire & Du Plessis 2019).

Although the act of reading can be replaced by audiotapes or other technology such as screen readers, writing cannot be replaced as easily. As a result, braille is still taught widely at schools for learners with visual impairment despite teachers not always being sufficiently trained to read and write in braille, more specifically teachers outside the context of special needs schools. Currently, only one school for learners with visual impairment in South Africa has the knowledge and expertise amongst teachers to teach mathematics and science up to Grade 12, thereby limiting the career options of learners who cannot be accommodated in the school or the school hostel (also refer to ch. 5 by Viljoen).

☐ Teaching pace, methods and processes

Although reading in braille can be quick, learners with visual impairment usually require additional time to complete classwork, assignments, tests and exams. They will, for example, require sufficient time for the tactile investigation of pictures and graphs, and to find the right places on question papers and answer sheets, necessitating a slower pace of teaching and the completion of school work in class.

In the same way, the teaching methods and processes employed to teach learning content to learners with visual impairment should be adjusted in this context. In addition to making abstract concepts concrete before requiring learners with visual impairment to work with new learning content, ample opportunities need to be built into teaching practices for tactile exploration as well as systematic verbal descriptions that may support the learning of learners with visual impairment. As the understanding of some concepts, however, largely rely on vision, for example, colours and rainbows, or may be too large to feel, for example, mountains, the sky and the ocean, or too small or dangerous to touch, such as a snowflake, a bee or bacteria under a microscope (DoE 2011; TSBVI 2017), the class teacher is continually expected to identify alternative creative methods of teaching and making the curriculum content accessible to learners with visual impairment.

One such teaching method will require the teacher to explain the learning content step by step (Bardin 2014) and analysing tasks into small steps. In another example, teachers will have to teach a skill from the beginning to the end (forward chaining), and then reverse the order of skills going backward (backward chaining) (Bardin 2014). Next, teachers can teach and then gradually remove support by reducing physical or verbal assistance, limiting visual, verbal or situational cues, and/or increasing the complexity of tasks. Learners may also be motivated to continue with a task when receiving positive reinforcement or rewards. In recent developments, the use of 3D-printers to print objects that may assist the teacher in explaining learning content have also been explored as an option. As all such (adapted) teaching methods and processes for learners with visual impairment can be time-consuming, the pace of teaching needs to be addressed when teaching learners with visual impairment in order to support their learning and ultimately the achievements they reach.

Learning material and equipment

Although policy generally stipulates the provision of learning and teaching material required by learners with visual impairment, and refer to the training of teachers to use and provide suitable learning and teaching material (DoE 2001), reality in challenging contexts often paints a different picture. More specifically, as the material and equipment (assistive devices such as audio material, optical aids such as magnifiers, and braille typewriters) required by learners with visual impairment are usually expensive, these are not always available to learners as required. In addition, many teachers do not know how to use and guide learners with visual impairment to use such devices. According to Simalalo (2017), this lack of sufficient knowledge by teachers can be ascribed to limited training opportunities (also refer to ch. 3 by Ramaahlo and ch. 8 by Erwee).

In addition to assistive devices and technology, teachers can provide other materials and equipment, in accordance with the type of visual impairment. For example, some learners may benefit from enlarged print when wanting to access written text. Other examples include pictures, graphs, diagrams and maps that can be adapted for learners with visual impairment (DoE 2011; TSBVI 2017), by simplifying the content without losing the meaning of the picture. Other pictures, graphs, diagrams and maps can be replaced by or supplemented with a written description, or substituted by a real item or model (DoE 2011). In addition, a summary sheet of learning content can be provided to assist the learners with visual impairment instead of expecting them to copy copious notes from the writing board (Arter 1999).

☐ Assessment and accommodations

Accommodations refer to the various ways in which learners can be supported to access assessment opportunities and activities. Differentiation in assessment and accommodations should not give some learners unfair advantage over others but are intended to provide all learners with equal opportunities to be able to demonstrate their true potential. Differentiated assessments and accommodations to learning should thus be applied for and granted as soon as teachers realise that such measures are required to ensure fairness (DoE 2014a). When such accommodations are granted, teaching and learning in classes should be adapted for learners with visual impairment to be able to access the curriculum and learn optimally.

Each education department has its own guidelines for the provision of accommodations. According to the South African guidelines for accommodations, learners with visual impairment (including learners who are blind, partially sighted or with low vision) are entitled to accommodations related to the format of the assessment as well as the use of AT (DoE 2014a). One or more of the following ways of differentiation and/or accommodation are allowed: adaptation of questions, extra time, using a digital player or recorder, using braille, working on a computer (text to voice and voice to text), enlarged print, handwriting, special arrangements for medication/food intake, oral examination, employing the services of a reader, rest breaks, scribe, using a separate venue, and including transcriptions of braille (DoE 2014a).

However, accommodations are only granted when applied for, in accordance with stipulated procedures. This procedure includes an academic assessment, close observation and the compilation of a portfolio of evidence consisting of, for example, reports by specialists, explaining the need for the specific accommodation(s). The reason for such strict procedures to be followed relates to the necessity to ensure that an accommodation is granted without advantaging or disadvantaging any learner. It is, however, also important that teachers and parents remain cautious of the fact that a future work life may not allow for accommodations, and gradually prepare and support learners with visual impairment for this.

Individual support plan

An ISP, or individual education plan (IEP), can be compiled for a learner with visual impairment as a way of providing coordinated and monitored intervention to any learner who requires support (DoE 2014b). An ISP usually stipulates the areas in which support is required, the goals to be achieved, the strategy of intervention, the people responsible for the intervention, the time frame, the review date for assessing achievement of the target and comment/s on progress made (DoE 2014b). All role players can be involved in compiling an ISP, such as the class teacher, subject teacher, members of the SBST, head of department, school principal, therapists, parents and the learners themselves. For more detailed discussions on how an ISP can support a learner with visual impairment, refer to Chapter 2 by Mokgolodi and Chapter 3 by Ramaahlo.

Family system (microsystem)

Teachers are generally not directly involved in the family matters of learners, however, according to Bronfenbrenner's model (Bronfenbrenner 1979), all relevant systems are reciprocally connected, with the implication that changes in one system will influence the other systems. In a classroom, the teacher is in a position through daily interaction with the learners to observe their progress and challenges. By providing feedback to the family, the family may know which areas of the learner's development to support.

One area where teachers can facilitate family-based support for learners with visual impairment relates to the realm of knowledge. This does not imply that teachers have to know everything about eye conditions and possible diagnoses and support measures, but rather require of them to know where to look for answers and to whom to refer the family for the next steps. Knowledge can provide teachers with information and rectify possible distorted perceptions. This can be valuable in cases where parents, for example, wrongly believe that the visual impairment is the result of something they did, or did not do. Dealing with a child with visual impairment can in such cases become a daily reminder of perceived personal inadequacies, potentially resulting in parents overcompensating. Other potential distorted perceptions that can be rectified by knowledge relate to cultural or spiritual beliefs about visual impairment, more specifically linking the condition to punishment for previous transgressions or witchcraft. Some communities may even ostracise children and their families for fear of being afflicted with visual impairment themselves.

Knowledge can furthermore empower the parents of a learner with visual impairment when they gain information on the support available. Not knowing what is possible may result in them accepting the status quo, subsequently not supporting their children in the best possible way to reach their full potential. The World Health Organization (WHO), for example, recognises that 80% of all visual impairment can be prevented, or cured (WHO 2013), often with a mere pair of corrective glasses (also refer to vol. 1, ch. 7 by Heard). However, being ignorant of this possibility may compound the consequences of a visual impairment for the future of a child.

Not only can knowledge be utilised to provide more sufficient support, it can also contribute to better planning of the future. For example, if a child has been diagnosed with a degenerative eye condition, the parents may decide to teach the child braille from an early age; or they may decide to invest in certain assistive devices. Sometimes, genetic counselling may be called for when parents carry genes that may increase the possibility of a second child being born with a visual impairment. Although procreation remains the decision of the parents, some parents may benefit from knowing the facts when planning for the future. In the same manner, learners with visual impairment themselves may benefit from genetic counselling and their future decisions on whether to have children or not.

Knowledge that teachers of learners with visual impairment can share with parents include knowledge about the support provided by the education system in school and through an ISP, support provision as part of the health care system through referrals to clinics or hospitals, organisations for people with visual impairment, applications for care-dependency grants, and specific support for the learner with visual impairment, as explained in this chapter. Because of the potential negative effects of incorrect information, teachers should refrain from sharing certain parcels of knowledge, such as knowledge about the basic types, causes or medical interventions for visual impairment as the sharing of such knowledge is best left for professionals trained in that field. However, as information of this nature is often complex, an understanding and patient teacher can assist in explaining complicated facts to parents who are not literate.

In addition to knowledge and monetary resources, teachers can facilitate family-based support by mobilising social and emotional resources. Social resources involve family and friends, ranging from a grandmother telling stories to a learner, to a parent patiently instructing the learner to perform basic tasks, to an elder sibling taking care of cooking, or a responsible sibling accompanying the learner with visual impairment when going out. On the other hand, emotional resources entail the support and capacity required to deal with the challenges inevitably brought to a family where a child has visual impairment. In this regard, teachers need to remain aware of the fact that parents, often single parents, will generally experience certain levels of stress when having a child with visual impairment. Basic support in the form of food, water, clothing and shelter may reduce the stress and enable a parent to better care for the child with visual impairment on an emotional level, and to make better decisions (TSBVI n.d.c).

A central challenge for many parents of learners with visual impairment is to accept the impairment of their child. To this end, parents of children with visual impairment may experience the various stages of grief (denial, anger, bargaining, depression and acceptance), when experiencing that their dreams, ideals and aspirations for their children have been lost (Elizabeth Kübler-Ross Foundation 2019). When talking to parents, teachers should remain aware of these different phases of grief, in order to understand parents' actions, limited involvement or desperate attempts to 'bargain' for remedies, schools, medicine or treatment. Even though the teacher may feel frustrated about a lack of action or apathy on the side of the parent, such lack of energy may actually relate to a stage of depression that the parent may be going through. By being aware of the possible stages of grief that a parent may experience, the teacher can demonstrate the necessary empathy and understand the parent's behaviour better, whether it is to limit involvement or at the other side of the spectrum, to overprotect the child with visual impairment.

As mentioned before, the contexts of the teacher will also play a role in the facilitation of family-based support to learners with visual impairment. In urban areas where medical specialists and other associated support staff are often involved, facilitation of family-based support may differ substantially from the type of family-based support that teachers need to facilitate in rural areas. In all cases and contexts, teachers should only provide family-based support with the approval of the school. In this way, the teachers will remain accountable to the school, thereby protecting themselves from crossing professional boundaries and acting in inappropriate ways.

Exosystem

Professionals in the medical and educational fields can be located in the exosystem, as access to professionals can influence the micro and mesosystems. Most teachers are willing to walk the proverbial extra mile. However, some challenges will require professional support and collaboration with others, in order to address these systems. For example, as many cases of visual impairment can be prevented or healed (WHO 2013), collaboration and intervention with people in the exosystem may make a difference, for example in support of areas such as basic general eye hygiene, or at the other end of the spectrum, specialist service provision that may be accessed.

Different school contexts and different learners with visual impairment will have different levels of access to professionals that may provide support. Additionally, different learners will require different forms of specialist support. Teachers cannot make recommendations for such support in isolation and should collaborate with the SBST in deciding on an appropriate referral or support plan for a specific learner with visual impairment. Specialists that may also be involved in the assessment, diagnoses and/or support of learners with visual impairment include clinic nurses, family doctors or paediatricians, optometrists, ophthalmologists, low vision specialists, opticians, ocularists (fits and manufactures artificial eyes and artificial eye shells), occupational therapists, O&M specialists, speech therapists, audiologists, educational psychologists, specialist educators, counsellors and therapists, and braille specialists.

Some specialists may be employed by government or academic hospitals, while some may do pro bono work as part of their contribution to the community, and others may be in private practice. Student doctors, intern doctors or doctors doing their community year before starting their own practices often provide a valuable service in the community and can also provide the needed medical intervention. In the same manner, staff members and students from universities' medical faculties can provide valuable support. As mentioned before, some of the required specialists can be found at special schools for learners with visual impairment (resource centres). Finally, many organisations for people who are blind or with visual impairment can also be contacted to provide the necessary intervention and support.

By involving the community, additional resources can be mobilised. For example, if a specific specialist is not available, but the involvement of such as specialist is crucial, a community member may sponsor transport for the learner with visual impairment and his/her parent to consult a specialist in a distant town. As such, collaboration between different role players in the exosystem can provide for support to learners with visual impairment, in the required areas.

Macrosystem

The education, social, health and political systems are usually not within reach of most teachers, but by becoming involved in policy and becoming spokespeople for causes they believe in, teachers may have a valuable impact on some of the macrosystems. Such influences will eventually filter down to affect microsystems, where teachers play a fundamental role, as discussed earlier in the chapter.

Chronosystem

The saying ‘prevention is better than cure’ is especially relevant for preventable visual impairment. As such, early childhood support remains crucial in the process of identifying and supporting learners with visual impairment to develop all their abilities. Teachers in this field will once again fulfil a pivotal role in identifying and supporting these learners.

Conclusion

The purpose of this chapter was to provide teachers and practitioners with some ideas for learner support for learners with visual impairment, more specifically in challenging contexts. Learner support does not necessarily require expensive technology, however, as learner support mainly operates on the level of proximal processes, which entail relationships between people, teachers have the responsibility to equip themselves with basic knowledge and skills in this field. In providing learner support, which entails whatever a learner may need, teachers should look beyond what is tangible in order to find assets and resources in all possible systems that may act as promotive factors in supporting learners with visual impairment to become more resilient, even in challenging contexts.

SECTION 3

Classroom practice

Chapter 5

Teaching literacy and mathematics through braille

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Keywords: Braille; Teacher; Learners; Blind; Number.

Introduction

The focus of this chapter is on braille as a writing and reading medium for blind learners. The value of braille as a medium of instruction and the question whether or not braille should be taught at school is often debated, as this is not the only way for blind people to access learning because of advances in technology for the blind. According to Loots (27 June 2019, pers. comm.), a blind statistician who has completed a doctoral degree:

> 'The issue of Braille in schools, in my opinion, is vastly different from the discussion on Braille in universities, and then Braille in

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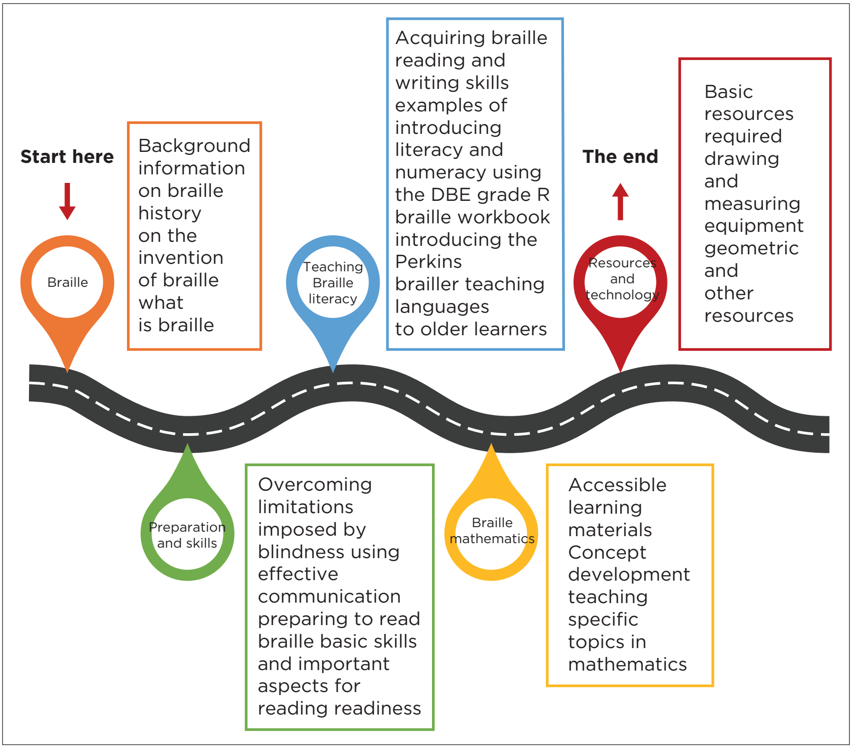
> the workplace … there's not one solution for all, and that no one approach will suffice. Without Braille, to me personally, grasping new concepts in Mathematics would have been very difficult. I for instance, used Braille for lecture/conference presentations, so that each page represented a slide … so, yes to braille, but also to all the other options that are available'. (Loots pers. comm., 27 June 2019)

As such braille holds distinct value for learners to grasp mathematical concepts and obtain spatial understanding and awareness. However, each individual learner's circumstances need to be considered when deciding on the potential value of braille for the individual, as well as the age at which the learner/person became blind, the subjects taken, and the unique and personal learning style. It follows that there is not a single answer



Source: Designed by Hendri Kruger, in 2019, published with permission from Hendri Kruger.
DBE, Department of Basic Education.

FIGURE 5.1: An overview of the chapter.

to the question whether or not a learner will learn more efficiently when using braille than through tactile or audio sense, or both. In addition to these considerations, other factors for consideration are discussed in Chapter 6 and Chapter 7 by Viljoen.

Overview of the chapter

Figure 5.1 provides an overview of this chapter.

Definition of key concepts

Braille

Braille is a tactile reading and writing medium of raised dots, representing the translation of print material but not regarded as an independent language. Braille is written on special paper using a braille writing machine.

Braille cells

A braille cell consists of six dots arranged like the six on a domino tile or a dice. This represents the space which is occupied by one braille character. An empty cell represents the space between words.

Unified English braille

Unified English braille is a standardised English braille code developed for translating literary and technical material for the English-speaking world in a uniform way.

Background information on braille

Until the introduction of the printing press in Europe in the 15th century, education for blind people was mainly through oral work and memorisation. After this event, different attempts were made to create a medium of reading and writing for blind persons, for example, using large embossed letters of the alphabet or big letters simplified and cut out of wood. The assumption was that blind persons would find it easy to recognise such enlarged, embossed or wooden letters, which proved not to be true. Other attempts included Moon Type which is a system developed by Dr William Moon (1818 – 1894) in Britain and which is, until today, only used in Britain for some individuals, but it has its own inherent limitations. Reading and writing remain limited though until a young, highly intelligent French boy developed what we today know as braille.

History on the invention of braille

Louis Braille was born in Coupvray near Paris, France in 1809. His father was a saddler and at the age of three, Louis damaged one eye with his father's awl and soon afterwards became blind. Trauma to one eye can sometimes result in blindness in both eyes (sympathetic ophthalmia), which was the case following the accident to Louis' eye.

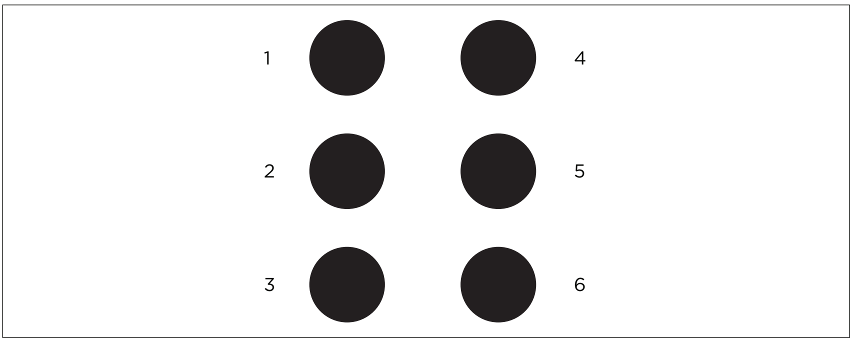
At the age of 10, Louis started attending the National Institute for Blind Children in Paris where he later became a teacher. He studied at the Institut National des Jeunes Aveugles. In 1821, Louis became aware of a system of dots and dashes on thick paper, developed by a Captain Charles Barbier of the French Army, which soldiers could read through touch during night times without using light. Braille considered this to be too complicated and subsequently reduced the initial system to a code of six dots, with a six-dot cell fitting exactly under the area of a fingertip and the possibility of 63 combinations. Louis Braille published this code in 1829 and also added signs for mathematics and music. He eventually became a full professor who taught algebra, geometry and history and was also an accomplished organist and cellist when he died of tuberculosis in 1852 (adapted from The Invention of Braille, Roth & Fee 2011).

What is braille?

Braille is a tactile reading and writing medium of raised dots, representing the translation of print material. Braille is not another language, but rather a system of raised dots that represent letters and numbers (and other codes) that people who are blind can feel or read by using the pads of their fingertips, thereby relying on their tactile sense. Braille is written on special paper using a braille writing machine such as a Perkins Brailler, or a braille embosser connected to a computer. The Unified English braille code, which is used in South Africa, was developed by the International Council on English Braille in 2004 to harmonise braille across codes and between English-speaking countries.

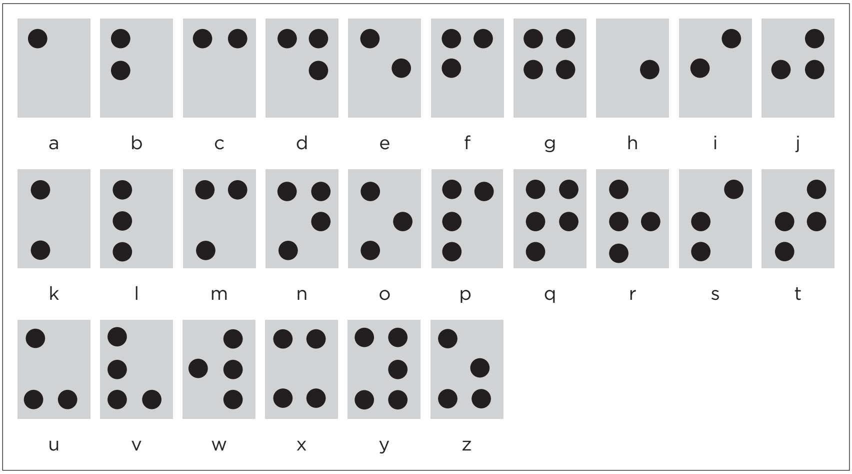
In braille, the dots are organised into braille 'cells' consisting of six dots that are arranged like the six on a domino tile or dice, thus three dots high and two dots wide, numbered left top to bottom 1, 2, 3 and right top to bottom 4, 5, and 6 (Figure 5.2). A cell thus entails the 'space' occupied by one braille character, with a space between words being called an empty cell.

By combining the six dots in various permutations, singly or in combination, the characters represent letters, numbers, punctuation, mathematical and scientific operations and symbols, music and more. Not all the possible dot permutations have a meaning on their own as some for example have the function of modifying the meaning of a character, based on the spatial relation to the preceding character. As an overview, the braille alphabet is included in Figure 5.3.



Source: Howse, Riessen and Holloway (2016).

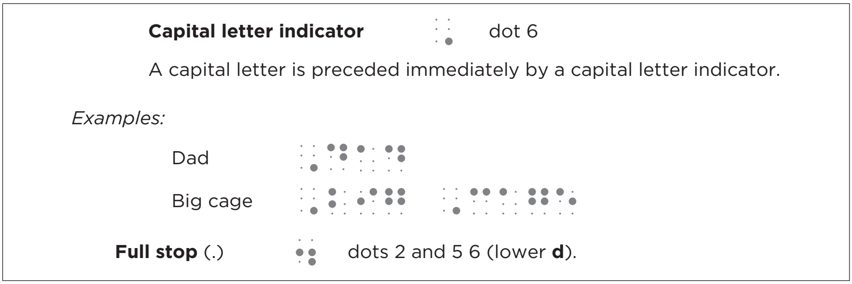
FIGURE 5.2: Braille cell.



Source: Howse et al. (2016).
FIGURE 5.3: Braille alphabet.

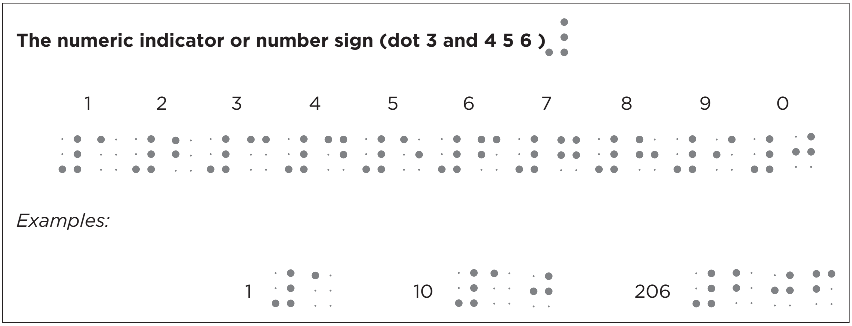
As depicted in Figure 5.3, the first 10 letters of the alphabet make use of only the top four dots in the cell. Letters k to t repeats the pattern of the first 10 letters, except that the bottom left dot in the cell (dot 3) is added to each letter. Letters u to z likewise repeats the pattern of the first 10 letters yet adding both bottom dots (dots 3 and 6). The letter 'w' does not follow this pattern, because the letter did not exist in the French language when the braille code was invented. The code for the letter w was presumably assigned much later, most likely when the system was finally accepted in Britain in 1870. To indicate a capital letter, a dot 6 is put directly before the small letter (e.g. refer to Figure 5.4). A full stop is indicated by a dot 2 and 5 6 (lower d).

The numeric indicator or number sign (Figure 5.5) was added as braille does not have enough usable characters to indicate both numerals and capital letters. More specifically, the letters a to j, preceded by the numeric indicator represents the digits 1 to 9, with j representing the 0. Numbers are formed by writing the number sign in front of the same notation used for letters and words, as an indication that a number is presented rather than a word.



Source: Howse et al. (2016).

FIGURE 5.4: Capital letters and full stop in braille.



Source: Howse et al. (2016).

FIGURE 5.5: Numeric indicator and braille numbers.

When words in a text are written in capital letters, italics or bold, an extra braille symbol similarly appears in front of such words. The same applies to subject-specific braille codes such as music, algebra or chemistry.

Braille can be written by using each individual letter of words – called Grade 1 braille or uncontracted braille. In addition, Grade 2 braille or contracted braille can be used, which entails something like a shorthand code, where some words and some endings and beginnings of words, for example, -ing, -ble or re-, are indicated by a single braille sign, with the advantages of speeding up reading and writing, and using less paper for printing. Grade 2 braille is usually introduced in phases, yet with some schools and countries never introducing this braille to learners.

Most schools in South Africa do not have braille instructors that can teach braille code outside of subject lessons. This situation emphasises the importance of teachers knowing the braille code for their subject areas. Even if a school has such braille instructors available, it remains important for teachers to learn braille when teaching learners who use the braille code. In the same manner that braille will empower people who are blind to access the written word, teachers of blind learners can be empowered to teach and assess the work of the blind learner in a more effective way if the teacher is braille competent. People with full vision (such as teachers) can read braille with their eyes. In this regard, Dr Frances Gentle (Brauner 2019), a Lecturer at the Royal Institute for Deaf and Blind Children, Renwick, makes the following remarks:

> Equitable educational opportunity for children who are blind requires teachers who understand the braille code and know how to modify print-based activities in the classroom. We want to enable students with blindness to continue studying mathematics into their senior school years and as a result, increase access to careers in STEM-related fields. Achieving this aspirational goal requires teachers and parents who understand Unified English braille in literary and mathematical contexts. It really helps when classroom teachers can read braille text but equally, when parents can use it. Knowledge of braille enables parents to share the joys of reading and writing with their child, whether it is assistance with homework, notes of encouragement or birthday cards in braille. (p. 2)

Preparation and prerequisite skills for braille

Before teaching young learners braille, they need some preparation because of the limitations and challenges caused by visual impairment. As the young blind learner will typically not be motivated to move around and explore the environment, new things, objects and noises because of the lack of visual stimulation, these learners will require purposeful, well thought through, methodical intervention to experience the necessary stimulation and acquire the skills needed to attain the same experiences and knowledge as sighted children. As such, Hall (2009) emphasises the importance of young learners with visual impairment being exposed to real objects and tactile stimulation, for them to be able to rely on tactile recognition in identifying objects in life.

Overcoming some limitations imposed by blindness

According to Cleveland and Sewell (2009):

> Visual Impairment affects the whole process of information gathering. Far too often we expect blind or visually impaired children to base their knowledge of the world on verbal descriptions and very limited 'hands-on' experiences. (p. 1)

In order to address these limitations, it is important that enough time is spent on activities for learners to be able to attain conceptual understanding. It is furthermore recommended that exposure to as many concrete experiences as possible is prioritised, guided by verbal and explicit explanations of these experiences.

As learners with visual impairment learn by doing and through tactile experiences, teachers should allow them to touch and feel, while verbalising what they experience. During this process, the use of descriptive words are recommended, specifically when handling real-life objects, such as round, straight, thick, thin, heavy, light, big or small. It is furthermore recommended to work from the part to the whole for learners to be able to understand not only unrelated parts but also the meaningful whole, allowing sufficient time for learners to mentally combine the various parts and form a mental image or model of the whole.

On a very practical level, teachers should stabilise objects such as building blocks and shapes by, for example, placing a non-slip surface on a desk to prevent movement and the learner from knocking things over. In support of their experiences, the teacher should also talk about their location, thereby making them aware of the environment. Throughout, it is important to remember that learners may struggle a bit before offering assistance, in support of the goal for them to become independent.

Utilising effective communication

As sudden noises can be frightening to the learner with visual impairment, continuous effective communication is important. When talking to the learner, the teacher (or parent) should use the learner's name, alerting the learner to things that are about to happen or to actions undertaken by the teacher. Even though the learner will lack the necessary vocabulary because of limited incidental learning and the inability to connect words to objects and ideas, it is in order to talk about colour or watching television or going to the movies when talking to the learner, also using words such as 'look' and 'see'. At its core, the primary goal is to ensure that the learner with visual impairment conceptually understands what they are 'looking' at.

Preparing the learner to read braille

All children will benefit from early exposure to books and having stories read to them, even more so in the case of learners with visual impairment who cannot observe others reading books (Hasty 2012). As sighted learners will read with more ease once a love for books has been instilled, learners with visual impairment should be exposed to people reading to them from a young age, as a regular activity.

In the same manner, techniques for teaching braille reading should be implemented as early as possible. The teacher (or parent) can for example use a colourful picture book when reading a story as well as a braille version, with or without tactile pictures, in order to be able to read and discuss the pictures with the learner, describing the characters and messages captured in pictures about these. Following the reading of a story, the learner with visual impairment should be encouraged to tell the teacher (or parent) how they understand the story and what they liked about it. Such a process can build vocabulary and stimulate so-called visual thinking. While implementing the process, the learner can feel the braille, realising that it represents written words and that written words carry meaning. Blind learners can furthermore trace the lines of words with their fingers even though they will not be able to read these.

Basic skills and important aspects for reading readiness

We have discussed possible limitations in the development of the blind child, which requires positive intervention, particularly for developing the basic skills for reading readiness, such as the following.

Tactual discrimination

In supporting the blind learner to become ready to read braille, the teacher can start with exposure to large three-dimensional (3D) objects that are very different from one another, such as blocks, balls and toys, even the learner's own toys. During such exposure, the objects should be discussed, and the correct words used to describe and name the objects, including discussions on textures and how the learners feel about and value their toys. When discussing the clothes that the learner is wearing, attention can be paid to aspects such as buttons (can they fasten the buttons), long and short sleeves. When discussing shapes, learners can be requested to sort shapes into pairs that are the same, or to find the same shape but which is different in size or to find a shape that is different than the rest. Such sorting activities can for example also be performed with bottle tops, keys, buttons and beads.

As already stated, it is important for learners to experience and be able to differentiate between different textures. For this purpose, learning aids can be made by, for example, pasting different fabrics onto cardboard, representing rough and smooth, hard and soft, and sticky and slippery. When exposing the blind learner to these, words to describe the textures should be provided such as smooth, soft, coarse, hard, fluffy, flat, sticky, bumpy, rigged, fuzzy, woolly and silky. Different objects can also be placed in bags, requesting learners to take out an object and describe what it is and how it feels.

More practical examples include the use of different sized pegs, nuts and bolts. Learners can trace around such objects or also trace around their own hands, practice to colour inside raised lines, or peel and stick different textures, shapes or magnets in order to compile a picture, no matter what the end result is. As the focus falls on the activity of handling objects and developing a creative imagination, the quality of a product is not important, asking of the teacher to encourage and praise the learner regardless of the product that is delivered. As another activity, learners can make their own handprints or fingerprints in playdough or clay, comparing the sizes of these with the prints of other learners.

Wrist flexibility and finger dexterity

Learners' fingers and wrists need to be strong for writing on a Perkins Brailler and for squeezing, grasping, pinching and holding things. Exercises in support of the development of wrist flexibility and finger dexterity include activities where learners put beads and blocks into boxes or fit shapes through the correct holes, progressively handling smaller and smaller objects such as paper clips and small nails (Figure 5.24). They can also pop bubble wrap to practice their pinching action, string beads and copy patterns on a pegboard, or use pegs to hang washing on a line.

For flexibility of the wrists, learners can open screw-top bottles or jam jars with screw-on lids, and then put the lids back again.

Learners can furthermore participate in stacking activities by putting boxes or tins or blocks on top of each other, paying attention to balancing these. Finally, as learners will be required to isolate their fingers and thumbs and press hard when starting to use Perkins Braillers, they may benefit from playing musical instruments to develop and strengthen the concept of using fingers in isolation or isolating fingers when performing certain actions (Cleveland & Sewell 2009).

Two-handed coordination and finger movements

In support of the development of these skills, learners should be encouraged to use both hands when they are scanning or 'looking at' a page. They can for example be guided to first do all the required activities with each hand separately, and then with both hands together, in a relaxed manner. Such practice aligns with people using braille, who typically use both hands to read and write.

Even though some learners may prefer one hand over the other, the use of all four fingers of both hands (except the thumbs) is important when tracing along lines. As some learners may find it difficult to use all their fingers, they may develop their own styles of hand movement and may favour certain 'lead' fingers while the other fingers act as 'assistants'. In supporting learners to overcome such challenges, they may be guided to follow the edge of a ruler when practising how to follow a line of braille. They should furthermore be encouraged to use smooth, even tracking movements of both hands from left to right across the lines. Once a learner becomes more experienced, the left hand might move down to find the next line before finishing the previous line. This can speed up reading.

Light finger touch

Learners should be reminded to apply light touch with the pads of the fingers when examining materials tactually, in preparation for using braille. As braille embossing does not last forever, the lighter the touch of the reader the longer the book can be used.

Posture

It is important that learners sit comfortably when they read or engage in exercises in preparation of reading braille. Their feet should be placed firmly on the floor and their elbows should be at the same height or a little higher than the top of the table. For small learners, schools normally have lower desks with small chairs, but one can put books under the legs of the table or on the chair if necessary.

Teaching literacy to beginners through braille

Sighted learners often initiate language development by pointing to interesting objects, with an adult responding with words and/or descriptions. However, most learners with visual impairment need to be encouraged to explore and become familiar with their environment and the objects in it, in order to obtain some prior knowledge to build on. To this end, a learner who knows their environment, and knows that things have names, can later learn that these names can be written down. This highlights the importance of bringing learners with visual impairment in contact with various kinds of things and teaching them what these objects do and how their parts fit together, using words such as big or small, high or low, and heavy or light.

As such, an underlying factor and prerequisite for future reading entails the conceptual understanding of the environment and what it consists of. On the contrary, a lack of understanding of certain concepts and how things fit into the environment and people's lives may result in conceptual problems and negatively affect the future reading. Hasty (2012) summarises this in the following way:

> [*B*]eing able to represent your thoughts and your actions, whatever, in a written way means that you need to have a concept of the

experience of having done that, and the language to express having done that. (p. 4)

Acquiring braille reading and writing skills

When starting to read braille, the learner will see the individual braille cell rather than the whole word as a unit. During this phase, the learner will thus identify the number of dots and the shape in which they are arranged, in order to recognise the specific braille character. As a next phase, the learner will acquire the ability to recognise individual characters in a series, memorise them and then integrate them to read complete words. As a result, the learner's reading rate may go down, but this is not the case in all instances. Some considerations that should be kept in mind when teaching a blind learner to read braille include the following:

- Motivation: Reading braille requires time and effort, a lot of concentration and memory skills. This may cause fatigue or even reduce a learner's motivation to read. In an attempt to address this challenge, the teacher should strive towards making it fun and gradually increase the level of difficulty, in order for the learner to experience success.
- Scanning skills: For people with full vision, skimming or scanning a page or picture quickly can help them to read an accompanying text. However, these actions will take more time for a braille reader and will require the support of a sighted person, with reading materials being adapted in advance.
- Oral reading activities: This forms an important part of an assessment and may disadvantage a learner who struggles with reading speed, when scanning and trying to locate a specific place or line in a document. In order to support blind learners, activities such as reading out aloud can be included in class, with learners taking turns, as this may support them in finding the place, orienting their hands on the pages as well as with reading fluency.
- Spelling: Learners with visual impairment are able to spell as well as sighted learners unless another brain dysfunction

is present. Lack of exposure to printed material and not being able to skim a whole word or sentence may however pose a challenge to learners with visual impairment as this will require more effort when wanting to learn correct spelling.

- Punctuation: Punctuation is enforced through reading and should be taught to learners by the teacher. As some braille conventions for displaying punctuation may differ from those for printed material, special attention should be given to this aspect.
- Promoting reading: Teachers can use creative ways to promote reading as a pleasurable and worthwhile activity. Reading materials should be interesting, attractive, clearly laid out and uncluttered, with a range of literary and non-literary texts available for the learners to browse through and read.

Examples of introducing literacy and numeracy using the South African Grade R Braille Workbook

The South African Grade R Braille Workbook has been written according to the national Department of Education's Curriculum and Assessment Policy Statement (CAPS) for Grade R and printed in braille (both text and graphics) for blind learners. However, for the purpose of this chapter, examples are taken from the hard copy printed version, for the sake of accessibility of the text for the reader. Even though Grade R learners are not expected to read the braille in the workbook, they are provided with the opportunity to gain some informal experience of braille and reading braille.

The lessons used as examples are numbered but are not necessarily successive lessons in the workbook. It merely attempts to illustrate the train of thought and the order in which to move from spoken words to tactile discrimination and reading.

Before starting with formal lessons, the teacher will do some informal orientation activities with young learners to familiarise them with their environment and to find their own seat in the classroom. They have to learn their teacher's name, the names of the other learners in the class, how to open and close their bags and lunchboxes, where everything is in the classroom and on the playground, where the toilets are and how to find their class in the mornings and after break. Then the teacher will start, still very informally, to lead the learners to talk 'About me'.

☐ Example Lesson 1: About me

For this lesson, the teacher reads some braille sentences and questions to the learners that focus on senses. The lesson has a question-and-answer format. Some examples of the sentences and questions are captured in Table 5.1.

During this lesson, all senses are covered in this manner, with the teacher making the learners aware of the various senses through prompting sentences and questions. The purpose is to relax them, to teach some simple vocabulary and to build confidence to respond and speak in class. This is a completely unfamiliar environment for the blind learner and can be more intimidating than for sighted learners.

TABLE 5.1: Sentences and questions asked during Lesson 1 on senses.

Sense	Examples of sentences and questions
Smell	• What do you use to smell with? • Touch your nose and count: 'one'. • Which smells do you like?
Listen	• What do you listen with? • How many ears are on your friend's head? • The teacher makes different noises which the learners identify, such as clapping hands, closing a door, pouring water, tearing paper, etc. Learners work in pairs and take turns to also make and identify sounds.
See	• The teacher says: Some people can see and read with their eyes. You are going to learn to read with your fingers.

Source: DBE (2013).

☐ Example Lesson 2: Introducing the concept of different shapes: A circle is round

During the second lesson, learners start using their braille workbooks. They are introduced to handling books correctly, and get the opportunity to experience the 'feel of words' and find words in their books. Graphics are also introduced to them, with the teacher building on concepts and vocabulary that has already been introduced to them.

In presenting the lesson, the teacher may start with large 3D objects that differ from one another (e.g. toys, boxes, blocks and balls) and discuss these with the learners, using and emphasising descriptive words such as 'round', or 'a circle has no sharp sides or angles'. Following this description, learners participate by, for example, following the edge of a circle with their fingers, walking around in the class to find objects like circles, naming other objects that are similar to circles, sorting objects, or making circles with play dough or clay.

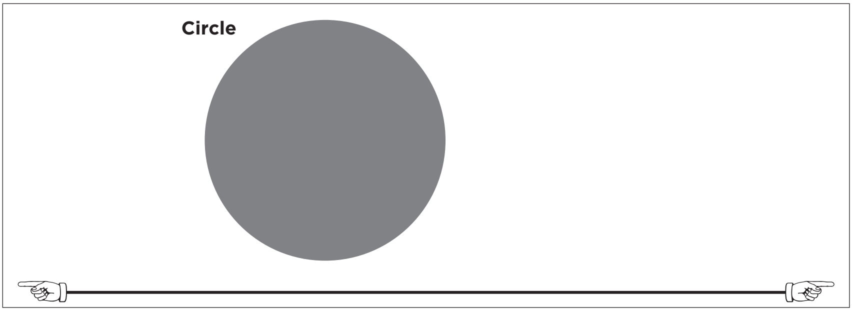
The purpose of these activities and the second lesson is to learn vocabulary and linking words to real objects and shapes. The teacher is not only building concepts and vocabulary but is also introducing simple mathematics at the same time. Mathematics and language are closely linked.

☐ Example Lesson 3: Using the workbook

For the teacher:

Hand out the books and help the learners to find the cover and place the book correctly in front of them with the spine on the left. Placing the book correctly will take some practice and should be repeated every time the learners use the books until they can all place it correctly without help. Guide learners to turn to Braille page 1, Figure 5.6 below and demonstrate how to do this correctly to individual learners who might have difficulty in doing so.

The teacher reads the instructions and guides the learners to do the following:



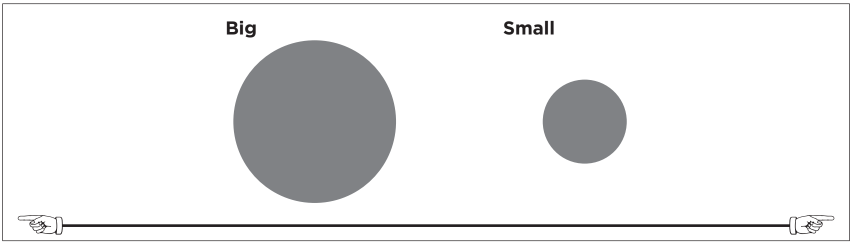
Source: DBE (2013).
FIGURE 5.6: Braille page 1: Circle.

- Use both hands and scan the page from the top to the bottom in zig-zag movements. Cover the whole page (the teacher may have to help by putting their hands over the learner's hands and guiding the learner over the page).
- What do you see/what do your hands find?
- How do you know when something has the shape of a circle?
- What objects are like a circle?
- Trace with your fingers around the circle.
- How many circles are there?
- Let's count (learner puts index finger on circle and counts 'one').
- Learners name parts of their bodies that they only have one of (e.g. One nose, neck, head, tummy).

The teacher reads the instructions on Braille page 2 and guides the learners to do the following:

- Learners use their bodies to compare sizes (The teacher is big and I am small).
- Compare a big plate and a small plate, a big block and a small block. A big bead and a small bead or any other available objects.
- Make a big ball, make a small ball with playdough/clay.
- Sort shapes: put big circles in one container and small circles in another container.

- Put a small circle on top of a big circle and discuss the difference in size.
- Open your book (the teacher may help the learner if necessary).
- Use both hands and scan the page from the top to the bottom in zig-zag movements (Figure 5.7).
- Cover the whole page (the teacher may have to help by putting their hands over the learner's hands and guiding the learners' hands over the page).
- What do you see/what do your hands find?
- Are the two circles the same size?
- Put your finger on the big circle.
- Put your finger on the small circle. How many circles are there?
- Put your finger on one circle and count 'one'.
- Put your finger on the other circle and count 'two'.
- String some small beads.



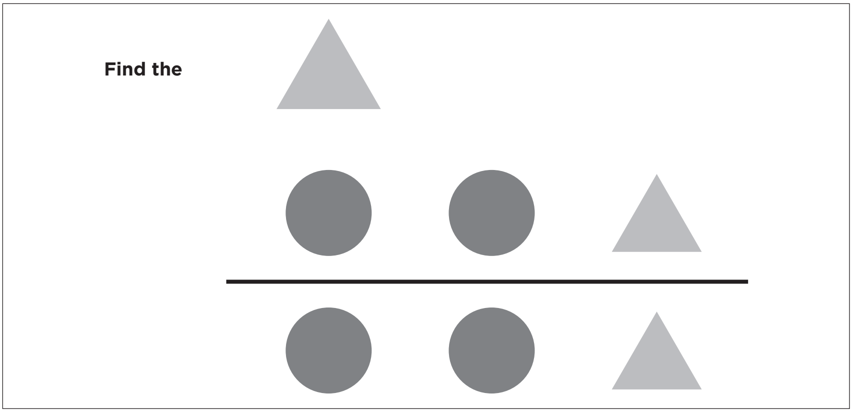
Source: DBE (2013).

FIGURE 5.7: Braille page 2: Big and small.

☐ Example Lesson 4: Things that are the same or different

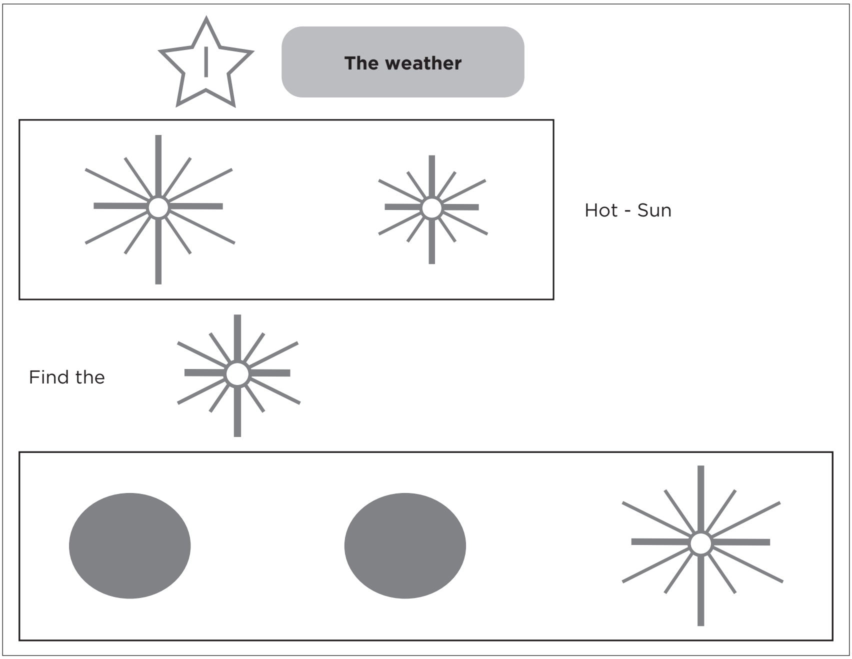
After this lesson, the teacher introduces the concepts of the 'same' and 'different' and then 'left' and 'right', et cetera. (Figure 5.8) before moving on to different shapes.

In Figure 5.9, the first weather symbol is introduced. Note that the symbol of the sun is labelled.



Source: DBE (2013).

FIGURE 5.8: Find the triangle.



Source: DBE (2013).

FIGURE 5.9: The weather: Circle.

Example Lesson 5: Introducing the concept of braille

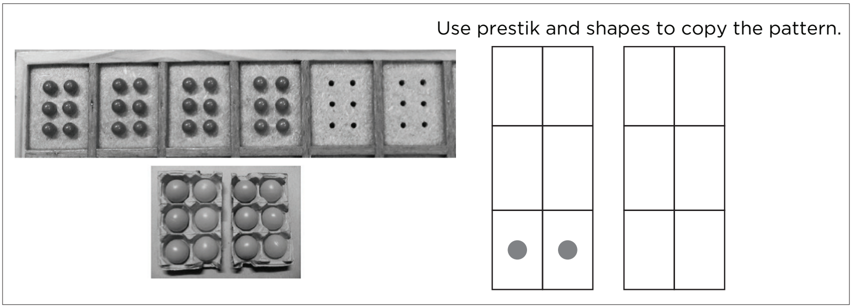
The first ‘picture’ of the braille cell is introduced only weeks later and not as printed braille on paper, but in an ‘experiential’ way using real objects to practise packing a braille cell with eggs in egg boxes or on a braille board with pegs. They will practise this for some time (Figure 5.10) with manipulatives such as shapes and prestik and then start on a more abstract presentation of a braille cell like in the second picture below.

Example Lesson 6: Linking sounds and letters

After this, the teacher starts introducing single letters or the sounds of the letters (Figure 5.11), for example, ‘a’. The letter ‘a’ is presented by dot 1 in braille.

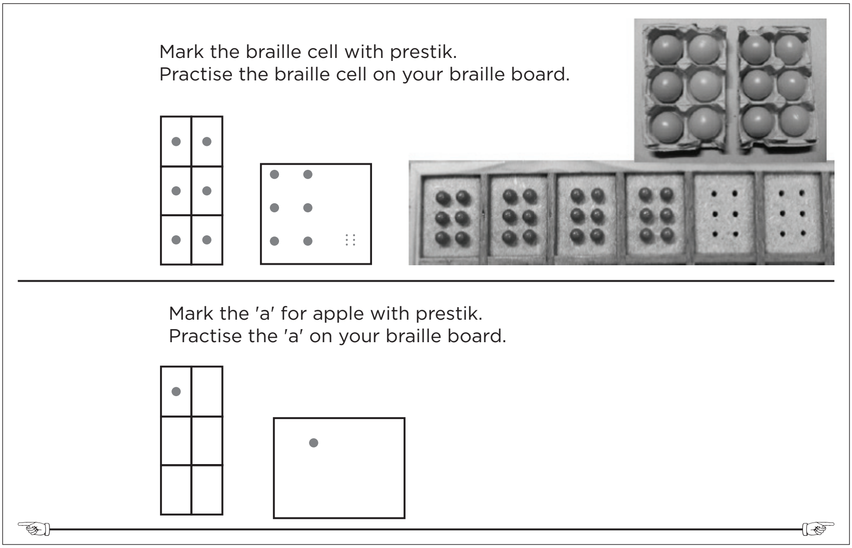
Example Lesson 7: Associating the sound or letter with familiar words

The learners can still not read the words, but as the teacher reads them, they put the prestik in the box (Figure 5.12) next to the word starting with the sound ‘a’.



Source: DBE (2013).

FIGURE 5.10: Use prestik and shapes to copy the pattern.



Source: DBE (2013).
FIGURE 5.11: Linking sounds with letters.

Mark the box of the words starting with 'a' for apple with prestik.

Apple

Box

Ant

Source: DBE (2013).
FIGURE 5.12: 'a' for apple.

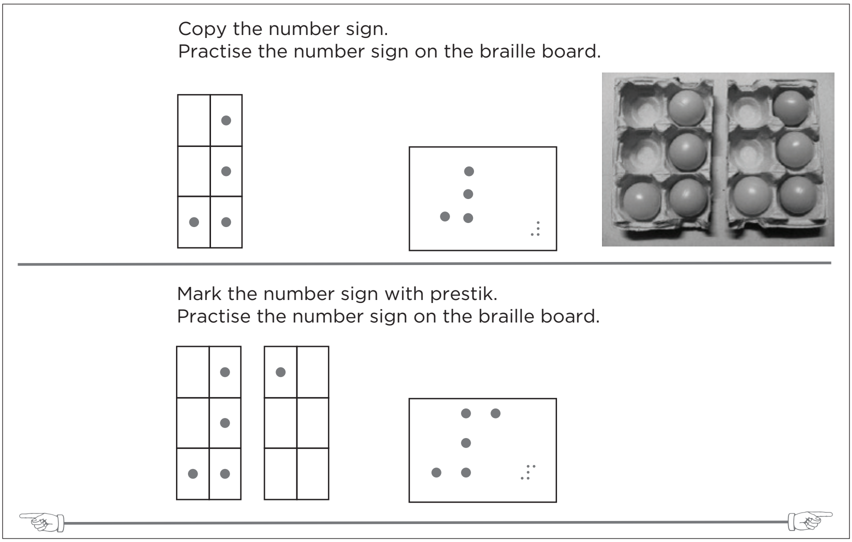
Mark the box of the words starting with 'a' for apple with prestik.

For the teacher: Guide the learners to find the box with 'a' for apple. Learners put their index fingers on the box for apple. The teacher says 'apple'. Discuss the sound that they hear at the beginning of the word 'apple'. 'Do you hear "a"'? 'Yes, apple begins with "a"'. 'Put prestik in the box because "apple" begins with "a"'. Guide learners to find the second block for 'a' and repeat the sequence. A few weeks after this lesson on the 'a', the teacher will continue with the number 1 for a very specific reason before learning more letters. Here is why.

Example Lesson 8: The number sign and the number 1

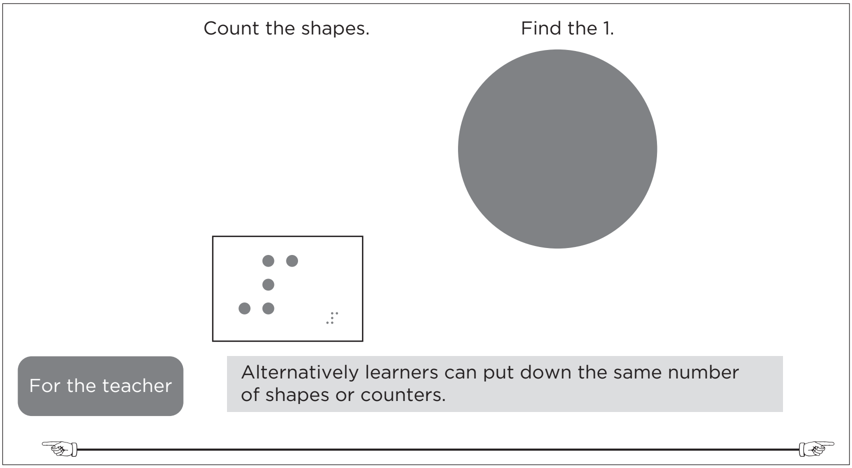
The letter 'a' and the number 1 are both presented by dot 1 in braille, but to distinguish between the letter and the number, the number sign (dot 3, 4, 5, and 6) is printed before the dot 1. Now it is number 1 and not 'a' (Figure 5.13).

On the next page, the learners associate the number 1 with one object: one-to-one counting (Figure 5.14).



Source: DBE (2013).

FIGURE 5.13: The number sign and the number 1.



Source: DBE (2013).

FIGURE 5.14: Associating the number 1 with one object.

The teacher will in the same way as the above lessons do the letter 'b' and the number 2. The recognition of letters/sounds and numbers continue throughout Grade R, while simultaneously learning more vocabulary and reading tactile pictures.

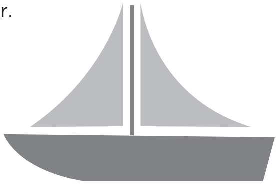
☐ Example Lesson 9: Learning vocabulary – Things that go

The teacher makes use of a toy plane, a small boat and a toy car (Figure 5.15 and Figure 5.16) to talk about and let the learners explore the braille drawings.

Following the Grade R year, the Grade 1 CAPS for languages continues in the first term with the recognition of letters and learning vocabulary. The curriculum follows a systematic increase in the level of difficulty from one grade to the next and thus, blind learners progress in the same way as mainstream learners. Building vocabulary and acquiring general knowledge should however be approached more purposefully in order to make up for limited incidental learning.

Transport on land.

Transport on water.



For the teacher	Talk about transport that goes on land. Talk about transport that goes on water.

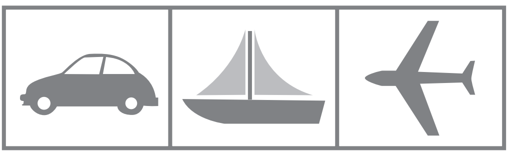
Source: DBE (2013).

FIGURE 5.15: Learning vocabulary exploring braille drawings.

Transport in the air.

For the teacher	Talk about transport that goes in the air. Learners sort different kinds of transport toys together.

Which transport goes on land?
Which transport goes in the air?
Which transport goes on water?



For the teacher	Let learners point to the picture that tells them which transport goes on land, which in the air and which on water.

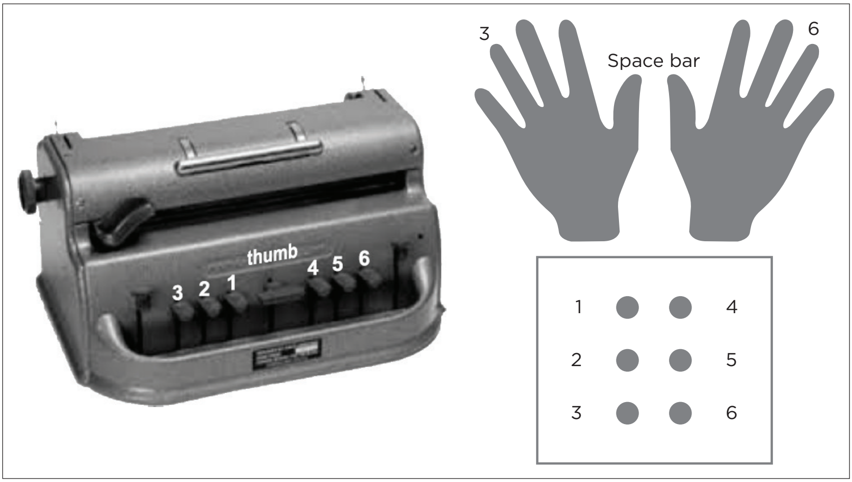
Source: DBE (2013).

FIGURE 5.16: Learning about transport exploring braille drawings.

Introducing learners to the Perkins Brailler

During the last term of Grade R, learners are introduced to the Perkins Brailler (Figure 5.17) which is the instrument they will use for writing, similar to sighted learners using pencils for writing.

In discussing the use of the Perkins Brailler, the teacher should pay attention to practical guidelines when using this resource, as a guide and preparation to learners. To this end, the teacher should explain that the pressure on the keys must be firm but light. As the writing action requires a crisp, staccato pressure on the keys, the Perkins braille user should thus press down firmly, but release the pressure on the keys immediately. In addition, the fingers should remain in contact with the keys when pressure is released. When explaining this, the teacher may find it useful to demonstrate the action on the learner's hand or forearm with their fingers and applying the idea of releasing pressure without losing contact. Throughout, the pressing down action and pressure on all keys should be even (adapted from *Grade R Workbook for Braille* 2013).



Source: DBE (2013).

FIGURE 5.17: Perkins Brailler.

The teacher should furthermore ensure that learners use the correct fingers on the keys at all times, more specifically the index, middle and ring finger on the six keys and the thumb on the space bar. Supple movement of the wrist should be encouraged to ensure that the thumb easily reaches the space bar.

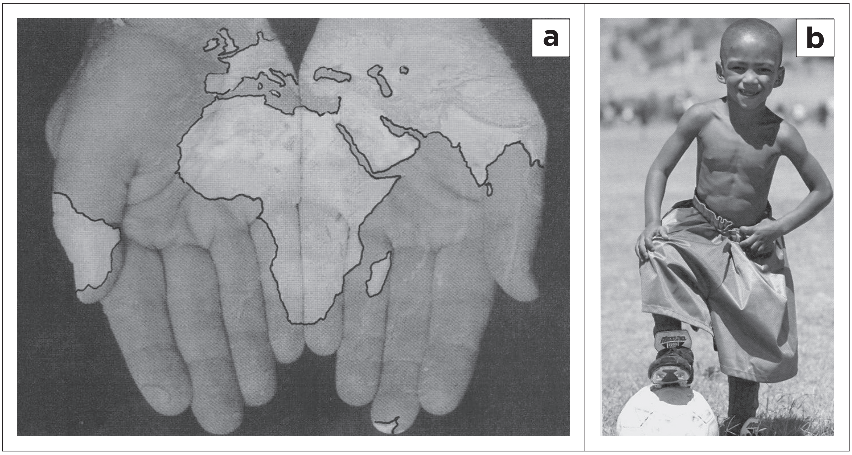
In applying these principles and facilitating lessons on the use of the Perkins Brailler, writing exercises can start with the learner practising lines of full braille cells, followed by full braille cells with a space in between. During these exercises, the teacher must check the cells that the learners produce in order to ensure that all the dots are present and even, in other words, that they have pressed down with force on all the keys. Once these basic skills have been acquired, progress can be made to the following finger combinations:

- Using three fingers of one hand only.
- Using the middle fingers only (because the middle fingers are the longest and can thus create a better balance of the hand on the keys).
- Using index fingers only.
- Using the middle and index fingers together.
- Using the index and ring fingers together.
- Using the ring fingers only.
- Using three fingers of one hand and one finger of the other hand.

During these phases of the learning process, the teachers should check for shadow dots, specifically in spaces and when learners do not write with the three fingers of one hand.

Teaching languages to older learners with visual impairment

When teaching languages, history, economics and many other subjects, information is presented more and more by means of diagrams and tables or through pictures, cartoons and comic strips such as Calvin and Hobbes, Garfield, Blondie or Peanuts.



Source: DBE (2013).
FIGURE 5.18: Photographs 1 and 2.

Sighted learners see all these images around them on a daily basis and gradually acquire the skills to interpret them visually by talking to their friends or parents, or by listening and watching television. In this manner, they will incidentally learn to interpret the ‘code’ of symbols, signs, styles, facial expressions, body language, objects used and how these may impact on the message of an illustration, which can for example be irony, exaggeration, fear, sadness, satire or be an analogy, symbolic or abstract, conveying concrete ideas and contemporary or past social or political issues.

On the contrary, the learner with visual impairment needs to be taught all these elements of design during class time, which is never enough to teach such detail. In light of this, and based on the fact that no one can ever know all the artistic techniques that can be used in illustrations, the teacher should include as many examples as possible in class, explaining in detail everything that is in an illustration, how it is used and why it is there, thereby touching on the meaning to the reader. Throughout, learners should be made aware that they should take an interest in current affairs, popular culture and social issues in order to be able to interpret cartoons and other illustrations, or newspaper articles and television advertisements and reports.

Metaphors are often used and easily understood – even by blind learners, such as 'He is a walking dictionary', or 'Thank you so much, you are an angel'. However, some metaphors may not be understood by a blind learner if the meaning is not explained for example 'That girl is a real peacock', 'His eyes shot fire' or 'This issue is not merely black or white, there is a whole lot of grey area'. The teacher should thus ensure that the necessary explanations are included when using metaphors.

In terms of the use of visual material, assessments on creative writing in all grades often make use of pictures when, for example, requiring of learners to write essays about any one of a few given pictures, with the essays and pictures correlating with each other. For learners with visual impairment to be able to have access to and complete such questions, they need to have acquired the skill of interpreting pictures.

When wanting to include such questions in test or exam papers, teachers should thus include descriptions of the pictures, using the minimum number of words to describe the picture without including any interpretation, as too many prompts and words curb creativity. For example, a description such as 'A photograph of two cupped hands on which a world map is painted' and 'A photograph of a young, smiling boy dressed in oversized shorts and boots, his foot resting on a ball' can be used when including Photographs 1 and 2 (Figure 5.18) in test or examination papers.

Teaching mathematics to learners with visual impairment

Number sense and logical reasoning heavily rely on visual skills. As learners with visual impairment do the same mathematics as sighted children, it is important that the learning materials are adapted (also refer to ch. 6 and ch. 7 by Viljoen) and supported by the suitable teaching aids, to be accessible to the learners. Whereas most full sighted learners find it easy to compare differences and likenesses in amount, size, shape, height, length, etc., learners with visual impairment will not automatically look for and focus on differences and similarities. As such, they need to be guided to explore, compare, order and solve problems in the real world in order to develop a natural number sense.

Of equal importance is the conscious development and nurturing from a young age of spatial understanding and spatial awareness. In this regard, Henion and Mix (2013), remark the following:

> Understanding the connection between spatial ability and math is especially important in the early elementary grades [*foundation phase*] because many studies indicate early intervention is critical for closing achievement gaps in math. (para. 6)

Spatial understanding entails the ability to visualise in one's mind one's own position, as well as the position of other objects in the environment or space, their spatial relationships to each other as well as the relevant shapes, sizes and how other forms can be created out of these, what they look like from different viewpoints or how to fit them into an environment or space. Some suggestions for developing spatial awareness include the creation of opportunities and encouragement of very young learners to explore groups of objects with one or two hands (beads, coins, sweets, buttons, toys and building blocks) and to compare the size, texture, positioning, direction, height, under, over, above, etc.; the matching of a number of objects to the number of fingers; talking about numbers by responding to questions about how many, how many more or less, or how many more are needed. Various mainstream teaching aids exist, such as building blocks, shapes, tangrams and mosaic tiles that can be used to enhance spatial understanding and may be applied with learners with visual impairment too.

Several strategies can be employed in following a practical approach when teaching mathematics to learners with visual impairment. Some of these strategies and considerations are described below.

Accessible learning material

It is the responsibility of the teacher to provide learner support material that is in the correct format for daily classwork activities. For example, the teacher needs to be able to use mathematics software when typing exercises and assessments, including diagrams, and to then print it on a braille embosser.

MathType software has shown good results when used with Duxbury braille translation software. Generally, correct and quality braille assist with graphics and layout. For this purpose, a good source that teachers can consult is the book *Unified English Braille Code – Guidelines for Technical Material* book, available from Pioneer Printers. In addition to teaching learners to copy the layout from their textbooks or workbooks printed by one of the braille printing houses for correctness, Dymo tape labels can be added to classroom resources, such as measuring cups, clocks, number lines, etc. in order for blind and partially sighted learners to be able to use the resources.

Concept development

Learners with visual impairment require additional assistance to develop a good understanding of number and spatial concepts. Whereas a sighted learner can immediately see which object on a table is the biggest, nearest, furthest to the left or the highest, a learner who can see only part of an object or area at a time, has to mentally put the pieces together after identifying each part before being able to make sense of the object.

In support of concept development by learners with visual impairment, activity packs and activity cards can be utilised, which cover topics such as matching, geometry, sequencing, spatial development, symmetry, transformation and tessellation. With the aid of such resources, spatial concepts and vocabulary may be developed to, for example, be able to understand the concept of a right angle turn and develop a feel for measures, in turn, supporting the learner's ability to understand mental maps as well as routes around the school and beyond.

Teaching specific topics in mathematics

Counting and ordering

A young learner with full vision can see that moving things around will not change how many things there are. However, when finding objects one-by-one, if you cannot see it, it may not be obvious that the number does not change. To this, teachers are encouraged to include activities where learners work with concrete objects such as number rods, counting or building blocks, pegboards and an abacus for long periods of time in order for them to be able to develop their sense of numbers and patterns, square numbers, sequencing, ordering and factor pairs.

Focusing on concept development and thereafter on method when teaching the four basic operations

Teachers should ensure that all learners understand the basic concepts, such as more, less, many, etc., one-to-one correspondence, the concept of sets, and basic number sense before using the four operations. These operations should be applied to real-life situations, such as calculating the price of materials required for a learner project, or the number of players in a specific number of soccer teams. Learners should be encouraged to also make up their own sums, using different operations, quantities, time, etc. As vocabulary is important in mathematics, mental mathematics and memory play a bigger role for blind learners than for sighted learners.

Some practical guidelines that may assist teachers who teach mathematics to blind learners include the following:

- Focus on different combinations of numbers that can make up a specific number.
- When teaching facts, focus on two or three related facts at a time. As accuracy is the priority and with speed being less important, learners should be allowed sufficient time.
- The number line is useful for working on operations, relationships, fractions and decimals. Stretch a number line across the top of the learner's desk, made, for example, of Velcro with Velcro numbers to stick on to the line. This activity can assist learners with counting forward for addition and counting backward for subtraction. They can use the same number line with other numbers stuck onto it when working with positive and negative numbers.
- Thermometers with braille or large print labels stuck onto these with Dymo tape can also be useful in teaching positive and negative numbers.
- Play games when working on the basic operations, using flashcards in braille and large print.
- Learners can roll dice marked in braille, and then add, subtract, multiply or divide the numbers thrown. If part of a game, the first learner whose numbers add up to, for example, 100 can win, or when starting at 100, numbers can be subtracted as the dice are thrown with the first learner reaching zero being the winner.
- Unifix cubes can be used to teach addition to young learners. When teaching multiplication and division, the 100 boards and multiplication boards can be used, overlaid with braille or large print.

Fractions, percentages and ratio

Sets of fraction circles and fraction strips marked with braille are ideal for teaching the concept of fractions. The interchangeable pieces can be used to demonstrate the relationship to a whole strip or circle.

Decimals and money

Learners with visual impairment may have less experience in handling money, as they may not be used to going to shops or paying for something and receiving change. Price labels are often too small for them to see and are usually not in braille. This lack of, or limited experience, can put learners with visual impairment at a disadvantage in terms of relative cost and value of everyday products. In an attempt to address this limitation, learners should be taught to distinguish between coins and notes, using real money and also involving the parents to teach their children about money. South African notes and coins fortunately have excellent tactile markings that can be used by learners with visual impairment to identify money.

Equivalent measures

Estimating distance or length is a difficult yet important skill for learning independent mobility skills. When teaching this, the teacher should provide ample opportunities for learners to practically measure size and distance in order for them to gain experience and be better able to judge relative size and distance. In addition to being important for the acquisition of O&M skills, the ability to estimate and order objects by size is an important life skill.

On a practical level, teachers can adapt scales, measuring spoons and measuring jugs with bold marker pens or Dymo stickers which are in braille. When working with liquids, food colouring can be added to make it easier for learners with visual impairment to see.

Calculations and written methods for operations

Braille mathematics is written linearly, that is, the fraction $\frac{3}{4}$ is written as $3 \div 4$. Seeing a whole calculation at once, taking in place values at a glance or seeing that there are brackets around one part of an equation may therefore be difficult for learners with visual impairment because of the linear layout followed in braille. As a result, more time should be provided for learners to work out which operations are required in a calculation before applying the rules that determine the order in which operations are performed. When not able to see a complete calculation, more short-term memory and concentration are required by the learner to keep track of what to do next.

When learning content involves calculations, it is important for the teacher to check how many examples a learner needs to complete to gain a secure understanding of the skill or concept being taught. In such a case, the learning outcome is more important than completing a certain number of questions to meet the expectations for other learners. When teaching the concept of remainders and quotients, the teacher can use bricks, the counting of blocks, and fraction strips or circles labelled in braille to demonstrate the content in a practical way.

☐ Calculator methods

Talking calculators are useful for both learners who are blind and learners who are partially sighted. When using these devices in class and during examinations, earphones should be used. Furthermore, learners should be able to key in calculations when using a calculator.

☐ Word sums

When teachers require learners to solve mathematics word problems, they should be cautious not to assume that the learner with visual impairment will already have the necessary general knowledge inherent to resolving the sum. Very often, learners with visual impairment do not hold the same level of general knowledge as others, even for simple things such as the number of eggs in a dozen or the number of legs a chicken has.

In order to address such a potential challenge when teaching this learning content, a problem-solving model can be followed.

To this end, the teacher and learner first need to identify the specific kinds of information required and then decide on the choices of operations to solve the problem.

Diagrams and data tables

Graphs, pie charts, histograms and tables present a huge challenge to learners who can only see a small part of it at once, or who has to explore a tactile diagram by touch. In the same manner, learners with visual impairment will find it hard to distinguish between colours or different shades of the same colour or different textures. As examination and learning support material are typically visual by nature, learners with visual impairment need as much experience as possible with a wide variety of diagrams in order for them to succeed and progress.

Because of the limitations of the braille layout, teachers may have to reduce the number of data entries for some activities, without compromising the learning outcomes. When learning about mean, median and mode, for example, the ability to calculate an average is more important than having to work with large data sets.

Graphs

Teachers can teach learners to draw simple graphs, like bar graphs, with a Perkins Brailler by using braille cells as units. For this purpose, they can use their own bold-lined graph paper or embossed graph paper. Wikki stix, string, elastic bands, prestik and a homemade (Figure 5.27) or bought graph board with grooves and pins with braille numbers on are furthermore useful for plotting graphs.

Two-dimensional and three-dimensional shapes

Learners with visual impairment generally experience position, direction and two-dimensional (2D) drawings of 3D shapes as challenging. It takes a lot of effort to explore a 3D shape through touch only, working out how many faces, edges and vertices it has, whether it is regular or irregular, and finally what shape it is. Cross sections and views from different sides are particularly difficult for blind learners to grasp. When teaching these, cross sections can be demonstrated by cutting a familiar object, like a fruit, in half.

☐ Symmetry

In CAPS, the teaching of symmetry starts in Grade R when using shapes on a board or pegs on a pegboard. When teaching this topic, the teachers can place a very simple design on the board and ask the learners to copy the design on an identical board. Next, the line of symmetry can be marked with Wikki Stix or string. Some learners may find the folding of pre-cut 2D shapes to be another possible way to understand symmetry.

☐ Position, direction, movement and geometry

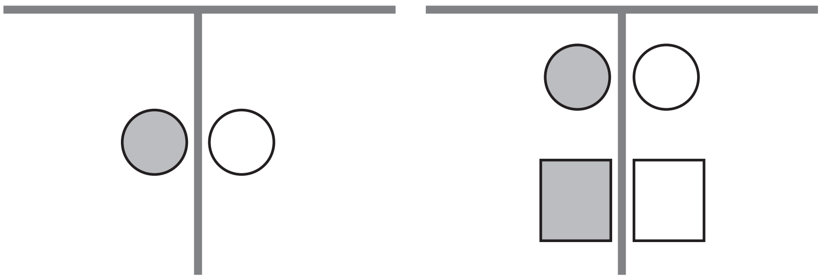
When teaching these topics, low vision and tactile geometry sets can be helpful. As a tactile protractor has a 7 cm radius, angles will have to be drawn large enough to accommodate this protractor. Furthermore, teachers should guard against drawings for measuring angles in braille that are cluttered.

In addition to being essential for mathematics, a good understanding of a right-angled turn or rotation, a 180° or half turn, and a full 360° rotation or one revolution is also important for spatial orientation, the understanding of instructions for simple directions within a room and for becoming independent in O&M exercises. In the same manner, it is necessary that learners with visual impairment understand north, south, east and west.

Transformations

When teaching transformations like translation, enlargement, rotation and reflection, teachers can use bought or cut-out shapes before using tactile images. The foundation for these concepts can be laid as early as Grade R. Figure 5.19 provides an example of how to start the teaching of symmetry, reflection, translation, shapes and position in Grade R.

Instruction: Stick your shapes on the shapes on the right-hand side of the picture. Use prestik.



Source: DBE (2013).

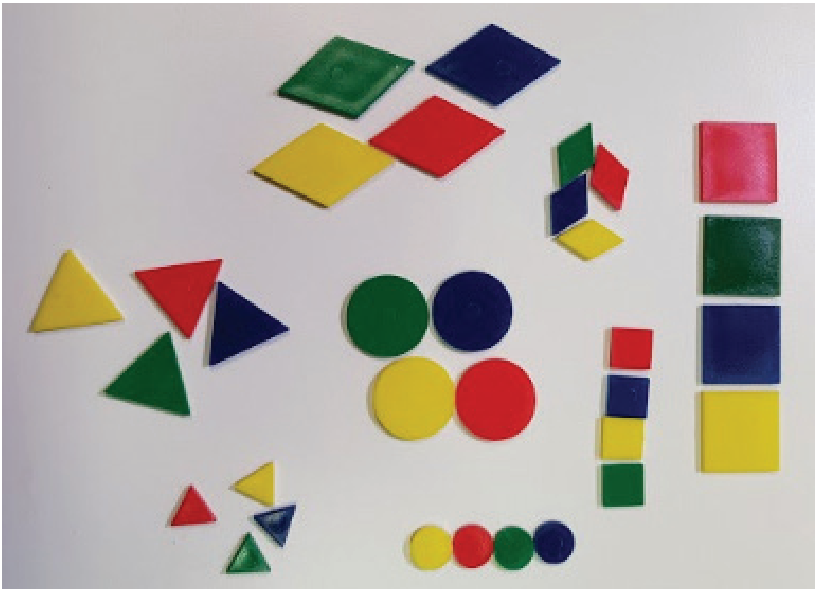
FIGURE 5.19: Examples of mathematical transformation.

Resources and technologies when teaching through braille

Using the appropriate resources and technology to support teaching through the medium of braille is important. The resources and technology listed in Table 5.2 below form an integral part of LTSM. It serves to enhance conceptual understanding, as well as to provide better, and sometimes faster, access to learning support material. Technology is not a replacement for braille. They are allies that complement and support the teaching of learners with visual impairment.

TABLE 5.2: Resources and technologies when teaching through braille.

Resource type	Resources for braille
Basic resources required by blind learners	A braille writer (Figure 5.17)
	Refreshable braille notetaker or computer with a refreshable braille keyboard
	Braille paper and a braille eraser
	A speaking calculator
	Braille ring binders
	A braille atlas
	A braille calendar
Drawing and measuring equipment	A braille ruler (Figure 5.26)
	Braille compass with a small tracing wheel instead of a pencil at one end (even though this is hard to find)
	A braille protractor (Figure 5.26)
	A tracing wheel
	A construction board (homemade or bought from the American Printing House for the Blind) (Figure 5.27)
	Homemade or bought stencils for graphs (Figure 5.28)
	Elastics
	Wikki Stix
	Embossed graph paper or embossed Cartesian plane
	Measuring jugs
	Measuring balances
	Clocks (Figure 5.25)
	A set of three-dimensional prisms, pyramids and spheres (Figure 5.23)
Geometric and other resources	Sets of shapes (Figures 5.20, 5.22 and 5.24)
	Building blocks
	Fraction circles and strips
	Number rods
	Tangrams
	Base 10 sets (Figure 5.21)
	Geoboards
	Multiplication boards and hundred boards
	sets of small animals, farm animals and ordinary toys
	Jars with and without lids
	Dice
	Cookie cutters
	Play dough or clay
	Braille games such as Ludo and Snakes and Ladders



Source: Photograph provided by the University of Cape Town Centre for Innovation in Learning and Teaching, taken in 2019, location unspecified, published with permission from the University of Cape Town.

FIGURE 5.20: A set of mathematical shapes.

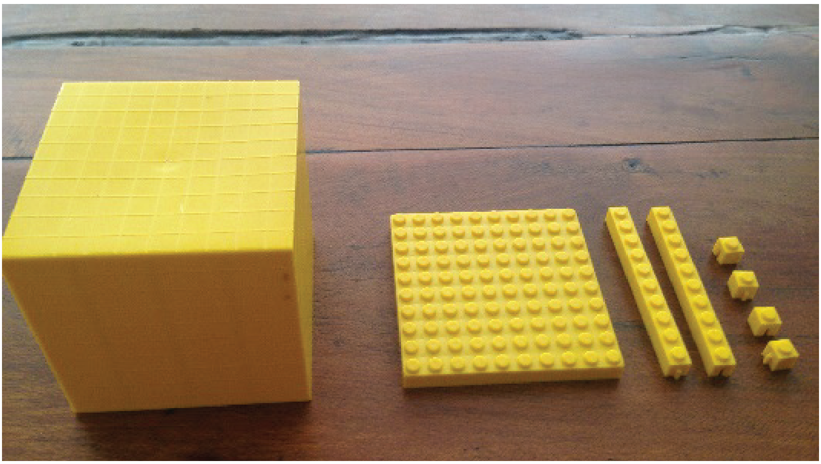


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FIGURE 5.21: Base 10 set.

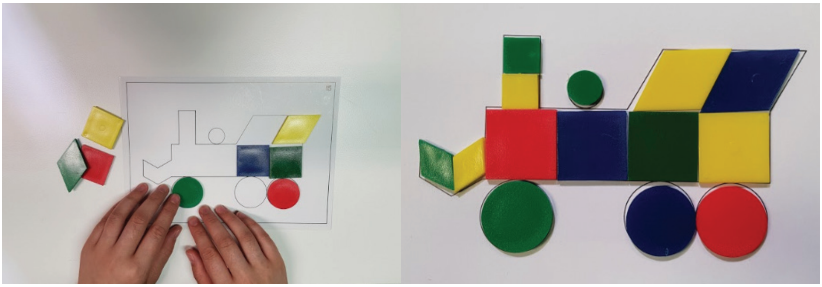

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FIGURE 5.22: Filling in a raised drawing of a locomotive with shapes.

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FIGURE 5.23: A set of three-dimensional pyramids.

Source: Photograph provided by the University of Cape Town Centre for Innovation in Learning and Teaching, taken in 2019, location unspecified, published with permission from the University of Cape Town.

FIGURE 5.24: Practicing fine motor skills with shapes, nails and a small hammer on cork board.

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FIGURE 5.25: A teaching clock overlaid with braille.

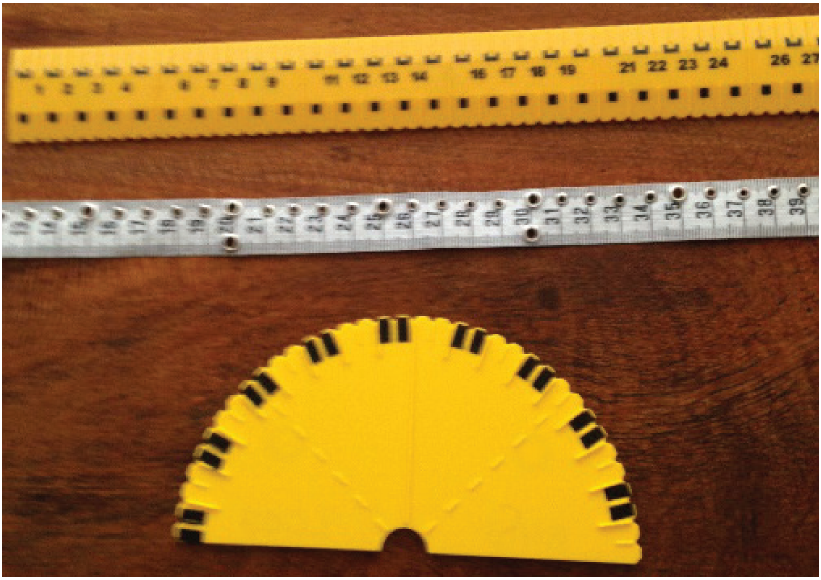

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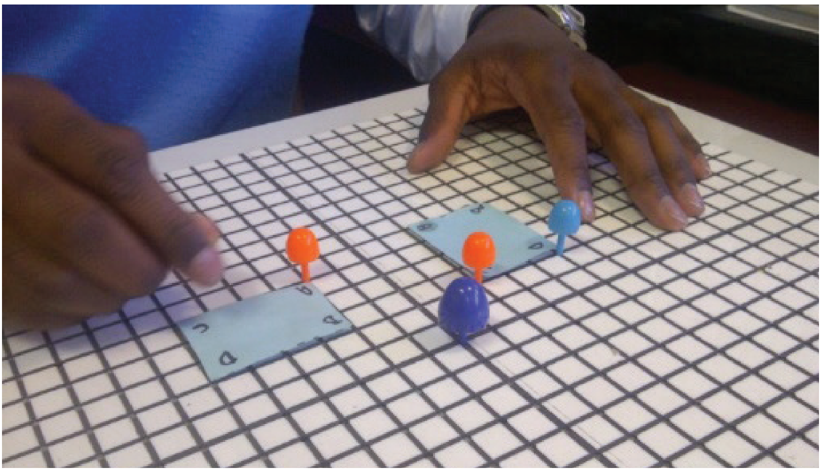
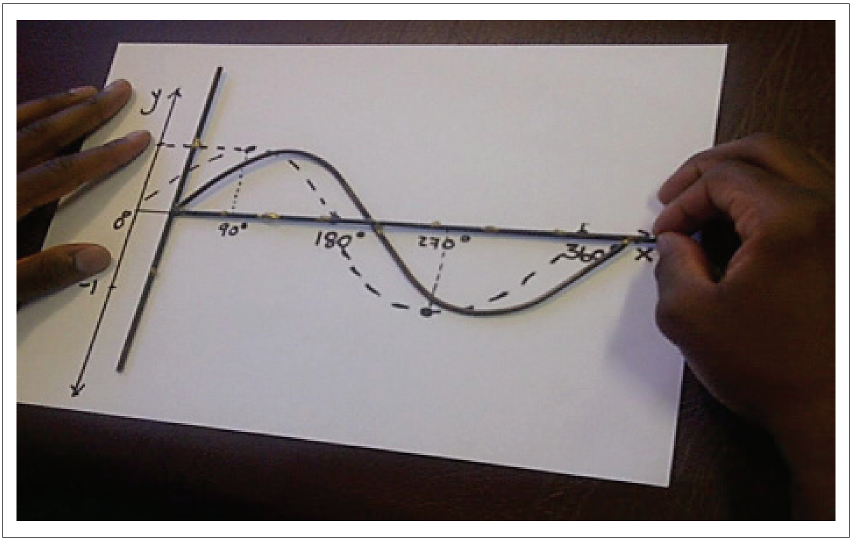
FIGURE 5.26: Braille measuring equipment.



Source: Photograph taken by Francois Prinsloo, unspecified date and location, published with permission from Francois Prinsloo.

FIGURE 5.27: A homemade grid with holes and pegs.



Source: Photograph taken by Francois Prinsloo, unspecified date and location, published with permission from Francois Prinsloo.

FIGURE 5.28: A homemade stencil for trigonometric graphs.

Conclusion

We have to ensure that the teaching of braille is not neglected in our schools. It enhances concept development and is not in opposition with developing new technologies, but braille and technology should be equal partners in the successful teaching and learning of blind learners. Schools should prepare learners to play their rightful equal role in the workplace by being familiar with all mediums of communication. Braille is foundational to reading and writing and should be taught in partnership with all other technologies.

Chapter 6

Practical approaches to curriculum differentiation for learners with visual impairment

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Keywords: Learners; Visual; Teaching; Lesson; Teachers.

Introduction

A 'learning-friendly' environment is 'child-friendly' and 'teacher-friendly'. It stresses the importance of learners and teachers learning together as a learning community (United Nations Educational, Social and Cultural Organisation [UNESCO] 2004:4).

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This quotation emphasises the importance of teachers being lifelong learners. Just as in the case of many learners requiring special support in order for them to perform optimally, teachers also need to be equipped with the necessary knowledge and practical tools to facilitate successful learning for all learners in their classes. This implies that teachers should be equipped to ensure accessible lessons, use effective teaching strategies, conduct fair assessments and provide suitable learning support material.

The purpose of this chapter is to provide teachers with a practical perspective on the promotion of inclusive education in the classroom through curriculum differentiation. It may result in teachers feeling empowered to fulfil this role in ever changing and increasingly diverse environments. Curriculum differentiation entails the process of thinking about teaching and learning in new and different ways. It is about innovation rather than following a set recipe. As such, curriculum differentiation is something that continually evolves or develops (DBE, Guidelines for Responding to Learner Diversity in the Classroom through Curriculum and Assessment Policy Statements 2011:2).

It is often said by teachers, parents and learners that the curriculum is too visual and not suitable for learners with visual impairment. Against this background, the aim is to provide possible answers to the question as to how teachers can differentiate the core curriculum in order to make it accessible for learners with visual impairment, while at the same time infusing aspects of the ECC into daily lessons.

■ Overview of the chapter

Prior to looking at differentiating the core curriculum, two aspects inherent to the learner with visual impairment are considered: incidental learning and the ECC. The four building blocks of curriculum differentiation, namely, differentiating the classroom environment and/or management, differentiating the content, teaching methodologies and differentiated assessment, are then discussed. By using example lessons, it is shown how the ECC is infused into everyday lessons.[1]

Definition of key concepts

Assessment

The strategy or activity of determining how much learning had taken place as a result of teaching and learning that had occurred. It is regularly organised and administered in a planned manner. Assessment provides feedback to learners, teachers and parents, with the aim of improving the teaching and learning process.

Classroom environment or management

Adapting the environment in order to create a positive classroom environment where learners feel valued, encouraged to take risks and actively participate in discussions.

Curriculum differentiation

A key strategy for responding to the needs of learners with diverse learning styles and needs. It involves processes of modifying, changing, adapting, extending, varying teaching methodologies, teaching strategies, assessment strategies and the content of the curriculum (Guidelines for Responding to Learner Diversity in the Classroom through Curriculum and Assessment Policy Statements, DBE 2011:4).

1. Some of my thinking and/or material in this chapter was originally articulated in guidelines documents and training manuals developed while I was working on contract for the DBE. The authors of these documents worked as a team and were not individually recognised. Although unpublished, documents, such as *Responding to Diversity in Grades R to 9: Practical Approaches to English & Mathematics Curriculum Differentiation*: Participants manual, Chapter 9, pp. 125–126 (August 2017), were widely used and informally disseminated within the education sector in South Africa and such documents or parts thereof can still be found on educational platforms.

Differentiated assessment

Assessment that is adapted, based on the belief that the needs of learners cannot all be met in the same way.

Expanded core curriculum

A curriculum that addresses the knowledge and skills required by learners with visual impairments because of their unique disability, specific needs and a lack of incidental learning.

Incidental learning

The skills and knowledge that sighted learners acquire by casually and informally or incidentally observing and interacting with their environment.

Learning content

What the teacher teaches and what the learners are expected to learn.

Teaching methodology or strategy

The way of teaching is differentiated at different levels, including aspects such as learning support material, methods of presentation, learning activities and lesson organisations.

Incidental learning

People with normal vision learn approximately 80% of what they know by incidental learning, which is often graphically communicated. As young learners primarily learn through incidental learning, learners with visual impairment are therefore denied access, to a large extent, of the knowledge and skills that are acquired by incidentally seeing and copying of others. In this regard, even though the visually impaired learner needs to acquire the same knowledge and skills as sighted learners and therefore needs to be exposed to the same variety of experiences, they need to do this with reduced visual complexity, gaining the same knowledge through senses other than vision, without everything being reduced to 'non-visual' experiences. As such, the experiences and concepts that other learners incidentally learn have to systematically be taught to learners with visual impairment throughout their developmental years and even after they leave school.

As a result, it has become clear over the years that learners with visual impairment can not only be taught the National Core Curriculum which includes all the academic subjects but should, in addition, be taught what has become known as the ECC. Dr Phil Hatlen (2019), who served as the Superintendent of the TSBVI from 1990 to 2007, explains the ECC in the following way (2019):

> The expanded core curriculum consists of educational topics or subjects that are unique to blind and visually impaired children because they do not have the opportunity to visually and causally observe behaviour. Every one of the areas of the expanded core curriculum have to do with the inability to observe and shape one's behaviour based on what they see visually. (para. 1)

Expanded core curriculum

As indicated by Dr Hatlen, the ECC addresses the knowledge and skills needed by learners with visual impairments because of their unique disability and specific needs. In this chapter, the ECC is not discussed in detail; the focus rather falls on the impact of the ECC on the teaching of the core curriculum, and how the additional and specific needs of learners with visual impairment may be addressed. At its core, the following aspects of the ECC require additional time and input during everyday classroom teaching, in order to support learners with visual impairment:

- Compensatory or access skills, which include, for example, learning braille, using large print, practising speaking and listening skills, developing better memory and developing study and organisational skills (also refer to ch. 4 by Du Plessis and ch. 5 by Viljoen).

- Assistive technology, as this can provide the learner with better access to the curriculum and can be an important instrument to ensure equal access on condition that the instrument is appropriately selected for a particular learner and that the learner is properly trained to use it (also refer to ch. 3 by Ramaahlo and ch. 8 by Erwee).
- Orientation and mobility, which include the teaching of learners to move around the environment using a long white cane, having a good body posture, strengthening the hands of the young braille user, developing tactile sensitivity, building conceptual and spatial understanding of far, near, high, low, sequencing, direction, safety, travel and independence, and acquiring some independent living skills (also refer to vol. 1, ch. 7 by Heard).
- Independent living skills, which, for example, include hygiene, cleaning, cooking, serving food, good manners, being organised, making appointments, doing shopping, measuring and planning activities (also refer to ch. 4 by Du Plessis).
- Sensory efficiency, in order for learners to be able to use their residual vision optimally. As the sight of learners with visual impairment varies, systematic intervention is required for them to learn about tactile sensitivity, tracking, scanning, visual discrimination and the use of optical devices.
- Career education, thereby guiding learners to explore their strengths and weaknesses, and learn about different careers and what it entails, which skills and qualifications are required and which knowledge and information can be regarded as important prerequisites (also refer to vol. 1, ch. 11 by Sefotho and ch. 12 by Heard).
- Recreation and leisure, whereby teachers can deliberately address the lack of sufficient information and experience of suitable activities that learners with visual impairment can enjoy throughout their lives and create opportunities for a

variety of activities such as music, sport, dance, and so on (also refer to ch. 9 by Heard).
- Self-determination, whereby teachers can guide learners how to handle peer pressure, acceptance of the self and others, frustration, abuse, finances, building self-esteem and acquiring self-efficacy as well as how to fully participate in the world out there, believe in the self, control one's own life, and so on (also refer to vol. 1, ch. 8 by Greyvenstein).
- Social interaction, which is about behaving socially in appropriate ways, dressing appropriately, being independent versus accepting help, communication, self-worth, the thin line between social acceptance and isolation, one's own feelings and life as an adult.

In South Africa, no allowance is made for separate periods on the timetable of the school or specialist itinerant or school-based staff to teach the ECC, apart from a few schools that have braille instructors, O&M instructors, occupational therapists and psychologists. Even though it cannot be expected of classroom teachers to deliver the majority of the ECC, classroom teachers need to be aware of the fact that blind and learners with visual impairment have additional curricular needs and need to acquire the skills listed above. As a result, teachers are encouraged to find ways to and spend some time on 'infusing' as much as possible of the ECC into their daily classroom teaching.

■ Curriculum differentiation for learners with visual impairment

According to Tomlinson and Allan (2000), differentiation can be defined as:

> [*A*] teacher's response reacting responsively to a learner's needs. … understands a student's needs to express humour, or work with a group, or have additional teaching on a particular skill, or delve more deeply into a particular topic, … guided help with a reading passage … teacher responds actively and positively to that need. (ch. 1, para. 8)

Closely aligned, the South African Guidelines for Responding to Learner Diversity in the Classroom through Curriculum and Assessment Policy (DBE 2011:4) regards curriculum differentiation as the most vital tool for meeting the needs of learners with diverse learning styles and needs. In the classroom, curriculum differentiation is addressed at four levels: content, teaching methodologies, assessment and learning environment. The content can be changed, modified, varied or selected to suit the learner's ability levels, cultural backgrounds and environment. Similarly, the teaching and assessment methodologies and strategies are modelled on the needs of the learners. Furthermore, for learners with visual impairment, the school and classroom environment should be adapted and modified for optimal access.

The responsibility lies with teachers to put aside their own beliefs and attitudes to make all learners feel welcome, included and affirmed. We should give no room for our own biases and stereotypes and treat each learner with respect, avoiding language that undermines and reveals preconceived assumptions. Considering and re-evaluating the unique needs of each individual learner is vital in determining our approaches, methodologies and strategies in the classroom. Teachers should 'create opportunities' for all learners to learn optimally, and the means for that is curriculum differentiation adapted from DBE 2011:10).

Therefore, even though learners with visual impairment study and focus on the same curriculum (CAPS), learning content, knowledge, skills and understanding of concepts and tasks as sighted learners, it is important to ensure that the curriculum is accessible to them. This can, for example, be achieved by bringing experiences to the learners that they may not have access to as well as carefully analysing and considering lessons prior to teaching, so that the necessary differentiation can occur and aspects of the ECC be infused into everyday classroom experiences.

Differentiating the classroom environment and/or management

Adapting the environment implies the creation of a positive classroom space, in which learners will feel valued and open to participate. This requires flexibility (Tomlinson & Allan 2000) or, as UNESCO (2004) stated, a classroom setting, which is inviting to both learners and teachers, for optimal teaching and learning to take place. Two key dimensions are distinguished for learning environments, being the psychosocial and physical environments.

The psychosocial environment relates to psychological and social factors, such as health, wellbeing, the ability to perform effectively, interpersonal cooperation, classroom and school culture, protection against harassment and mental harm and effective communication adapted from DBE 2011:6–7).

These aspects all form part of the ECC. In terms of the physical environment, aspects included are, for example, classroom space, school infrastructure, furniture, noise, lighting, seating, moving around easily, resources and displays. In order to successfully modify a classroom to assist learners who are blind or have low vision, any one or a combination of the aspects discussed below will have to be considered or addressed.

Psychosocial environment

Teachers can create and maintain a positive psychosocial classroom environment by attending to aspects such as the following, amongst other examples:

- get to know all the learners in a class
- allow and create opportunities for all learners to express how they feel and what they are experiencing, in order to determine how their loss of vision affects, for example, their being and socialisation

- ask learners about their interests and let them talk about it
- encourage learners to care for each other
- listen to learners when they talk, as this can provide valuable information on their fears, uncertainties, dislikes, interests, and so on
- create a friendly learning environment where learners feel safe and valued, and where there is neither discrimination nor any form of abuse.

Physical environment

A safe physical environment is of great importance when teaching learners with visual impairment. Various aspects can be considered and adapted, as discussed below.

Seating and lighting

- In most cases, learners with low vision should sit in the front-centre of the class; however, a learner with vision loss in only one eye may prefer to sit to one side of the room.
- Learners with field vision loss will generally prefer to sit at the back of the classroom in order to increase their field of vision.
- Glare from desktops or shiny paper should be avoided.
- Some children may need their own desk lamp to provide an even light source.
- With group activities, it is advisable for learners with visual impairment to sit close to the teacher or the demonstration, in order to allow equal access to learning experiences and opportunities for all learners.
- Teach learners to rather lift books up from the table and bringing them closer to their eyes, rather than leaning downwards or forwards.
- Use appropriate low vision aids and braille-assistive devices.
- Check the size and distance of the objects or material.
- A sloping desktop or bookstand may be helpful for learners with low vision.

- Ensure that lighting in corridors and on stairs is adequate.
- Position classroom displays at an appropriate height and in good light.

Extra space

- Learners may require additional desk workspace as well as additional storage in the classroom, to accommodate their equipment and bulky braille and large print materials.
- Two desks per learner and a storage cupboard in the classroom can be helpful.

Safety in the classroom

- With some initial assistance, the blind learners will become familiar with the layout of the classroom and learn to find their way around independently. If any furniture is moved, these learners need to be informed, showing them the changes.
- Other learners should be taught to be tidy and not leave things on the floor.
- Chairs should be pushed in and no obstacles should be on the floor at any time.
- Doors need to be wide open or completely closed, as a door which is half open is dangerous for a learner with visual impairment.
- Glass doors need to be marked to make them more visible.
- Sharp protrusions on furniture and fittings should be avoided.

Verbal prompting and descriptions

Teachers can assist learners with visual impairment through verbal prompts and descriptions by, for example:

- saying what they are writing on the board
- describing what other learners are doing
- using the learner’s name when talking to a specific learner

- talking about what the teacher is doing
- warning learners about things that will be happening and explaining sudden noises to them
- providing a commentary on any class activity that a learner with low vision cannot be close enough to in order for the learner to see what is happening, which also applies in the case of all blind learners
- giving clear directions, for example, not referring to 'here' or 'there', even though words like 'look' and 'see' are acceptable, as well as references to colour
- asking learners whether or not they need help rather than assuming that they do, as learners also need to become independent
- not leaving a learner alone unless they know where they are
- not pushing or steering a blind learner but rather having the learner take the teacher's hand or elbow.

Visual fatigue

Visual fatigue is a common challenge experienced by learners with low vision. Symptoms include avoidance of visual activities, headaches, an increase in nystagmus (eye wobble), loss of concentration, sore eyes or rubbing eyes, double vision and/or watering eyes. As a result, activities should be organised in such a way that sufficient opportunities for 'eye rest' are included. To this end, teachers can, for example:

- alternate reading and writing activities with oral work
- allow time for a variety of non-visual tasks
- encourage learners to close and rest their eyes from time to time
- encourage learners to occasionally look away from a task
- request learners to look out of the window and change the focus of the eyes from time to time.

Organisational skills

Organisational skills are some of the most essential skills required by a blind and visually impaired person, and without good organisational skills, learners may find it difficult to succeed in school. In support of the development of these skills, teachers can:

- constantly promote the idea of 'a place for everything and everything in its place', so that a learner does not have to waste time to search for his or her belongings
- implement effective teaching methods and filing at work, thereby setting good examples.

Differentiating learning content

The learning content of subjects dealt with in the school includes terminology, concepts, facts, general principles and characteristics of things. In addition, content also entails subject-related skills, attitudes and any materials that can be associated with the content that is taught by teachers and required to be learned by learners with visual impairment (Tomlinson & Allan 2000).

Reasons for differentiating learning content

Learning content is primarily differentiated for one or more of the following reasons:

- to make knowledge, the acquisition of skills, understanding of concepts and completion of tasks accessible and meaningful to learners with visual impairment, thereby allowing them to benefit from learning opportunities
- to provide learners with visual impairment with an equal opportunity to achieve, thereby allowing them to experience success

- to motivate learners with visual impairment and support their self-esteem, as well as feelings of self-efficacy and self-worth, as a result of them being able to access the learning content and achieve success.

Process of content differentiation

The decision to differentiate learning content can generally be linked to three aspects that may require adaptation. These include adaptation of abstract content, adaptation to ensure variety and adaptation because of complexity. With regards to abstractness, many learners with visual impairment will benefit more from work that is concrete, and gradually move from the concrete to the abstract for successful conceptual understanding to take place. Real-life objects, experiences and content that learners can relate to can be used to provide learners with concrete objects and learning experiences. In addition, it is advisable for teachers to present work either from whole-to-part or part-to-whole.

In terms of variety, it is important to include aspects of the ECC as far as possible in class, allowing for variety in the content that is presented. In this regard, visual content can be supplemented with tactile and other sensory experiences when necessary. Furthermore, it is important to include various topics in order to allow for differing learner interests and contexts.

Finally, complex learning content will require adaptation. Teachers can, for example, simplify graphics and pictures, provide learners with personal guidance on how to 'read' graphics and provide varied options of different levels of difficulty according to readiness of learners with visual impairment when presenting content of this nature.

Differentiating teaching methodology

As all classrooms are expected to be inclusive, learners with various backgrounds, learning preferences, learning styles, special needs and potential need to be accommodated in one class. Teaching in such a diverse context, where learners with visual impairment may be included, requires adaptations on various levels. One of these relates to teachers adapting, modifying and planning for different teaching strategies or methodologies, in order to allow all learners with the opportunity to benefit optimally from the learning opportunity.

Teaching methodology or strategies can be differentiated at different levels, for example, in terms of the learning support material that is used and provided when teaching, the methods of presentation, learning activities that take place inside and outside the classroom, and lesson planning and organisation. As the adaptation of learning material for learners with visual impairment is dealt within the next chapter, this section primarily focuses on components related to the differentiation of teaching methodology.

Time as a crucial factor in learning activities and lesson organisations

When a child is compelled to use senses other than vision to learn, it can take longer than when relying on all the senses, including vision. As a result, teachers should always keep in mind that blind learners may require more time to complete some tasks than other learners, in order to achieve the same results. In addition, blind learners may experience some so-called 'easy tasks' as difficult, thus requiring more time to complete such tasks, for example, finding a book on a shelf. It follows that the workload of learners with visual impairment may need to be adjusted, depending on the capability of the learner.

As graphic information cannot merely be scanned at a glance by learners with visual impairment, the time allowed for such activities should be well-planned and adapted as necessary. Furthermore, teachers have the responsibility to teach these learners how to explore text and view graphics, objects and shapes systematically (from left to right and top to bottom). Besides the need for additional time, graphic material will have to be presented in a simpler form and often in a very different way than with sighted learners. As it is not always possible to construct a meaningful two-dimensional graphic representation, an object may have to be used when explaining new work and for concept development.

Despite these specific needs for additional time in completing tasks, learners with visual impairment have the potential and cannot be regarded as 'slow-learners'. Thus, it should be kept in mind that they merely require different methods and deserve to work from suitably adapted learning support material and well-planned lessons and activities.

General principles underlying the adaptation of lessons

When adapting lessons for learners with visual impairment, teachers can keep the following guidelines in mind (adapted from *Well Prepared!*, An illustrated guide to how examination and assessment materials are modified [RNIB] [Cobb & Mc Donald 2001]):

- adapt lessons only when it is necessary to provide or enhance access to learning content and/or promote learning
- retain the same skills, knowledge and concepts as in the original lesson, so that the same outcomes and assessment objectives are reached
- keep the same level of difficulty as in the original lesson or activity except when teaching learners with cognitive disabilities
- keep the balance in terms of weighting of content, in line with the curriculum
- avoid spending a disproportionately large amount of time on small or insignificant aspects of the curriculum

- material that is inherently visual may need to be replaced, but only when it is essential to provide access for the learner with visual impairment to reach specific objectives
- guard against the complete removal of all visual material, as learners with visual impairment need to know and be conversant about the visual aspects of life and the environment in the same way as their sighted peers.

Approaches to the adaptation of presentation methods

When adapting teaching methods or strategies, any one, or a combination, of the approaches discussed below may be followed (adapted from *Well Prepared!*, An illustrated guide to how examination and assessment materials are modified [RNIB] [Cobb & Mc Donald 2001]):

- **Reduce the amount of information:** When the amount of information is unnecessarily bulky, for example, data or it cannot all fit onto a braille page, the information may be reduced. When following this approach, it is, however, important to ensure that the same skills and knowledge can still be taught at the same level of difficulty, despite the information being less than it was initially.
- **Replace a picture or diagram with written text:** Sometimes, it is necessary to replace a picture or diagram with a written description that may enable the learner to visualise or conceptualise the content captured in the picture or diagram.
- **Simplify a picture or diagram:** Teachers can simplify pictures or diagrams when necessary or alternatively display it in a different way in order to reduce the visual complexity of the figure. Alternatively, a picture or diagram can be supplemented with a written description in support of conceptualisation.

- **Use an alternative for an abstract or three-dimensional (3D) item:** When a picture or diagram is too abstract or 3D, teachers can replace it with a real item or a concrete model for the sake of conceptual understanding. Following this phase, teachers and learners can progress to, for example, a more abstract drawing, even though this may still need to be simplified and presented as two two-dimensional drawings, specifically for younger learners.
- **Remove a picture or diagram:** When a picture or diagram is unnecessary to understand the lesson or activity, it can simply be removed to avoid confusion and wasting time on trying to 'read' or decipher something that is not required for teaching the content or for meaningful learning to occur.
- **Accept margins of error:** Some learners with visual impairment are not able to accurately measure in millimetres, millilitres or degrees, therefore requiring of teachers to accept rounded off measurements or margins of error.
- **Replace visual material with non-visual material:** Visual material can inherently be replaced by equivalent non-visual material, yet teachers should always aim to give learners with visual impairment a sense of the 'inherently visual' content even if it is performed in a mere conversational way or for general knowledge purposes.
- **Use alternative material for graphs and pictures:** Teachers can use Wikki Stix or any other suitable material to draw graphs or pictures; however, well-designed printed graphics must be introduced from a young age to develop tactile skills.
- **Accept responses in an alternative format:** Instead of expecting learners with visual impairment to make drawings, they can, for example, submit audio or recorded responses or answers. As an alternative, the teacher can reverse the activity and provide a drawing which learners then analyse and make deductions from.

Differentiating assessment

Learners in South Africa are assessed according to the National Policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades R–12 (DBE 2015g), which can be accessed on the website of the DBE. According to the Guidelines for Responding to Learner Diversity (2011):

> [*W*]ithin a differentiated curriculum, assessment of learners and their learning is integral to the teaching and learning process. As with a differentiated instruction, differentiated assessment is based on the thinking that the needs of learners cannot all be met in the same way. (p. 12)

The differentiation of assessment practices requires of teachers to reconsider traditional assessment processes and the value of assessing all learners in the same manner, requiring the same tasks to be completed. In order to be able to differentiate assessment practices, teachers need to follow a more flexible approach in order to accommodate the diverse needs and learning styles of the various learners in class. Throughout, the possibility of learners demonstrating what they have learned in the best possible way should be considered.

When differentiating assessment procedures, teachers can be guided by the main purposes of assessment, which should always be met. As such, any adapted assessment measure should be informative in instructional planning and the practice of the teacher. It should, furthermore, enable the teacher to determine the effectiveness of the teaching for all learners as well as the learning that had taken place. Finally, assessment should assist the teacher in identifying the needs and strengths of the various learners and measure their performance against specified criteria for reporting and grading purposes. When assessing learners with visual impairment, or adapting assessment measures for these learners, teachers should keep the following guidelines in mind (Guidelines for Responding to Learner Diversity, DBE 2011):

- expectations can be high for all learners
- all learners should have access to the standard of assessment best suited and adapted to accommodate their specific needs
- no learner may be disadvantaged by an assessment strategy or any adapted assessment material
- assessment should inform the support that is provided to a learner, also indicating whether or not such attempts are successful
- every learner has the ability to demonstrate newly gained knowledge and skills in a creative way
- assessment should be authentic and make provision for multiple abilities, learning styles and levels of functioning
- all learners can be accommodated within the flexible framework of the National Curriculum Statement Grades R–12.

According to the National Curriculum Statement Grades R–12 (DBE 2015f), any form of assessment needs to be inclusive and create equal opportunities for all learners, including those who experience barriers to learning. In line with Education White Paper 6: Special Needs Education: Building an Inclusive Education and Training System (DoE 2001), assessment must create the necessary conditions for learners to provide a true reflection of their academic abilities irrespective of the barriers they may experience. The DBE of South Africa has a stipulated protocol for assessment for learners with visual impairment. According to the protocol, learners with visual impairment can be granted adapted questions, additional time, the use of a digital player or recorder, braille, large print, computer voice to text or text to voice, accommodations for handwriting, medication or food intake, an oral examination, a scribe, a reader, rest breaks, a separate venue and transcription of braille (national policy pertaining to the programme and promotion requirements of the National Senior Certificate [NSC] Examinations, Annexure C1, DBE 2014:89).

Infusing the expanded core curriculum into activities across all subjects by differentiating lessons

The concept of infusing the ECC into classroom lessons stems from the fact that there should be a compensation for the limitations in experience and general skills and knowledge brought about by the lack of incidental learning because of vision loss.

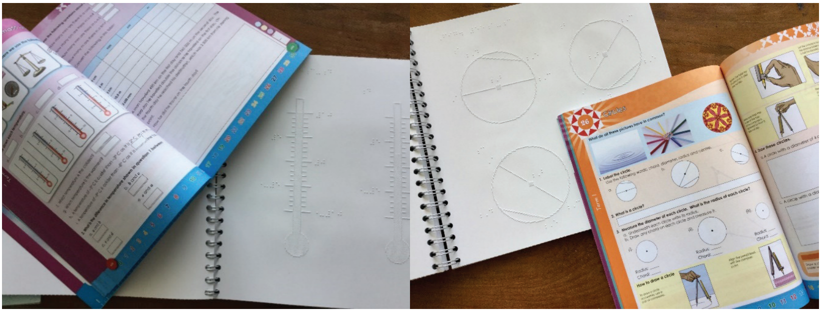
Guiding questions for differentiation of lessons

Teachers can be guided by the following questions when wanting to differentiate a lesson:

- How can I differentiate this lesson to make it accessible for each individual learner with visual impairment, in terms of classroom, content, teaching methodology and eventually assessment?
- Do I have to enlarge the text for low vision learners? Are there any blind learners who need the text in braille? What about pictures and diagrams?
- How would I use this lesson to include and enhance aspects of the ECC for learners with visual impairment, for example, the development of sensory skills, skills of daily living, O&M, real-life experiences, and so on?

Examples of differentiation of lessons

In this section, examples of lesson differentiation are provided, which may guide teachers in applying the principles of differentiation to their own classroom situations. The lessons have been taken from the DBE Rainbow Workbook series, as indicated in the various examples. Even though most of the examples have been taken from the foundation, intermediate and



Source: Photograph taken by Hestelle Viljoen, date and location unspecified, published with permission from Hestelle Viljoen.

FIGURE 6.1: Print and braille workbooks.

senior phases, it will be useful for all teachers of learners with visual impairment to understand and be familiar with what the learners with visual impairment learn and how they learn it from Grade R to 12. Examples from the Further Education and Training phase are included in the next chapter (ch. 7 by Viljoen).

In addition to providing braille workbooks (depicted in Figure 6.1), the South African DBE has provided toolkits with teaching aids for teachers to use in support of conceptual understanding and moving from the concrete to the abstract. During the discussion of examples of lessons in this section, reference will be made to both the braille workbooks and DBE toolkit where appropriate.

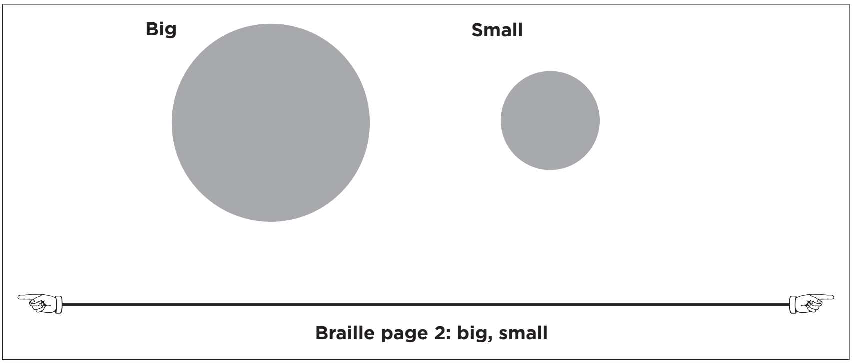
Example 6.1: Taken from the Grade R Workbook for Braille

This lesson focuses on the concept development of 'size', which is often a difficult concept for learners with visual impairment to understand because of them not being able to see a complete object. Figure 6.2 and Figure 6.3, taken from the Grade R Braille Workbook (DBE 2013a), capture how learners are guided to understand and conceptualise size.

- Learners use their bodies to compare sizes. (The teacher is big and I am small).
- Compare a big plate and a small plate; a big block and a small block; a big bead and a small bead or any other available objects.
- Dough/clay: make a big ball; make a small ball.
- Sort shapes: put big circles in one container and small circles in another container.
- Put a small circle on top of a big circle and discuss the difference in size.
- Open your book. (You may help them if necessary.)
- Use both hands and scan the page from the top to the bottom in zigzag movements. Cover the whole page. (You may have to help by putting your hands over the learners' hands and guiding them over the page.)
- What do you see/what do your hands find?
- Are the two circles the same size?
- Put your finger on the big circle.
- Put your finger on the small circle.
- How many circles are there?
- Put your finger on the circle and count: 'one'.
- Move your finger to the other circle and count: 'two'.
- String some small beads.

Source: DBE (2013a).

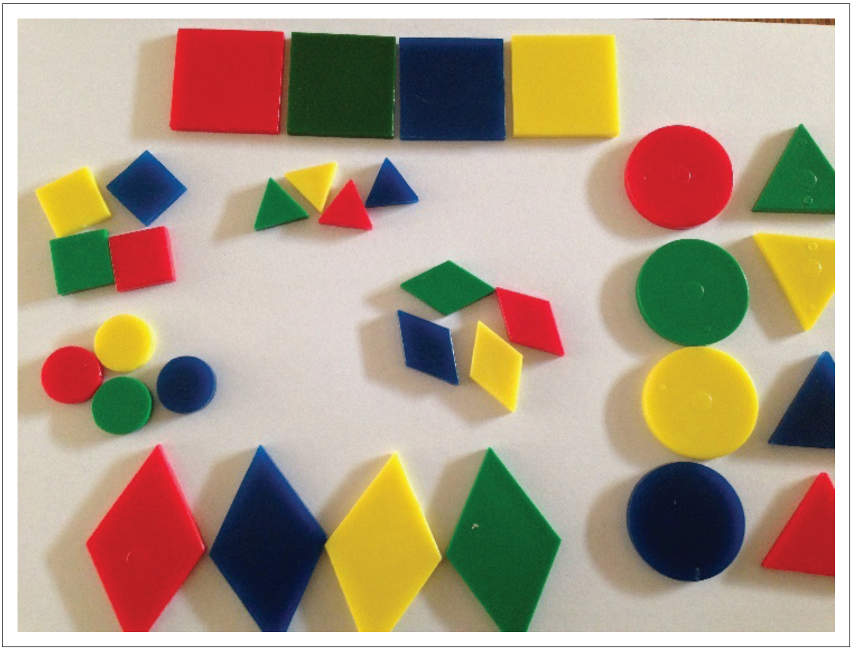
FIGURE 6.2: Braille page 1, Grade R Workbook for Braille.



Source: DBE (2013a).

FIGURE 6.3: Braille page 2, Grade R Workbook for Braille.

Differentiated lesson: The teacher makes sure she has all the necessary objects needed for the lesson and then reads (Grade R learners cannot read) and facilitates the instructions, thereby assisting the learners. She starts with familiar things and guides



Source: Photograph provided by the University of Cape Town Centre for Innovation in Learning and Teaching, taken in 2019, location unspecified, published with permission from the University of Cape Town.

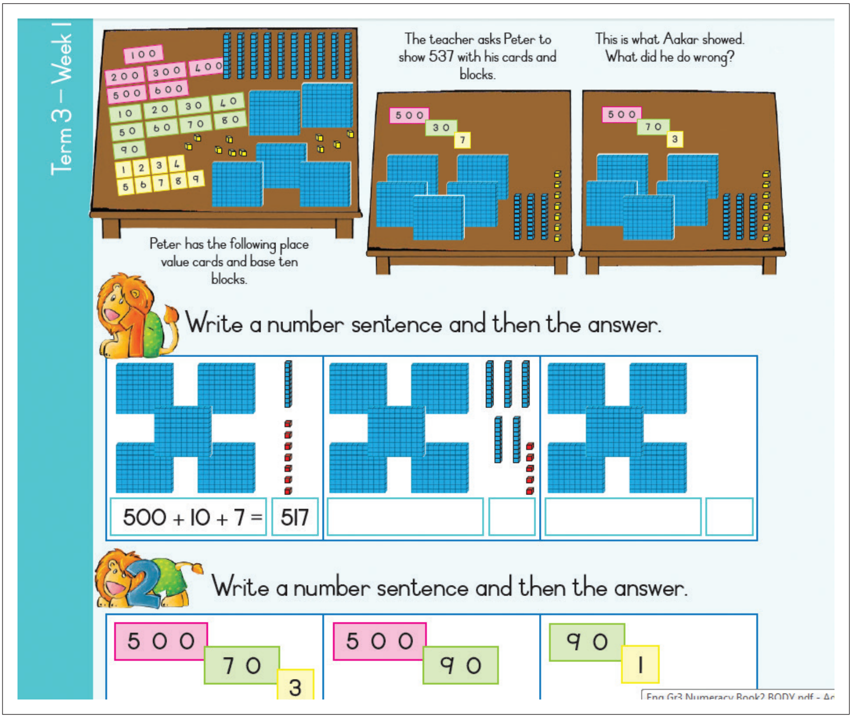
FIGURE 6.4: Braille page 1, shapes.

them through a 'discovery' process until she refers them to the tactile diagram on page 2 (see Figure 6.3). She then guides them to scan the diagram in order for them to make sense of it. In this example, compensatory skills are included in the lesson, planned for by the teacher.

An example of a set of shapes in different sizes that the Grade R teacher can use in support of conceptualisation during this lesson (taken from the DBE toolkit) is captured in Figure 6.4.

◻ Example 6.2: Taken from the Grade 3 Mathematics Workbook

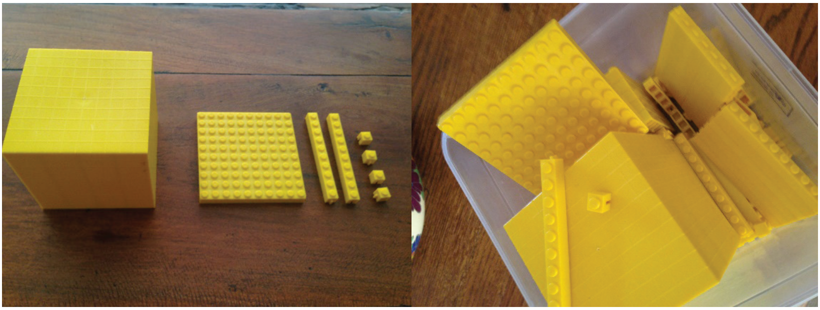
In this lesson, the focus falls on numbers between 500 and 600. The activities expected of the learners are captured in Figure 6.5.



Source: DBE (2013d).

FIGURE 6.5: Activities with numbers, Grade 3 Mathematics Workbook.

Differentiated lesson: As it is difficult for low vision learners to read such different font types, work with overlapping squares and distinguish between the pinks and yellows used for ones, tens and hundreds, the worksheet needs to be adapted. It can be printed in large print and braille, requiring some prior preparation by the teacher, more time spent with the learners and on the topic and the use of teaching aids to ensure that learners can access and understand the graphics (braille and large print), concepts and notations. Thus, for this lesson, the learners start with the concrete and then move onto more abstract 2D drawings. The base ten sets (in the DBE toolkits) (Figure 6.6) can be used, allowing learners to pack out the blocks and strips for each



Source: Photograph taken by Hestelle Viljoen, date and location unspecified, published with permission from Hestelle Viljoen.

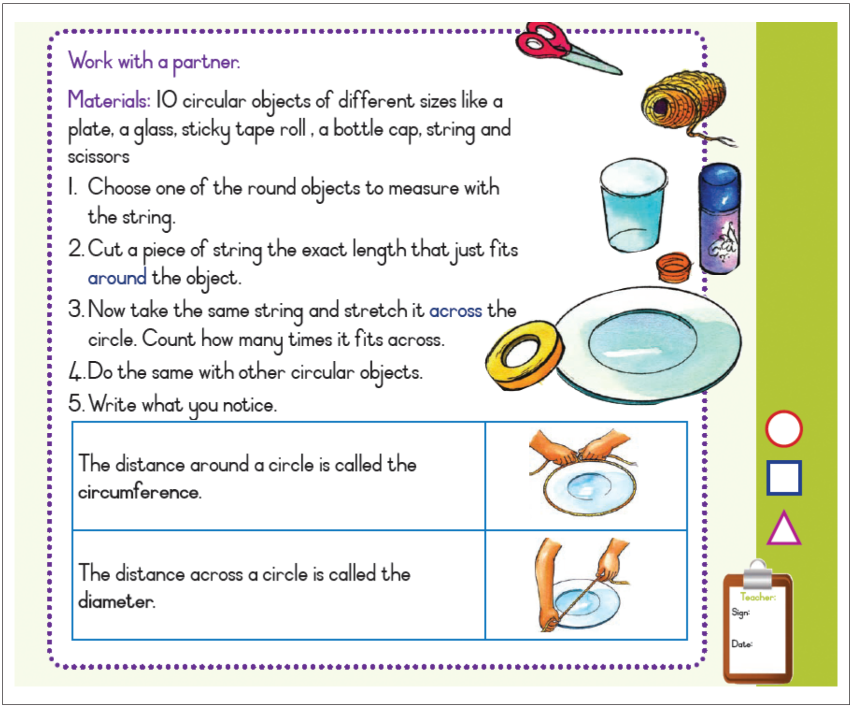
FIGURE 6.6: Base 10 sets.

problem on their desks. Enough time should be spent with the 100 squares, the bars of 10 and the unit blocks. Learners can also build a thousand cube by using 10 slabs of a 100 or build hundreds by fixing 10 strips of 10s on top of a 100 slab. In addition to focusing on concept understanding, such an exercise involves good finger work in support of the development of stronger and more neatly skilled hands.

☐ Example 6.3: Taken from the Grade 3 Mathematics Workbook

In this lesson, learners are taught to measure circles, as indicated in Figure 6.7.

Differentiated lesson: This lesson provides a good opportunity for concept development, as well as the development of finger dexterity and skills of daily living (cutting, holding and measuring). Prestik is, however, easier to use than sticky tape and is thus recommended. Blind learners will use the braille books for this lesson, while learners with low vision can use magnifiers or large print books. Specialised measuring equipment for people with


Work with a partner.

Materials: 10 circular objects of different sizes like a plate, a glass, sticky tape roll , a bottle cap, string and scissors

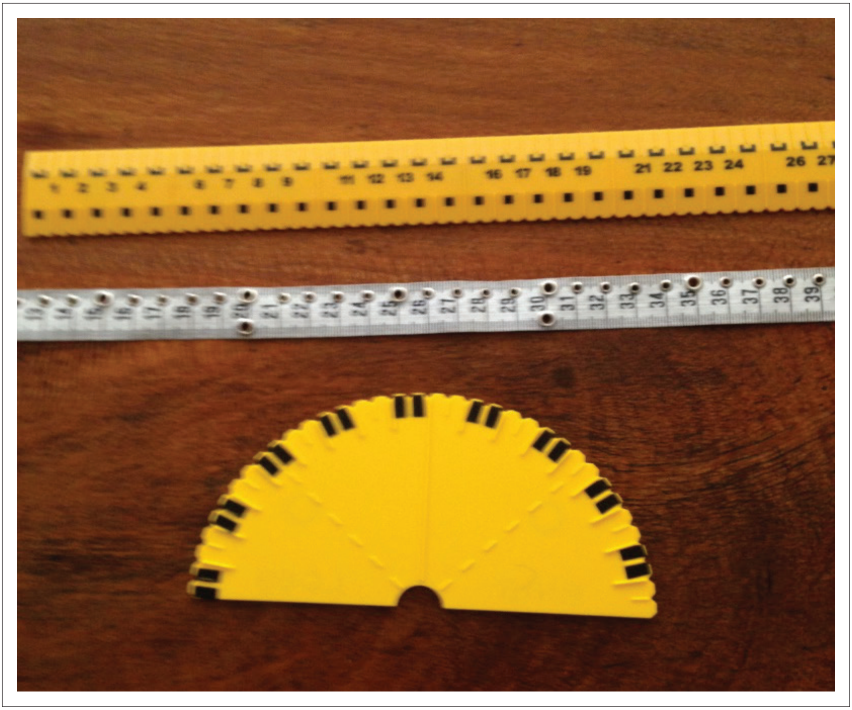
1. Choose one of the round objects to measure with the string.
2. Cut a piece of string the exact length that just fits around the object.
3. Now take the same string and stretch it across the circle. Count how many times it fits across.
4. Do the same with other circular objects.
5. Write what you notice.

The distance around a circle is called the circumference.	
The distance across a circle is called the diameter.	

Source: DBE (2013d).

FIGURE 6.7: Worksheet on measuring of circles, Grade 3 Mathematics Workbook.

visual impairment (Figure 6.8) should also be available. For the lesson, learners can work in pairs of two, for example, a sighted with a blind partner or two learners with visual impairment together. Working together will support the development of social skills, patience, tolerance, good manners and teamwork. This can be discussed with the learners, highlighting the benefits of teamwork yet also exploring their experiences in this regard. As these learners cannot be expected to measure with the same accuracy as learners with normal vision, a bigger margin of error should be allowed for assessment.



Source: Photograph taken by Hestelle Viljoen, date and location unspecified, published with permission from Hestelle Viljoen.

FIGURE 6.8: Measuring equipment for the visually impaired.

Example 6.4: Taken from the Grade 2 English Home Language Annual National Assessment

This lesson focuses on creative writing, which is often associated with and supported by pictures, both in textbooks and formal assessments, as is also the case in this example (Figure 6.9). Sometimes, it is possible to describe the picture to learners with visual impairment; however, this implies the possibility of them being provided with the necessary words, ideas and sentences, with some learners merely copying the sentences used for the explanation.

Write five to eight sentences about the picture below.

Source: DBE (2013b).

FIGURE 6.9: Exercise to practice creative writing.

Differentiated lesson: Some learners with low vision may find this picture difficult to see, because of all the lines and low contrast. In addition, the picture cannot be printed in braille for blind learners, resulting in teachers having to explore other avenues. One way of adapting this lesson is to rely on the imagination and experience of the learners, allowing them to come up with the ideas and words. In order to achieve this, the teacher will firstly facilitate an oral discussion in class about whether or not the learners read stories at home, who reads to them, what they read and when. Next, some vocabulary can be discussed and learners can be requested to write down a few of these words. Finally, the teacher can introduce the written topic by saying: 'A girl is reading a book to a little boy'. Write five to eight sentences.

Example 6.5: Taken from the Grade 2 Home Language Workbook

Differentiated lesson: Even though the pictures in Figure 6.10 will not be accessible to all learners with visual impairment, this activity can be fun and include lots of sensory experiences. The teacher can start by discussing the gifts that learners would like and talking about new vocabulary in this field. A surprise bag with gifts (one for each learner or small group of learners) can be made, including things such as fragranced soap on a rope, chocolates, a toy for a boy, a toy for a girl, sweet smelling flowers, hand cream, and so on. It is not necessary to buy any items, as the teacher, learners or colleagues can merely bring objects from home, thereby enhancing cooperation and collaboration with staff members too. After each learner or group has taken an object, questions can be asked about fragrances, textures and other sensory experiences the learners might identify, allowing them to describe or guess what they have picked. The questions can be adapted to say '[c]hoose a gift for everyone in your family. As you choose the gifts, say in a full sentence to whom you would give the gift and why, e.g. say "I will give the chocolates to my mother because she likes sweet things".'

Lesson: My family – Fun
(a) Choose a gift for everyone in your family.
(b) Tick each gift when you have given it to a family member.
(c) You must use up all the gifts.

Source: DBE (2013c).
FIGURE 6.10: Lesson on my family, Grade 2 Home Language Workbook.

☐ Example 6.6: Taken from the Grade 3 Home Language Workbook

An example reads (DBE 2015a):

Let's read

Read the story. Then circle the words with the ee- and ea- sounds.

I like to eat the vegetables from our garden. The garden is around our house.

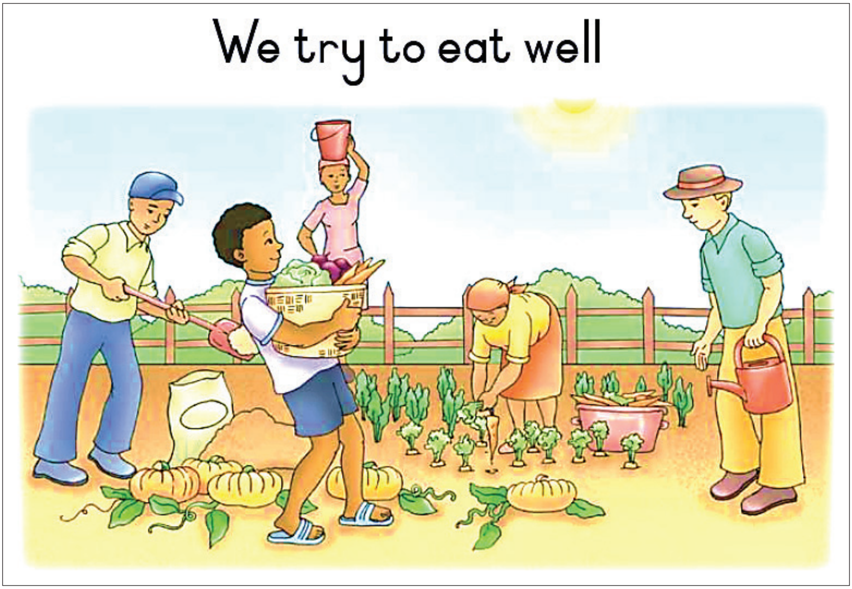
We grow green beans and peas to eat.

We also grow potatoes and tomatoes.

I pull out the weeds each week.

I water the plants when it does not rain. (n.p.)

Differentiated lesson 1: For blind and low vision learners, who might not be able to see the picture in Figure 6.11, the picture can be described briefly, simply saying that it shows a family working in their vegetable garden, with some of the vegetables being identified in the picture. The caption (We try to eat well.) and text can be in braille or printed in large print; however, as blind learners are not able to circle words, they should be requested to write down the relevant words. In preparation of the lesson, learners can be requested to bring some fresh vegetables from home if possible, for a display on the table, with the teacher subsequently cutting the vegetables for learners to be able to taste them. The adapted instruction for the activity is '[g]o to the discovery table. Touch and smell the vegetables. Ask the teacher to cut a piece so that you can also taste the vegetables. Say what each vegetable is and whether you like to eat it or not'.



Source: DBE (2015a).

FIGURE 6.11: Lesson on healthy eating, Grade 3 Home Language Workbook.

Differentiated lesson 2: Another option is to start a small-scale vegetable garden with the learners at school, where they can be taught about the duties of caring for and watering vegetables that are planted. Stories such as Jack and the Beanstalk or information about fruit and vegetables can be included in discussions. Once the vegetables are ready to be harvested, the lesson follows the same format as described in the previous paragraph, with learners engaging in smelling and tasting activities.

☐ Example 6.7: Taken from the Grade 3 Mathematics Workbook

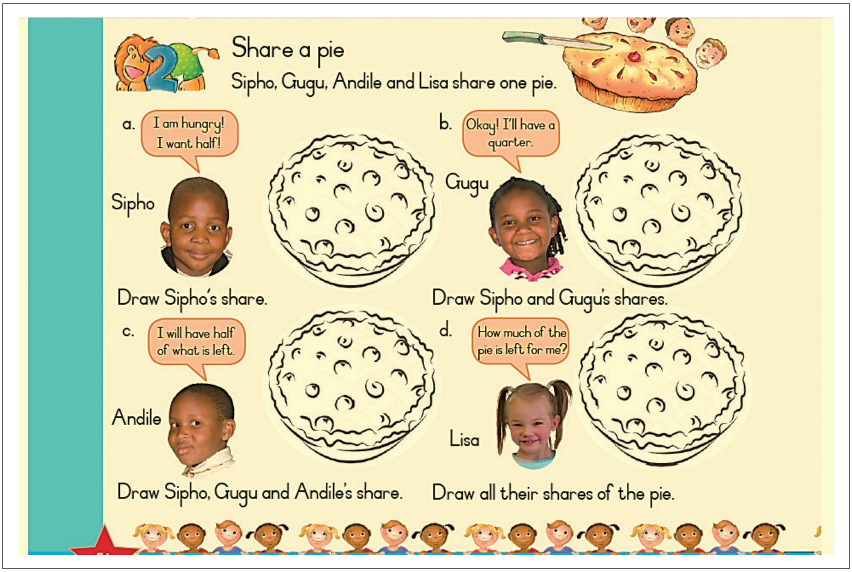
In this lesson, the focus falls on fractions, as captured in Figure 6.12.

Differentiated lesson: Neither blind nor low vision learners can read a page like the one displayed in Figure 6.12. In support of teaching daily living and social skills, it may, however, be an idea to arrange that the learners eat lunch in class on the day or have a class party. For this event, a volunteer can be requested to bake a pie(s) for lunch, allowing for a discussion on the size of the pie(s) and cutting the pie(s) so that each learner has the same fraction of the pie. During such a lesson, other subjects can also be integrated such as life skills, language and mathematics. For the activity, the following instructions can serve as a guideline:

(a) Let us lay the table.

(b) Let us eat like 'Cool Kind Kids'

- Wash your hands before sitting down.
- Wait to begin eating until everyone is seated and has been served.
- Stay seated without wiggling in your chair.
- Do not lick your fingers, pick your teeth or put your elbows on the table.

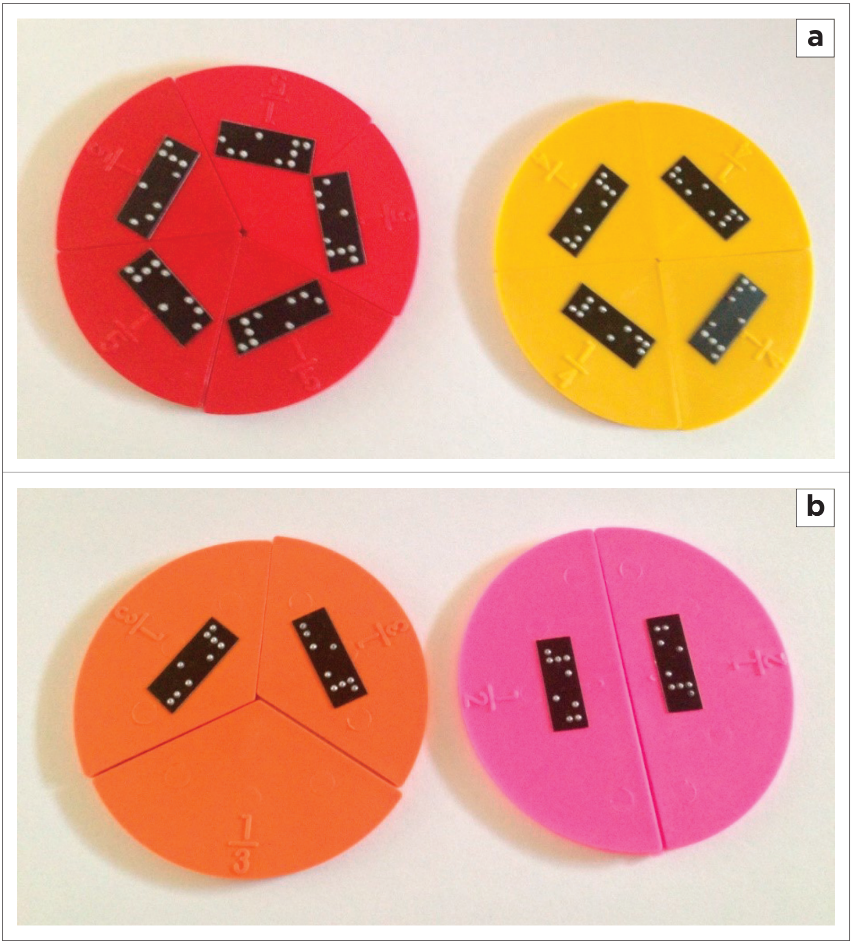


Source: DBE (2015d).

FIGURE 6.12: Lesson on fractions, Grade 3 Mathematics Workbook.

- Use your serviette.
- Say, 'Excuse Me', and ask permission to leave the table.
- Don't put too much food on your fork.
- Chew with your mouth closed.
- Do not talk with your mouth full of food.
- Say 'May I please' and 'Thank you' if you would like more food. Do not reach over the table.
- Do not burp, slurp or say negative things about the food.
- Help clear the table and say thank you for the food.

For the next lesson on fractions, the fraction circles in the DBE toolkits can be used and labelled in braille (Figure 6.13). In this manner, progress will take place by moving from the concrete to the more abstract.



Source: Photograph provided by the University of Cape Town Centre for Innovation in Learning and Teaching, taken in 2019, location unspecified, published with permission from the University of Cape Town.

FIGURE 6.13: Fraction circles.

Example 6.8: Taken from the Grade 4 English Home Language Workbook 1

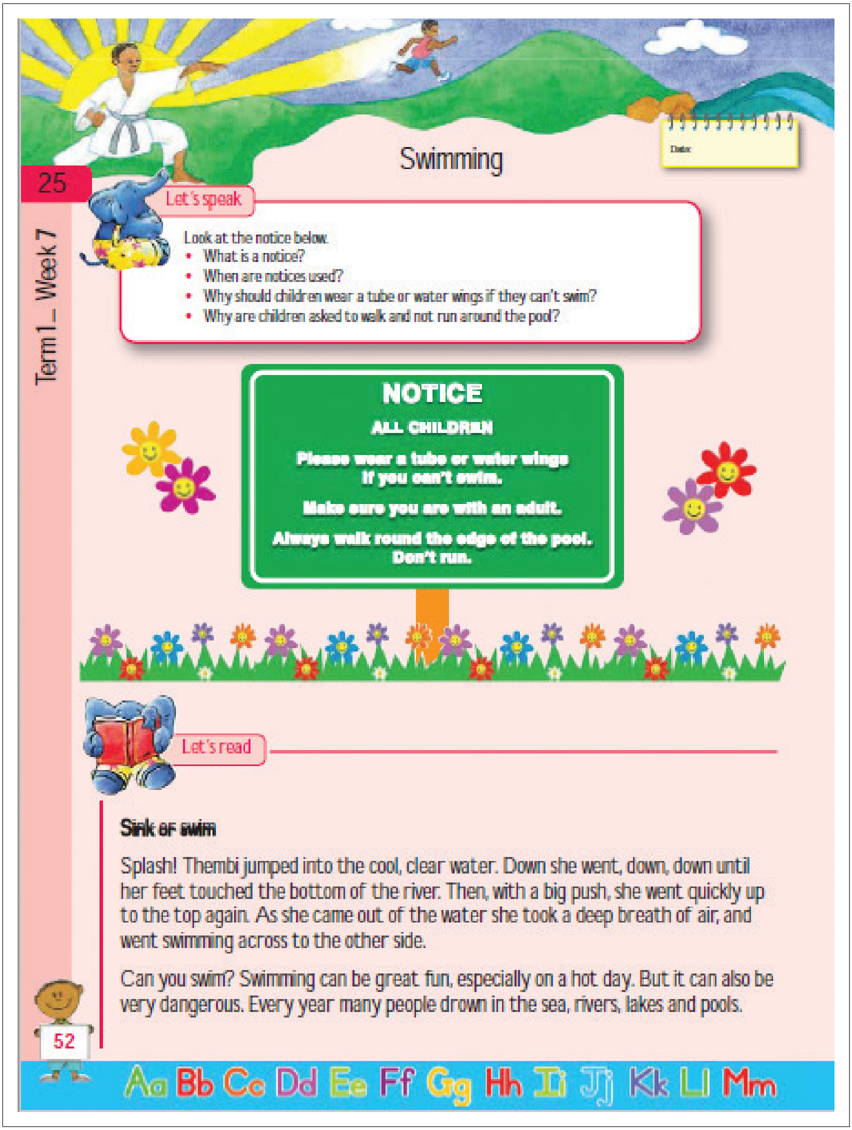
Differentiated lesson: In this exercise (Figure 6.14), learners with visual impairment will be challenged by various things, such as the many colours, contrasts and pictures, which clutter the pages and include many unnecessary pictures, rather than only focusing on the learning content. Even though a few learners may be able to access the learning material through electronic magnifiers, the activity will have to be retyped for others, using the correct font and indicating that there is a notice and what is written on the notice. In addition, the worksheet will also have to be printed in braille. Several aspects of the ECC can be integrated and addressed in this lesson, for example, learners' experiences in swimming and the drowning of people. Learners can similarly be engaged in discussions related to science, the environment, water pollution, and so on.

Example 6.9: Taken from the Grade 6 English Home Language Workbook

This lesson focuses on the reading of advertisements, as indicated in Figure 6.15.

As a next phase of this lesson, learners are expected to design their own advertisements (Figure 6.16).

This role play activity is very suitable for learners with visual impairment, who are often better listeners than sighted persons as they depend more on audible information. Even though the activity is suitable, the teaching material, however, still requires adaptation. For low vision learners, the items on the mind map can simply be written underneath each other, in the correct font and large print. These typed questions can also be used for blind learners yet with adapted instructions. Instead of using pictures or drawing the advert, blind learners may be given the option of making a radio or



25

Term 1_ Week 7

Swimming

Date:

Let's speak

Look at the notice below.
- What is a notice?
- When are notices used?
- Why should children wear a tube or water wings if they can't swim?
- Why are children asked to walk and not run around the pool?

NOTICE

ALL CHILDREN

Please wear a tube or water wings if you can't swim.

Make sure you are with an adult.

Always walk round the edge of the pool. Don't run.

Let's read

Sink or swim

Splash! Thembi jumped into the cool, clear water. Down she went, down, down until her feet touched the bottom of the river. Then, with a big push, she went quickly up to the top again. As she came out of the water she took a deep breath of air, and went swimming across to the other side.

Can you swim? Swimming can be great fun, especially on a hot day. But it can also be very dangerous. Every year many people drown in the sea, rivers, lakes and pools.

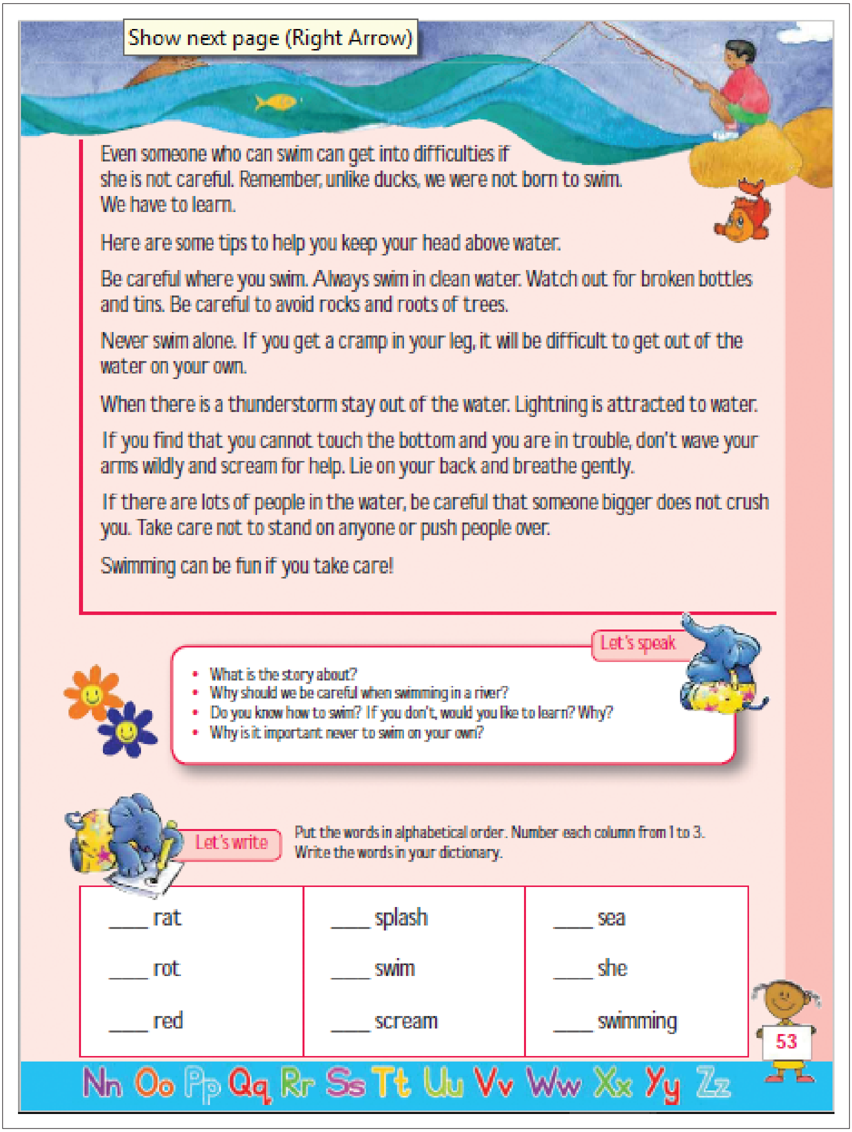
52

Aa Bb Cc Dd Ee Ff Gg Hh Ii Jj Kk Ll Mm

Source: DBE (2015b).

FIGURE 6.14: Comprehension lesson on swimming, Grade 4 English Home Language Workbook 1.

Figure 6.14 continues on the next page→



Show next page (Right Arrow)

Even someone who can swim can get into difficulties if she is not careful. Remember, unlike ducks, we were not born to swim. We have to learn.

Here are some tips to help you keep your head above water.

Be careful where you swim. Always swim in clean water. Watch out for broken bottles and tins. Be careful to avoid rocks and roots of trees.

Never swim alone. If you get a cramp in your leg, it will be difficult to get out of the water on your own.

When there is a thunderstorm stay out of the water. Lightning is attracted to water.

If you find that you cannot touch the bottom and you are in trouble, don't wave your arms wildly and scream for help. Lie on your back and breathe gently.

If there are lots of people in the water, be careful that someone bigger does not crush you. Take care not to stand on anyone or push people over.

Swimming can be fun if you take care!

Let's speak

- What is the story about?
- Why should we be careful when swimming in a river?
- Do you know how to swim? If you don't, would you like to learn? Why?
- Why is it important never to swim on your own?

Let's write

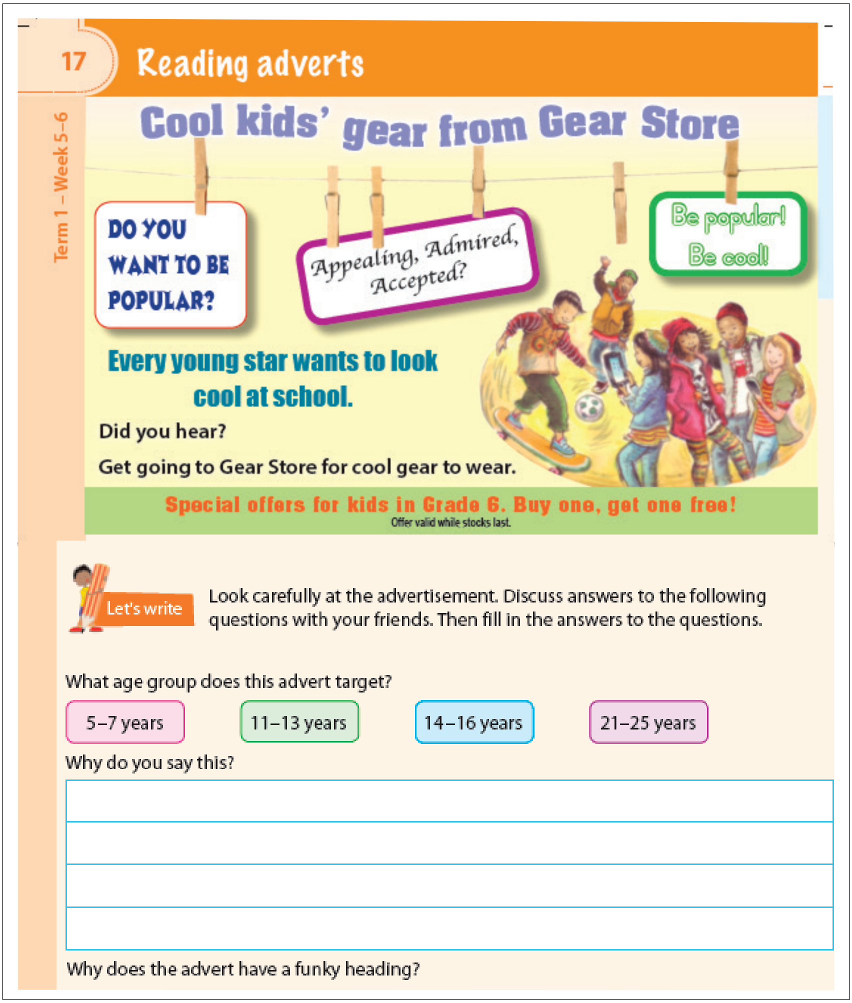
Put the words in alphabetical order. Number each column from 1 to 3. Write the words in your dictionary.

___ rat	___ splash	___ sea
___ rot	___ swim	___ she
___ red	___ scream	___ swimming

53

Nn Oo Pp Qq Rr Ss Tt Uu Vv Ww Xx Yy Zz

FIGURE 6.14 (Continues...): Comprehension lesson on swimming, Grade 4 English Home Language Workbook 1.



17 Reading adverts

Term 1 – Week 5–6

Cool kids' gear from Gear Store

DO YOU WANT TO BE POPULAR?

Appealing, Admired, Accepted?

Be popular! Be cool!

Every young star wants to look cool at school.

Did you hear?

Get going to Gear Store for cool gear to wear.

Special offers for kids in Grade 6. Buy one, get one free!

Offer valid while stocks last.

Let's write

Look carefully at the advertisement. Discuss answers to the following questions with your friends. Then fill in the answers to the questions.

What age group does this advert target?

5–7 years | 11–13 years | 14–16 years | 21–25 years

Why do you say this?

Why does the advert have a funky heading?

Source: DBE (2015c).

FIGURE 6.15: Lesson on reading advertisements, Grade 6 English Home Language Workbook.

Source: DBE (2015c).

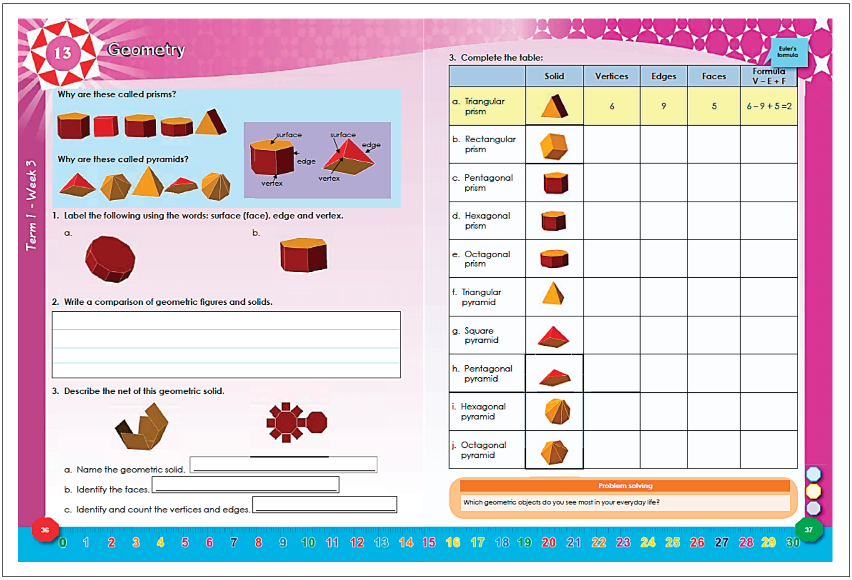
FIGURE 6.16: Designing an advertisement, Grade 6 English Home Language Workbook.

television advertisement, using only text and singing or instrumental music. They may furthermore be allowed to work as a group. In adapting the lesson in this way, the ECC skills of training to use imagination and visualisation, creative thinking, working interactively and socialisation can be integrated as part of the activity.

☐ Example 6.10: Taken from the Grade 8 Mathematics Workbook

This lesson focuses on three-dimensional - objects, with the required activity indicated in Figure 6.17.

Differentiated lesson: The concept of 3D objects is one of the most difficult things to understand for learners with visual impairment, both blind and low vision. The 3D drawings in Figure 6.17 will have no meaning for them, requiring adaptation of the worksheet and material presented to them. A set of wooden or plastic (bought) geometric solid shapes will have more value (Figures 6.18 and 6.19), allowing learners with visual impairment to familiarise themselves with the shapes of sides, vertices and, for example, the difference between pyramids and prisms. Prestik can be used to help them count the faces, vertices and edges. However, this exercise will take much longer for learners with visual impairment than for learners



Source: DBE (2015e).

FIGURE 6.17: Activity on 3D objects, Grade 8 Mathematics Workbook.

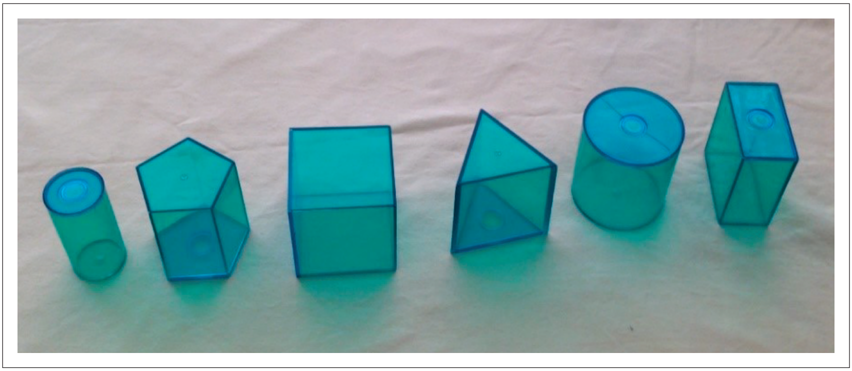


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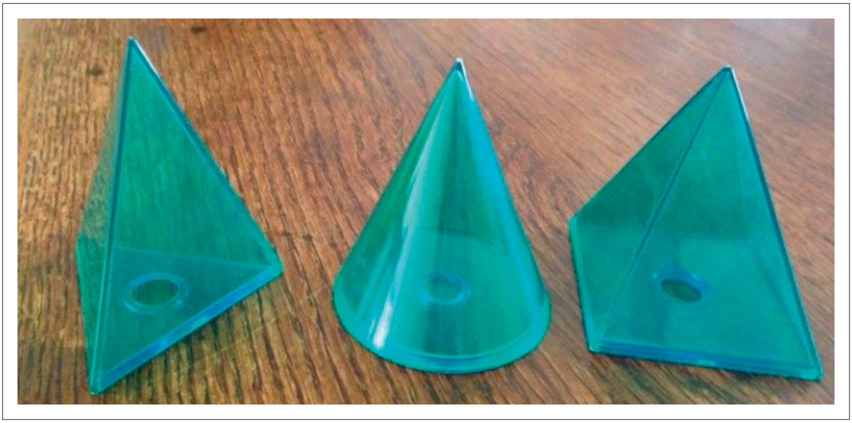
FIGURE 6.18: A set of prisms.



Source: Photograph taken by Hestelle Viljoen, date and location unspecified, published with permission from Hestelle Viljoen.

FIGURE 6.19: A set of pyramids.

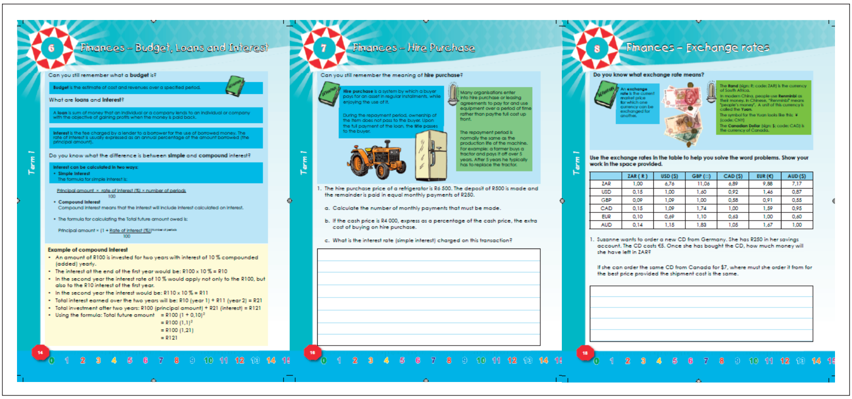
with normal vision. It will require patience on the side of the teacher, as it is important content to understand, specifically for learners who would like to study mathematics after school.

Once learners with visual impairment understand the difference between prisms and pyramids and their nets, which are 2D figures or drawings, they can be provided with the nets in classroom lessons (Question 3 in Figure 6.17) and assessed in terms of identification of the solid 3D objects. In presenting the lesson in this way, various aspects of the ECC can be infused in the lesson, such as conceptual understanding of the relationship between 3D solids and their 2D representation, something which is very hard to grasp for particularly, learners with visual impairment.

☐ Example 6.11: Taken from the Grade 9 Mathematics Workbook 1

This topic on financial mathematics is covered over three consecutive lessons, captured in Figure 6.20.

Differentiated lesson: Financial mathematics is a field in which many young people are interested in as a career, including learners with visual impairment. It is a good idea to invite one or more people who work in this field, or a related field, to come and explain the topic and concepts to learners with visual



Source: DBE (2017).

FIGURE 6.20: Lessons on financial mathematics, Grade 9 Mathematics Workbook 1.

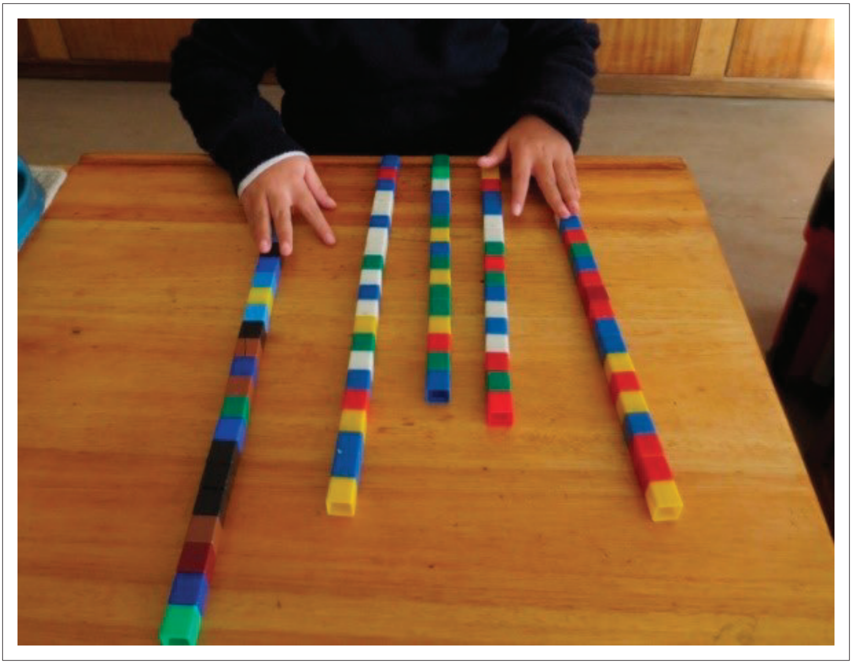
impairment and discuss possible careers in the field. Alternatively, learners can be taken on an educational excursion to visit some financial institutions in their area. Whichever field is decided upon, some of the ECC content can be infused into these lessons, such as exposing learners to essential institutions and financial concepts that are not easy for them to access because of the very limited publications in braille. They will also better understand personal financial responsibility and how the financial system functions.

Example 6.12: Focusing on the teaching of bar graphs to Grade 3 blind learners

When teaching bar graphs to blind learners, building blocks can be utilised for concept development, after which the graphs can be drawn by using a Perkins Brailler, for reading with both hands. To this end, learners can, for example, do a survey over a few days, keep count of their data and then first build a bar graph to represent the data by using building blocks (Figure 6.21) for concept development. Next, they can be taught how to draw a simple bar graph by using their Perkins Braillers and a braille cell for each unit. After mastering this skill, computer printouts of the embossed graphs can be provided to the learners to read (Figure 6.22).

Ideas for teaching poetry, literature and cartoons

When teaching poems, literature or cartoons to learners with visual impairment, it will almost always be necessary to explain in more detail than in other cases, and to have longer discussions about the imagery and metaphors used in poems. Learners who are near-sighted or blind and cannot see the ‘mountains with their rumpled cheeks’ or the ‘far away horizons’ may, for example, never understand these metaphors for images others may



Source: Photograph taken by Erika Opperman, date and location unspecified, published with permission from Erika Opperman.

FIGURE 6.21: A bar graph made with building blocks.

imagine but not them, because of the inherently visual nature of such images. As a result, these learners may struggle to grasp the atmosphere or mood captured in a poem.

When assessing these learners, it would thus be unfair to, for example, ask them to explain how a specific figure of speech was used effectively in a poem if the figure of speech is inherently visual and lies outside of what such learners can possibly understand of the 'image' used. As a result, questions during formal assessment will have to be adapted to rather focus on aspects that lie within the field of experience of learners with visual impairment.

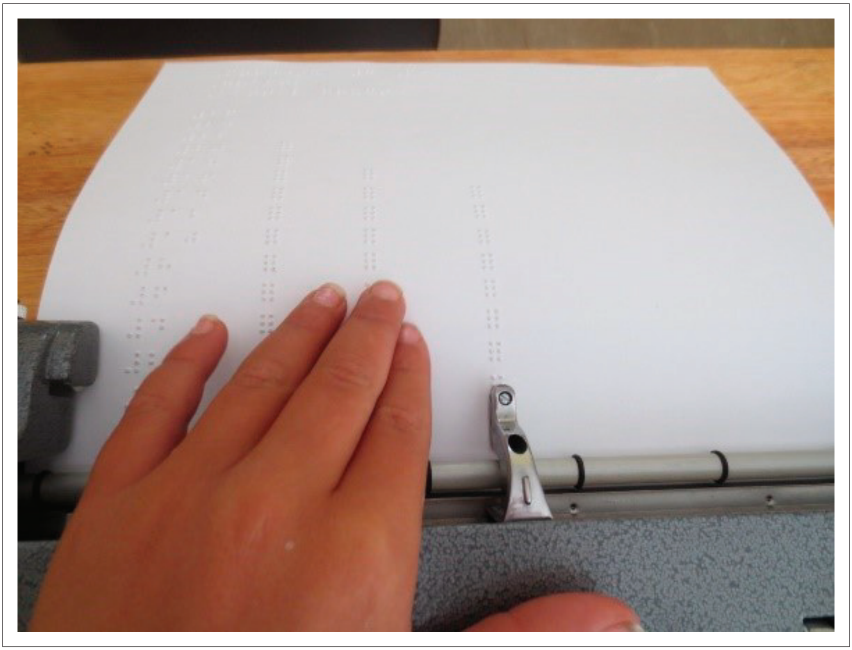


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FIGURE 6.22: A learner drawing a bar graph with a Perkins Brailler.

Conclusion

Carol Ann Tomlinson says the following in the foreword to her book *The Differentiated Classroom: Responding to the Needs of All Learners* (Tomlinson 2014):

> Teachers often say to me, 'How can I find time to differentiate instruction? I'm so busy already!' Writing this book has reinforced the only answer I know to give: 'Build a career. Plan to be better tomorrow than today, but don't ever plan to be finished'. As I once heard a teacher say to a student in her classroom, 'Of course it's hard. That's why it's worth your time. And you can do hard things.' (p. vi)

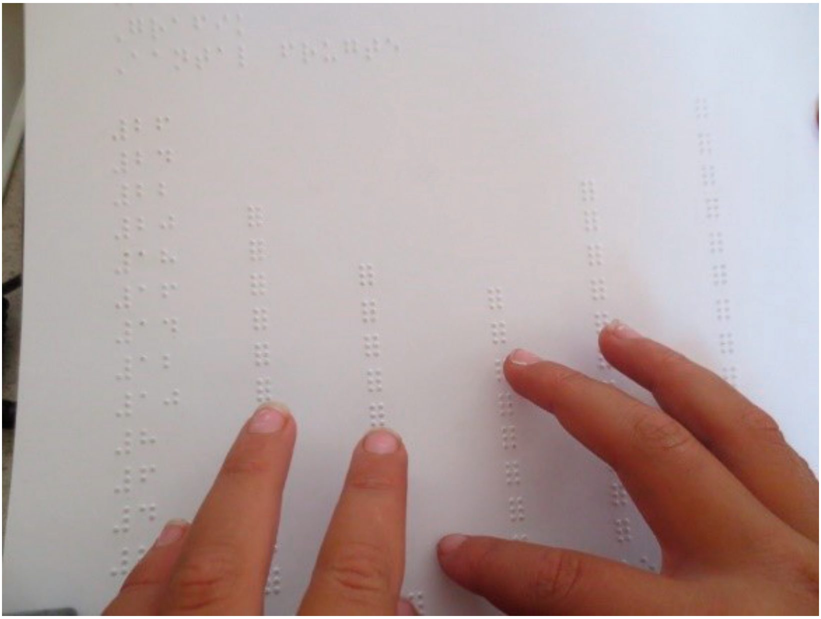

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FIGURE 6.23: A learner reading a bar graph drawn with a Perkins Brailler.

Nothing should be too hard for teachers who work with learners with disabilities, such as visual impairment, considering the reward and satisfaction when succeeding in supporting all learners to reach their maximum potential, no matter what the obstacles and barriers are. Every child has the right to a positive future and the dignity of access to and receiving quality education that meets all his or her needs. Even though this will require additional effort and finding creative solutions on the part of the teacher, the benefits of differentiation in the school curriculum will have far-reaching positive effects in learners' lives who require special support.

Chapter 7

Adaptation of learning and teaching support material and assessment of learners with visual impairment

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Keywords: Learners; Question; Grade; Annual; LTSM (learning and teaching support material).

Introduction

The accessibility of LTSM and effective assessment are key to the performance of learners with visual impairment. If these learners do not have equal access to the curriculum of which LTSM and

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assessment are inherent elements, their human right of equal access to quality education is violated (also refer to vol. 1, ch. 3 by Bornman). The reasons for the underlying principles and possible approaches to adaptation align with those discussed in Chapter 6 (by Viljoen) for curriculum differentiation. However, this chapter focuses on presenting LTSM and assessment in accessible ways in the classroom, as well as for formal or external assessment.

The content included in this chapter is based on the author's experience in a school for the blind, as well as on the work done by Cobb and McDonald (2001) regarding adaptation of examination and assessment materials. Following international research, South Africa has since collaboratively developed a model of adaptation of LTSM and assessment, which forms the basis of the discussion in this chapter.[2]

■ Overview of the chapter

This chapter focuses on presenting LTSM and assessment in accessible ways in the classroom, as well as for formal or external assessment. It explores the differences between LTSM for blind and LTSM for low vision learners, explains the rules for presenting graphic material and discusses adaptations of LTSM and assessments. The reasons for adaptation and examples of different approaches to adaptation are included, and so are the access arrangements for examinations and reasonable accommodations and/or concessions that can be applied for in the case of learners with visual impairment.

2. Some of my thinking/material in this chapter was originally articulated in guidelines documents and training manuals developed while I was working on contract for the DBE. The authors of these documents worked as a team and were not individually recognised. Though unpublished, documents such as *Responding To Diversity in Grades R to 9: Practical Approaches to English & Mathematics Curriculum Differentiation: Participants Manual*, Chapter 9, pp. 125–126 (August 2017) were widely used and informally disseminated within the education sector in South Africa and such documents or parts thereof can still be found on educational platforms.

Definition of key concepts

Adaptation

The process of making resources and the curriculum accessible for learners, thereby providing them with equal opportunities for learning.

Formal assessment

Examinations or tests for promotion and/or progression purposes, which can be classroom-based or of an external nature.

Informal assessment

Assessment that is not for promotion purposes but rather serves a diagnostic purpose in order to determine whether or not learners understand what they have been taught.

Learning and teaching support material

This concept refers to textbooks, workbooks, worksheets, tests and examinations.

Preparing learning and teaching support material in a format suitable for learners with visual impairment

The textbooks used in class when teaching learners with visual impairment are usually transcribed into Braille and/or are available in large print. Low vision learners can also use magnifiers if they are comfortable with this, and if e-books are available, some learners can use screen readers, even though this may not suit everyone and should not be seen as a replacement for printed LTSM. It should rather be viewed as an additional method for learners to access learning material. Learners should be encouraged during classroom teaching to try some unadapted exercises. They will enjoy using easily found materials like cooldrink straws, string and glue, or even their Perkins Brailler to 'draw' simple graphs. Throughout the exercise, the teacher should remember that the focus in the classroom is on conceptual development and understanding.

Material for blind learners

Blind learners usually require material in Braille. In addition, it is possible to use electronic or audio formats, depending on individual learners, subjects and visual content. Work needs to be prepared well in advance as it takes time to adapt and produce it in the correct format. It often helps to distribute work the day before a lesson is presented for learners to have enough time to read through the content before the lesson.

The quality of Braille is important when distributing material amongst learners who are blind. In this regard, it is important that learners receive accurate representations of original documents, in the correct braille code and printed on quality paper. Furthermore, the layout must be clear in order for the document to be suitable for scanning when looking for specific information.

Providing graphic material

- Braille printing houses in South Africa rely on the certain guidelines to develop braille graphics when transcribing textbooks, workbooks and formal assessments, such as the NSC examination papers or Annual National Assessments.
- Use a larger and clearer scale or size for diagrams.
- Keep in mind the important facts, content and questions, as well as the level of knowledge, skills and age of the learners, when designing the graphic. Omit unnecessary and irrelevant information or parts of a diagram or map.
- Write the heading, legend (or key) and transcriber's notes above or before the diagram or graph.
- Labels are always written horizontally. Do not expect blind learners to identify things like flowers, people, animals and so on, if they are not labelled.

- Draw graphics in two dimensions where possible. Complicated 3D drawings can be split into several 2D drawings to make it more accessible.
- Avoid lines that are too close together and will be hard to distinguish for the learner.
- Use different textures to differentiate between objects, for example, water and land in maps or finding objects that are same or different.
- Present information in an informative way. For example, replace a question like 'Can you tell what this is?' with 'This is a drawing of a train with the locomotive on the right in the drawing and the carriages to the left'. In this manner, learners are provided with a starting point.

Material for learners with low vision

As the functional vision of learners with low vision varies, they may require the use of different fonts; font sizes; coloured paper; higher contrasts; less, more or special lighting or magnifying devices. In addition, in order to function optimally, some learners may need to avoid glare or sit in a preferred position in class. Some possible variations and guidelines in terms of colour include the following:

- black against white
- light yellow against dark blue, for example, '**My name is Sam**'
- avoiding the use of pastel colours next to each other, for example, '**I like green**'
- keeping in mind that red is often difficult to see.

In terms of font size preferences, the following general guidelines apply:

- Text is easier to read when it is bigger and has **better contrast**.
- **Arial 18 bold is the most common font choice for learners with low vision, but it does not suit everyone.**

$3\ x^2 + 2x\ \ = 5$

$\mathbf{3x^2 + 2x = 5}$

$\mathbf{+, \div, x, -, <, >, =, \%, \frac{1}{2}, \frac{3}{4}}$

FIGURE 7.1: Example of the transcription of an equation.

When using numbers, exponents and operational signs, learners with low vision often experience difficulty in distinguishing the numbers and symbols from one another, for example, the first equation in Figure 7.1. When transcribed into large print, it is advisable to print in bold and use the correct font size for each learner (Figure 7.1).

Adaptations of learning and teaching support material and assessments

Cobb and McDonald (2001) argue that the:

> [*M*]ain principal underlying all special arrangements (adaptations or modifications or concessions) for assessment tests is to enable visually impaired children to demonstrate their knowledge, skills and understanding on an equal footing with sighted children. (para. 1)

At the same time, however, these authors emphasise the importance of not being in the process of creating an 'unfair advantage' for these learners by 'removing (the) disadvantage' (Cobb & McDonald 2001).

Reasons for adaptations, access arrangements and reasonable accommodations

Every teacher has the responsibility to ensure that what is taught or assessed is accessible to all learners, in order for them to be able to gain the intended knowledge, skills and understanding of concepts. Some visual material in its original format may not have any meaning for the learner with visual impairment, necessitating adaptation of the material so that it can be meaningful for all learners. The adaptation of LTSM and assessment procedures will place learners with visual impairment at an equal footing with their sighted peers, so that they too get an opportunity to perform well and achieve success.

General principles for adaptation

Despite the necessity of adaptations when working with learners with visual impairment, teachers need to keep in mind that not all material will have to be adapted or modified. As a general classroom teacher gains experience, they will know which material needs to be adapted in order to provide learners an in-depth subject knowledge, and which methods need to be applied when adapting the material. For formal examinations, the expertise of subject specialists may however be required – those who have preferably worked with learners with visual impairment and understand what visual skills these learners 'cannot reasonably be expected to possess' (Cobb & McDonald 2001).

When adapting learning material, general guidelines can be kept in mind (adapted from Cobb & McDonald 2001):

- Only adapt material when it is necessary to provide or enhance access to learning and an equal opportunity to reflect what has been learned.
- Retain the same skills, knowledge and concepts as in the original document so that the same learning outcomes and assessment objectives can be reached.
- Keep the level of difficulty the same as in the original document, except when the learners have cognitive disabilities.
- Keep a balance in terms of the weighting of content, in line with the original question or task.
- Avoid requiring the learners to spend a disproportionately large amount of time on the reading of large tables of information or complicated graphics for relatively few marks.
- Even though material can at times be so inherently visual that it needs to be replaced, this should only be done when absolutely essential as the learners still have to meet the same assessment objectives as in the case of the original document.

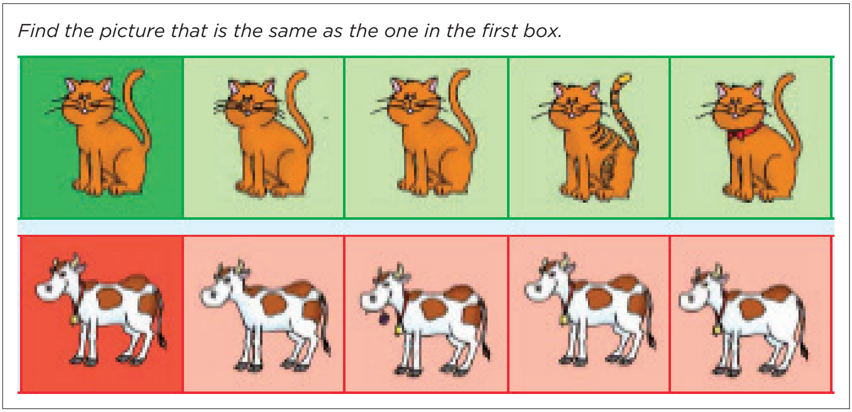
- Guard against the complete removal of all visual material and only remove such material when it does not form an integral part of the question.
- Remember to change the general instructions of a braille question paper, the instructions for individually adapted questions as well as the memorandum. When adapting the instructions keep in mind that blind learners, for example, do not write in the provided answer books or on the answer sheets, do not start each question on a new page and do not underline correct answers or rule off after questions, as is often required of other learners.
- Use an adapted memorandum for marking braille answers.

In the next section, examples of adaptations are provided. In Chapter 6 the various approaches that can be followed for adaptation were discussed; these are illustrated here. In some cases, more than one approach is followed in order to adapt a question successfully. All examples were taken from existing sources, as indicated.

Examples of approaches to adaptation

Simplifying a picture or diagram or presenting it in a different way

Adaptation: To distinguish between these pictures requires very good eyesight because the differences are minute. Keeping in mind that a differentiation between 'same and different' is the concept to be assessed, the following adaptation illustrates how this can be done by using familiar shapes and adding a tactile element for blind learners (Figure 7.3). Another example of an adaptation is to use the same shape in different directions and with different textures (Figure 7.4), which can also assess the concept of 'same and different'. Or the pictures can be replaced with well-known shapes, but with different tactile textures, as illustrated in Figure 7.5.



Source: DBE (2013j).

FIGURE 7.2: Example of a question requiring the learner to find a picture that is the same as the first picture, taken from the Grade 1 Mathematics Workbook.

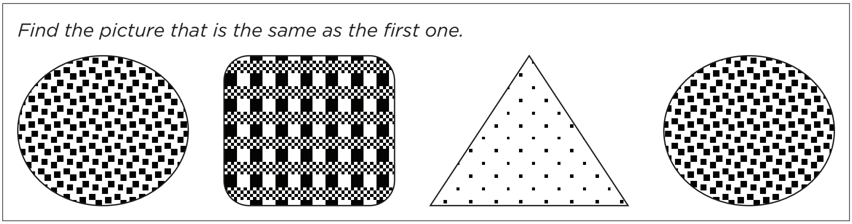


FIGURE 7.3: Example of an exercise in which learners are required to find an image that is the same shape as the first image.

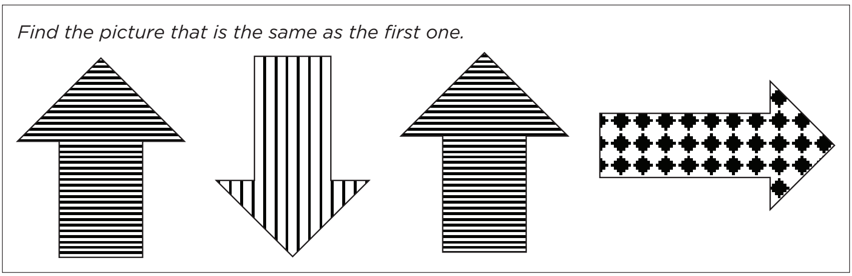


FIGURE 7.4: Example of an exercise in which learners are required to find an image that points in the same direction as the first image.

Find the pictures that have the same texture.

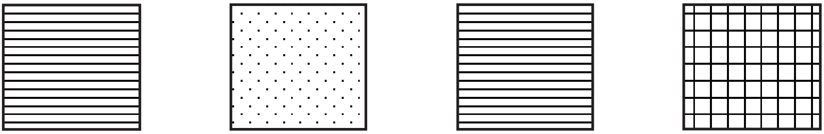
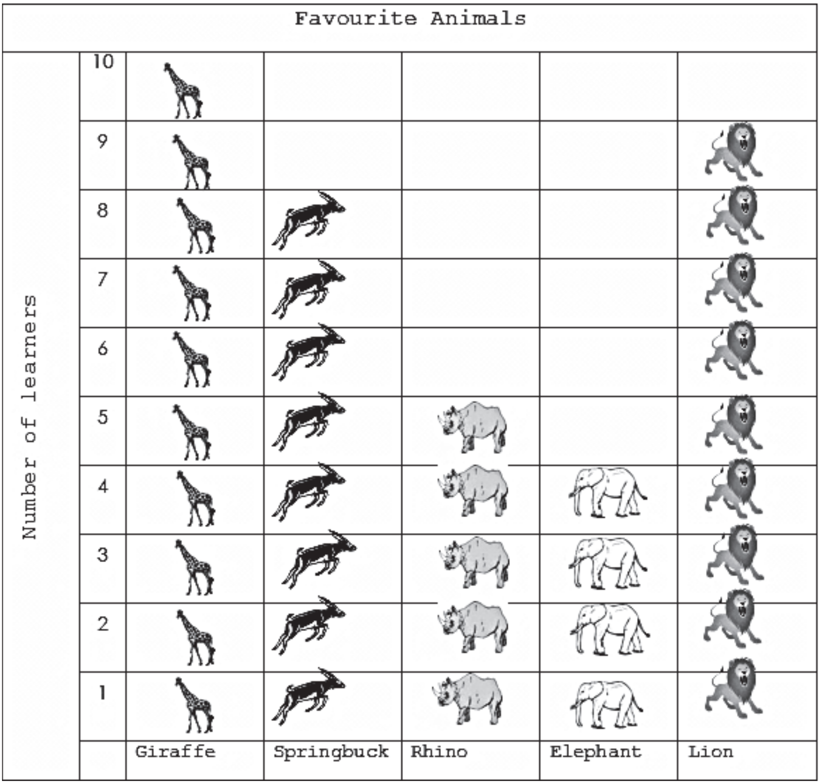


FIGURE 7.5: Example of an exercise in which learners are required to find the image with the same tactile texture as the first image.

Use the graph to complete the sentences below.



The least favourite animal is the ________
There are five more ______ than rhinos.

Source: DBE (2011a).

FIGURE 7.6: Question taken from the Grade 2 Mathematics Annual National Assessment.

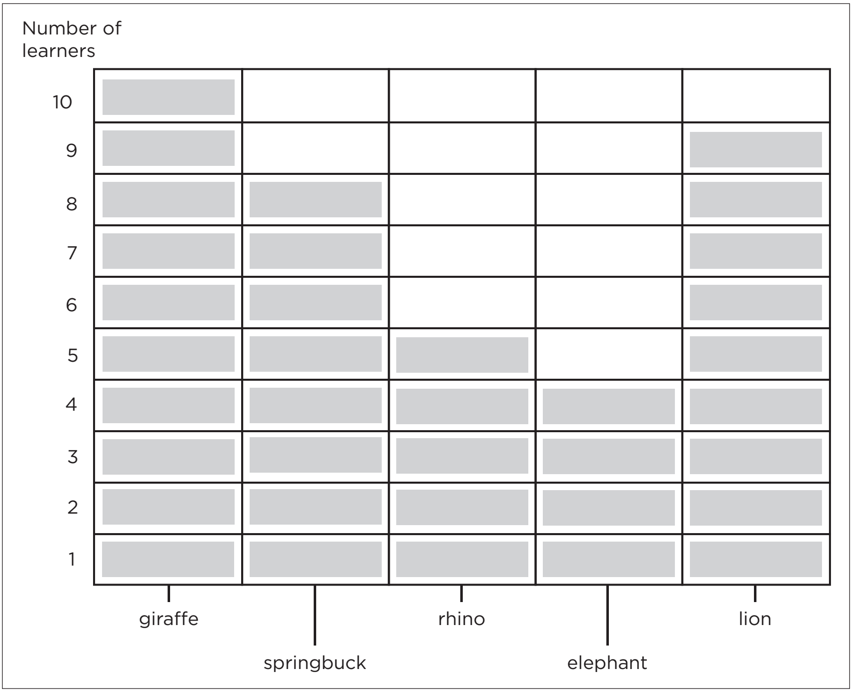
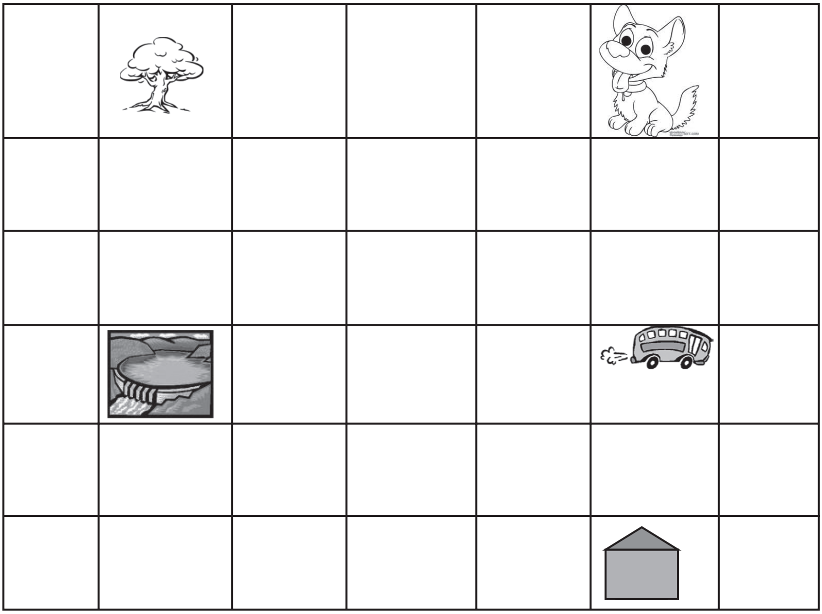


FIGURE 7.7: Example of a pictogram in Figure 7.6 adapted to a bar graph.

Adaptation: As the small pictures of animals (Figure 7.6) cannot be in braille and are also unclear for learners with low vision, the pictogram needs to be adapted to an ordinary bar graph, as captured in Figure 7.7. If needed, the labelling on the horizontal axis can be written over two or more lines in order to fit in more characters across a braille page.

Adaptation: In this example (Figure 7.8), several challenges can be identified, namely, that the small pictures will have no meaning when in braille, that they will be hard to identify for learners with low vision and that blind learners will not be able to draw the arrows. In adapting the question, the pictures can be replaced with words, arrows can be drawn to guide the learner to follow the track (orientating the learner on the page) and the grid can be simplified to leave out what is unnecessary (Figure 7.9). In order to compensate for drawing the arrows, another question is added.

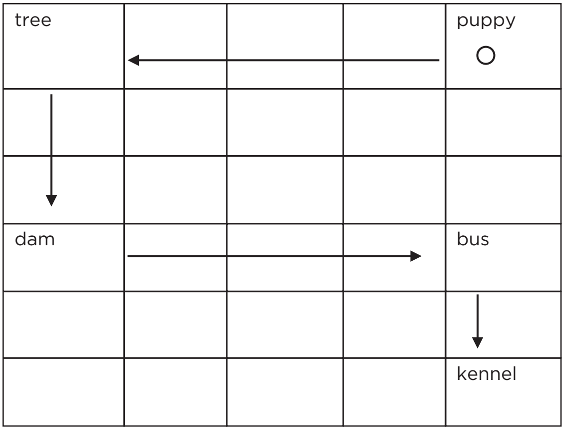
Help the puppy to find his way to his kennel.
The puppy runs to the tree.
He feels thirsty and runs to the dam to drink water.
He runs to the bus and then to his kennel.
Draw arrows on the grid to show how he ran.
How many blocks did he run altogether?



Source: DBE (2013f).

FIGURE 7.8: Question taken from the Grade 3 Mathematics Annual National Assessment.

Help the puppy to find his way to his kennel.
Study the blocks carefully and follow the instructions.
The puppy runs to the tree.
He feels thirsty and runs to the dam to drink water.
He runs to the bus and then to his kennel.

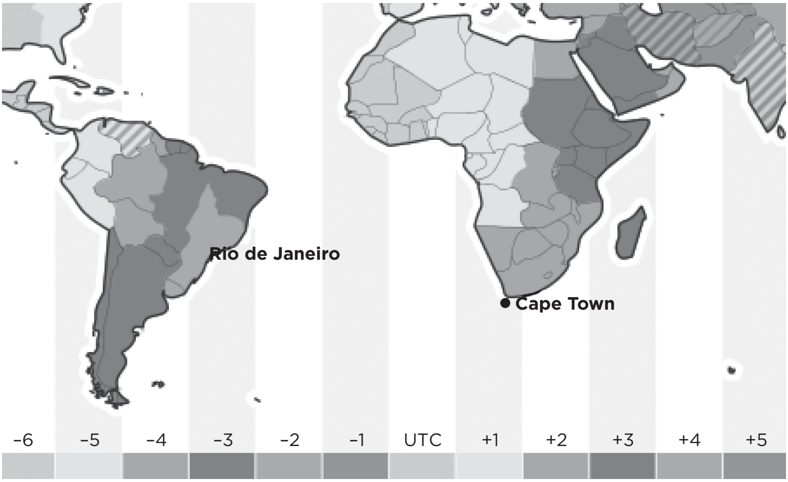


1. *How many blocks did he run altogether?*
2. *If the puppy is still thirsty when he gets to his kennel, how many blocks does he have to run back to drink some more water?*

FIGURE 7.9: Adaptation of the question presented in Figure 7.8.

Adaptation: In this example (Figure 7.10), learners with visual impairment will not be able to 'read' the grey and white time zones. However, it is not really necessary to include any detail on the maps other than the two cities involved. When adapting this question (see Figure 7.11), the unnecessary information ('clutter') is therefore removed and only the time zones that matter are included. The questions remain unchanged.

Examine the map below and answer the questions that follow.

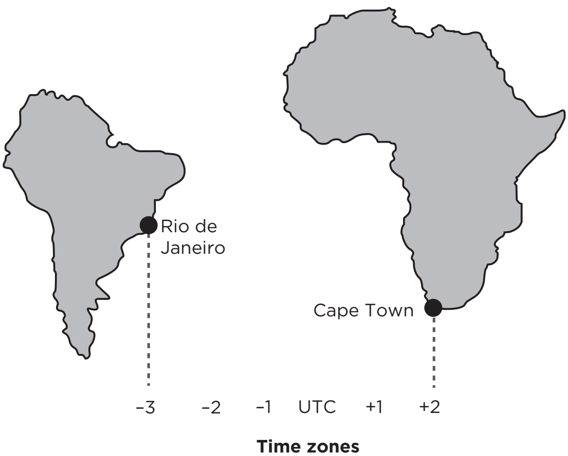


a) What is the time difference in hours between Cape Town and Rio de Janeiro?
b) If it is 11:00 a.m. in Rio de Janeiro, what is the time in Cape Town?

Source: DBE (2013g).

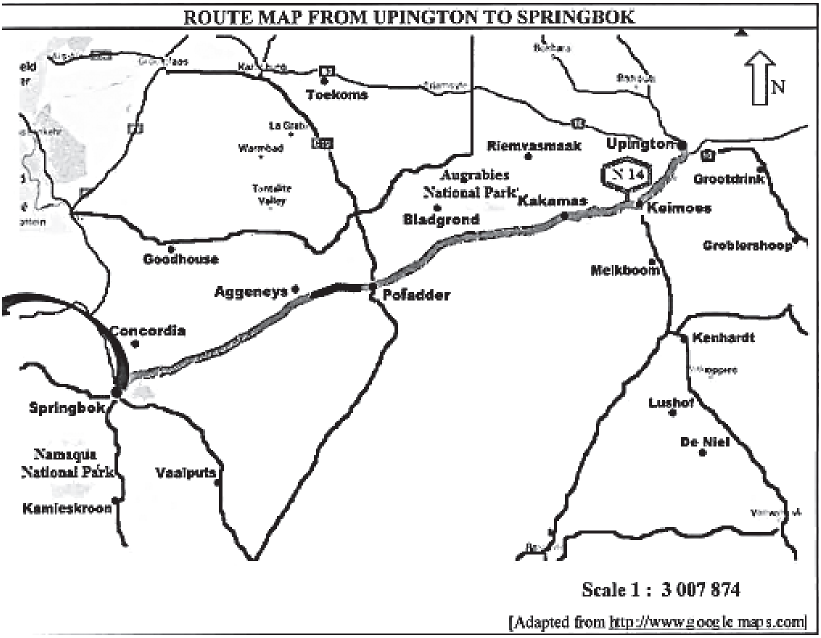
FIGURE 7.10: Example of a question requiring learners to ascertain time zones based on a graphical representation, taken from the Grade 6 Mathematics Annual National Assessment.

Examine the map below and answer the questions that follow.



a) What is the time difference in hours between Cape Town and Rio de Janeiro?
b) If it is 11:00 a.m. in Rio de Janeiro, what is the time in Cape Town?

FIGURE 7.11: Adaptation of the question presented in Figure 7.10.

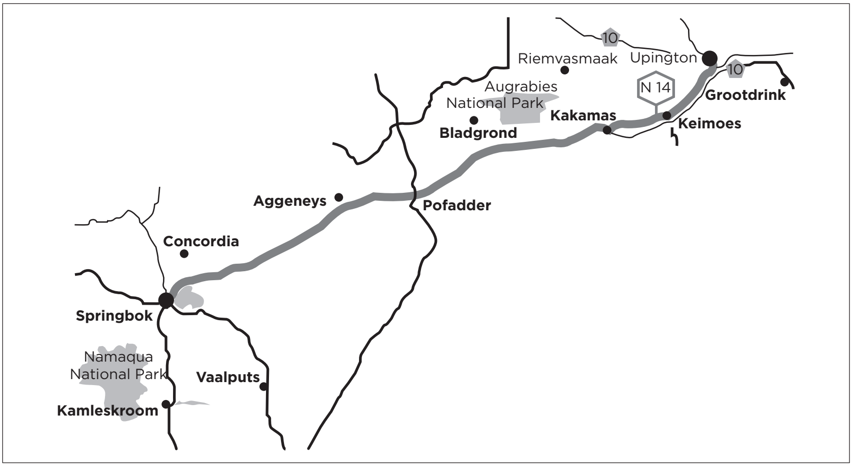


A parkrun is a weekly 5 km run. A group of runners drove from Upington to Springbok to take part in the weekly parkrun in Springbok. Use the map to answer the questions below

Source: DBE (2018).

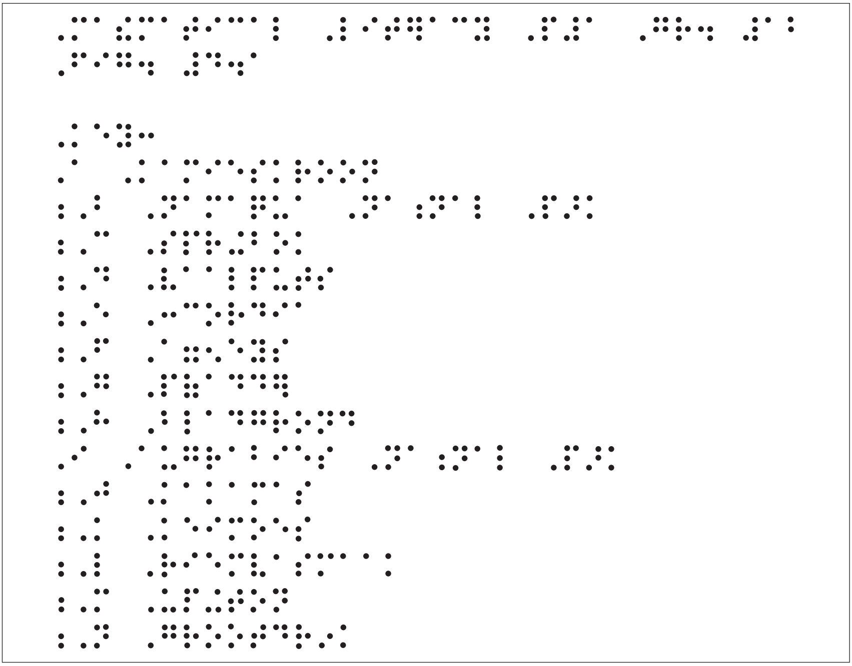
FIGURE 7.12: Question taken from the Grade 12 Mathematical Literacy Paper 1.

Adaptation: As all these questions are accessible to learners with visual impairment, it is merely necessary to unclutter the map (Figure 7.12) and develop it in braille. In the first drawing, only the essential part of the map is included (Figure 7.13), yet the names of all the places cannot be included on a braille map due to the amount of space available. As a solution, a key is developed and provided with the map, as captured in Figure 7.14 and Figure 7.15, respectively.



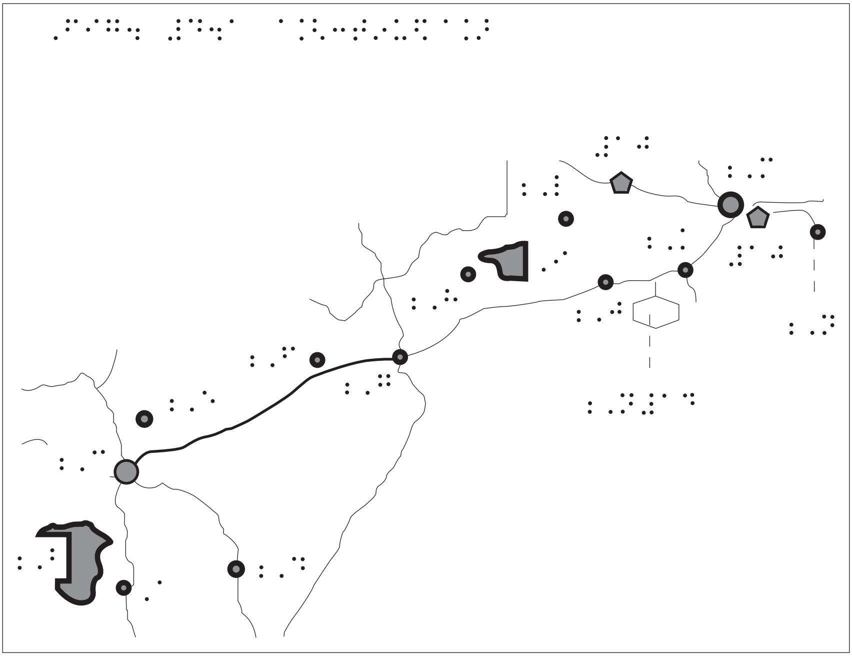
Source: Adapted from Google (2018).

FIGURE 7.13: Simplified adaptation of the map presented in Figure 7.12.



Source: Pioneer Printers (2018).

FIGURE 7.14: Braille notes and legend.



Source: Pioneer Printers (2018).

FIGURE 7.15: Braille map.

Replacing a picture or diagram with a written description

Adaptation: In addition to the problem that these pictures cannot be put in braille, both the pictures and the font used may be difficult for learners with low vision to see. In adapting this question, each picture can be replaced with a brief description, with the question remaining the same, as captured is Figure 7.17.

Match the words with the pictures.

Source: DBE (2013d).

FIGURE 7.16: Question taken from the Grade 4 English Home Language Workbook, Third Edition.

Match the words in column 1 with the sentences in column 2.

Column 1	***Column 2***
A. jungle	*a. A Power station is sending thick clouds of smoke into the air.*
B. polluted	*b. Children are carrying posters saying: Save the forests, Keep our planet safe.*
C. dangerous	*c. Men are chopping down trees while wild animals are fleeing.*
D. protest	*d. Signs on a barbed wire fence are saying: Danger, Keep out, Danger Beware.*

FIGURE 7.17: Adaptation of the question presented in Figure 7.16, using descriptions in place of pictures.

Adaptation: In order to adapt this question (Figure 7.18) to be suitable for learners with visual impairment, the picture can be described, and the same questions asked, as shown in Figure 7.19.

Look at the picture and answer the questions.
a) Circle the correct answer.
The group of children are (shouting talking singing crying).
b) Place a cross (x) in the box next to the correct answer.
There are ... singers in the group.
Three four five two
c) Circle the letter next to the correct answer.
The person in the middle of the group is a ...
A woman. B man. C boy. D girl.

Source: DBE (2013b).

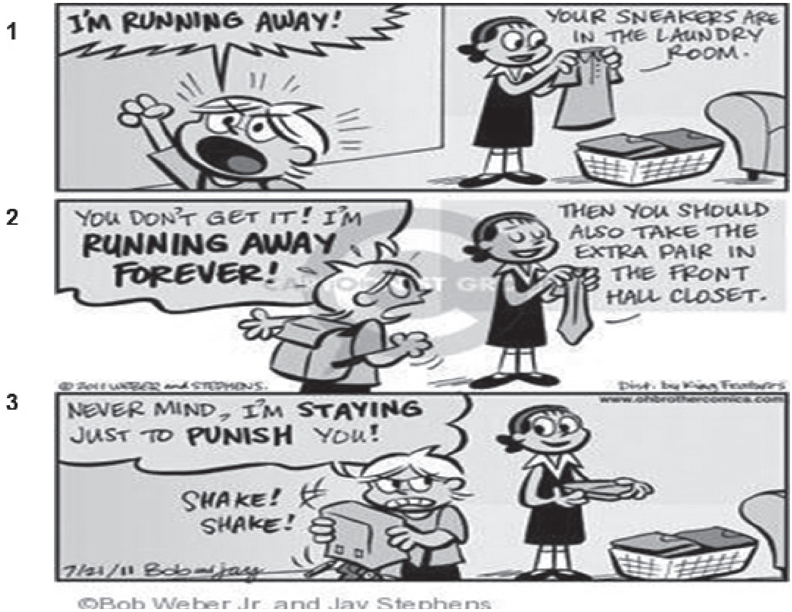
FIGURE 7.18: Question taken from the Grade 3 English Home Language Annual National Assessment.

A picture is showing a group of children with their mouths wide open and music notes floating above them. They are standing in this order: girl, boy, boy, girl, girl. Answer the questions by writing down the correct answer.
a) The group of children are (shouting/ talking/ singing/ crying).
b) There are ... singers in the group. (three, four, five, two)
c) The person in the middle of the group is a ... (woman, man, boy, girl)

FIGURE 7.19: Adaptation of the question presented in Figure 7.18, with the picture described and the same questions asked.

Adaptation: Cartoons and advertisements are often used in various subjects, with these usually being quite visual (see Figure 7.20). Questions containing these do not have to be omitted; however, sufficient time should be spent on teaching

Read the cartoon below and then answer the questions.



a) Circle the letter of the correct answer.
Why are the words, 'I'm running away!' in frame 1, written in bold?
A. The boy knows his mother does not like his attitude.
B. The boy likes to seem important.
C. The boy has a pleasant voice.
D. The boy is shouting.
b) Circle the letter of the correct answer.
Indicate what feeling the expression on the boy's face in frame 3 conveys.
A. Disappointment B. Sadness C. Concern D. Anger
c) Explain your answer to question 3.2 by referring to:
A. The boy's body language
B. The boy's facial expression.
d) Read the last frame carefully then explain the humour in the cartoon.

Source: DBE (2013c).

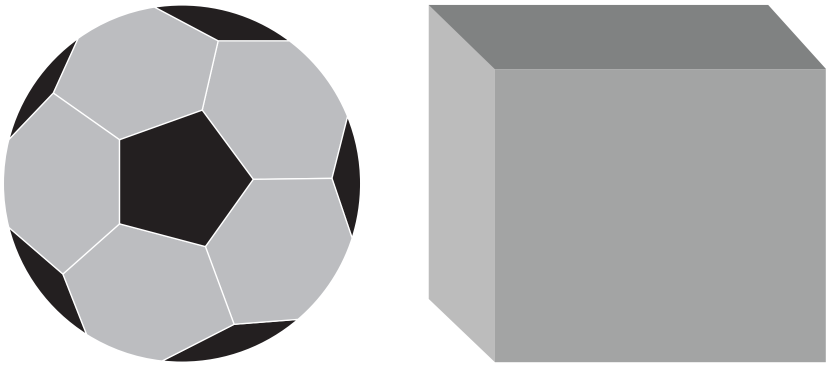
FIGURE 7.20: Question taken from the Grade 9 Home Language Annual National Assessment.

learners about visual 'signs' and how facial expressions and body language may be portrayed in such pictures. In adapting this example, the cartoon can be described and the questions kept as they are. The descriptions, for example, can be given as presented in Figure 7.21.

*Frame 1: On the left in the frame, we see a boy with his mouth wide open and his right fist in the air. Above him, in bold capital letters, the following words appear: '**I AM RUNNING AWAY**!' To the right is his mother folding laundry. She says: 'Your sneakers are in the laundry room'.*
*Frame 2: The boy has his backpack on his back, turns to his mother and says: 'You don't get it! I'm **RUNNING AWAY FOREVER**!' His mother continues folding and says: 'Then you should also take the extra pair in the front hall closet'.*
*Frame 3: The boy is holding his backpack upside down. Next to it are the words: Shake! Shake! He is rolling his eyes with his back to his mother and his teeth are showing. He says: 'NEVER MIND, I'M **STAYING** JUST TO **PUNISH** YOU**!**' His mother just stands there.*

FIGURE 7.21: Adaptation of the question presented in Figure 7.20, with descriptions provided for the cartoons and the same questions presented.

Draw a cross (x) on the object that can slide.



Source: DBE (2012a).
FIGURE 7.22: Question taken from the Grade 1 Mathematics Annual National Assessment.

Supplementing a picture or diagram with a written description

Adaptation: As learners with visual impairment cannot be expected to identify a 3D object in a 2D drawing (Figure 7.22), it is important to label all drawings, as done in Figure 7.23.

Adaptation: Weather charts (Figure 7.24) are often used in textbooks, in workbooks and in the classroom. When including these charts, questions can be adapted by providing a legend or key to the various symbols with a label to explain the meaning of

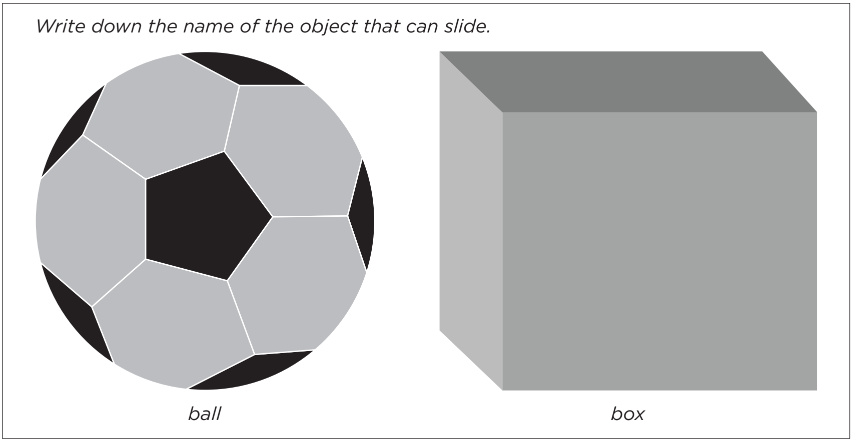
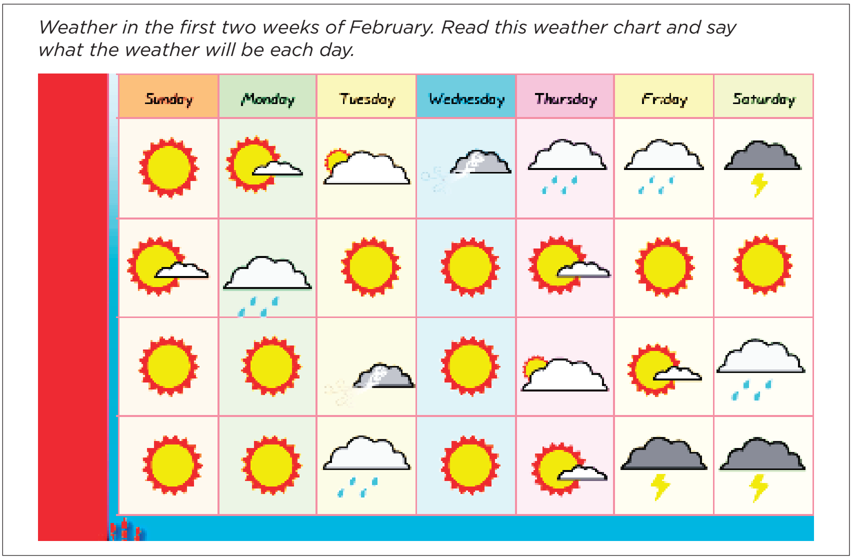


FIGURE 7.23: Adaptation of the question presented in Figure 7.22, in which descriptions are provided below the objects.



Source: DBE (2013k).

FIGURE 7.24: Question taken from the Grade 2 Rainbow Workbook 1.

each of the labels, and then printing the table vertically for a better fit on a braille page. The adapted version of this question is provided in Figure 7.25.

Read the weather chart for two weeks in February and say what the weather will be each day.

Weather symbols:

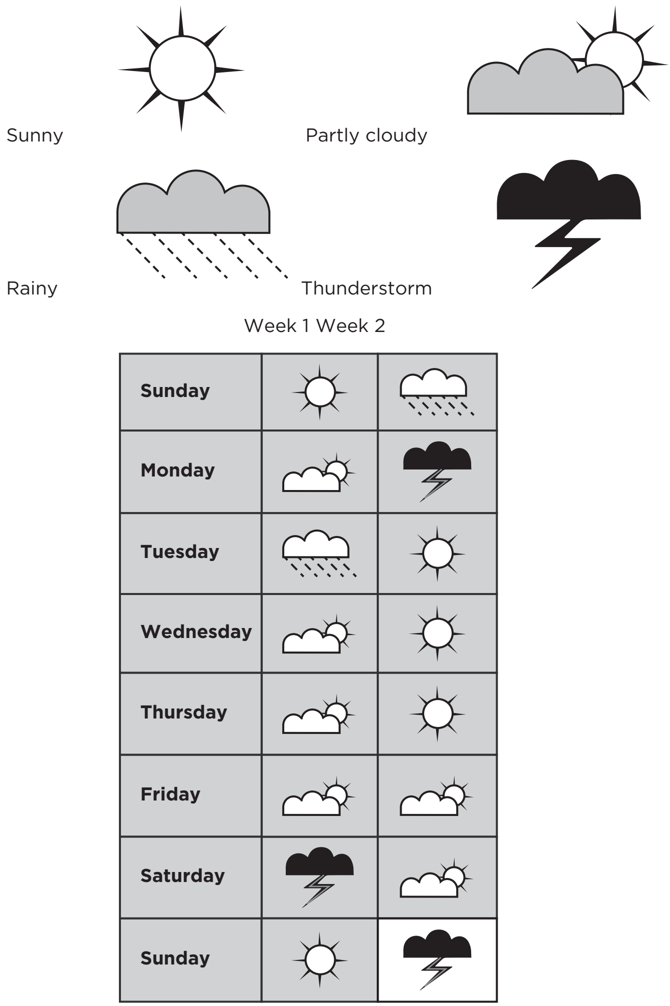
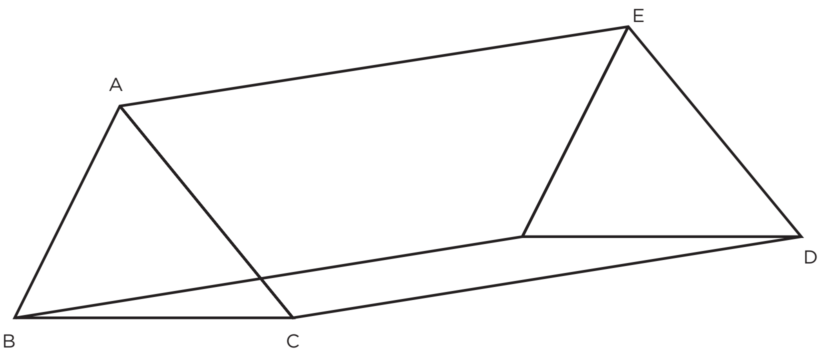


FIGURE 7.25: Adaptation of the question presented in Figure 7.24, with a legend provided and the chart printed vertically.

Adaptation: As it is difficult for blind learners to read 3D diagrams (Figure 7.26), it is important to provide additional information in such questions to make it easier for them to interpret the drawing, such as 'in the above triangle prism, ΔABC forms the base of the prism. AB = 3 cm, AC = 4 cm and BC = 5 cm. The length of side CD of the rectangle ACDE is 12 cm.' The questions can remain the same.

Adaptation: To adapt this question (Figure 7.27), five individual drawings of the beaks need to be provided to the learners with a short description of the shape of each beak (Figure 7.28). The question can remain unchanged.

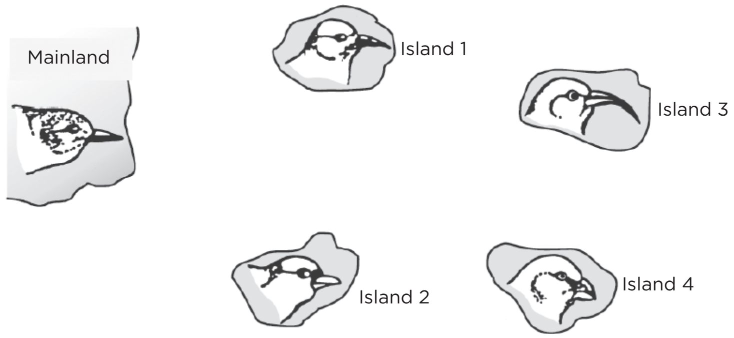


In the above triangular prism, AB = 3 cm, AC = 4 cm, BC = 5 cm and CD = 12 cm.
a) Show that ΔABC is a right-angled triangle. (4)
b) Hence, calculate the surface area of the prism. (4)

Source: DBE (2012b).

FIGURE 7.26: Question taken from the Grade 9 Mathematics Exemplar Annual National Assessment.

The diagram below shows five closely related species of finches found on the mainland and on four nearby islands. Describe how the different species on the four islands evolved over many generations from the original ancestor on the mainland.



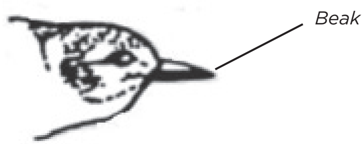
Closely related species of finches found on the mainland and on four nearby islands

Source: DBE (2013e).

FIGURE 7.27: Question taken from the Life Sciences Grade 12 Paper 1.

Picture 1: Mainland

Head of finch



Picture 2: Island 1

Head of finch with longer beak, slightly hooked

FIGURE 7.28: Adaptation of the question presented in Figure 7.27, with individual images and descriptions of the birds' beaks provided. The remaining three pictures can be dealt with in the same manner.

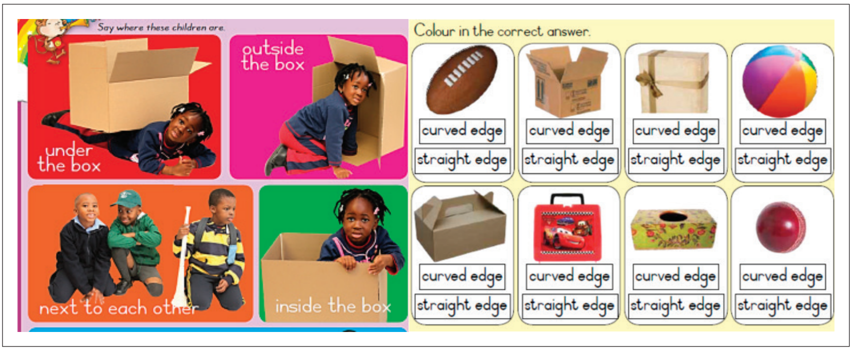
Replacing a picture or diagram with a real object or model for classroom work

This approach is not really used in formal assessment, yet it is useful to make the spatial understanding of 3D pictures easier for learners with visual impairment. Thus, the approach is important for classroom teaching in support of concept development and learners' understanding of 3D objects or models, and their graphic representations in 2D.

Adaptation: When teaching these concepts to young blind learners, it works best to bring the objects into the classroom, for them to physically explore all the positions and edges of the objects.

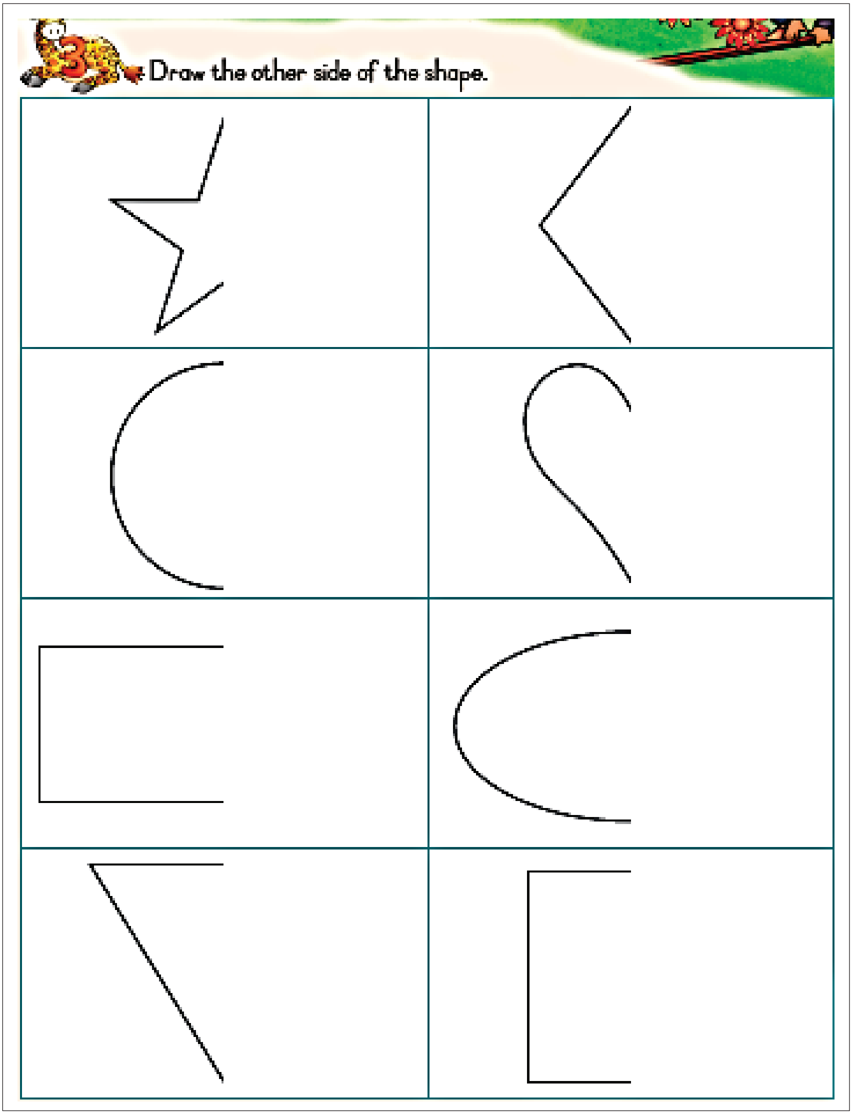
Symmetry is an important principle in mathematics, and often includes exercises such as the one in the example.

Adaptation: In the case of learners with visual impairment, they can use Wikki Stix to complete the shapes.



Source: DBE (2013j).

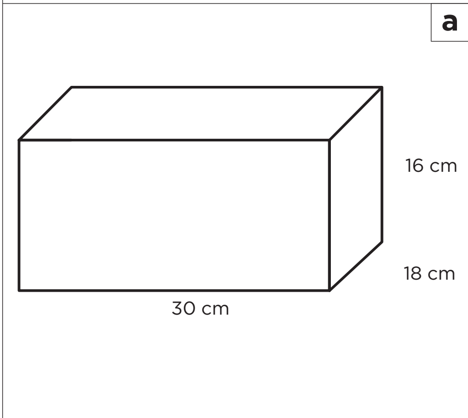
FIGURE 7.29: Exercises taken from the Grade 1 Rainbow Workbook 1.

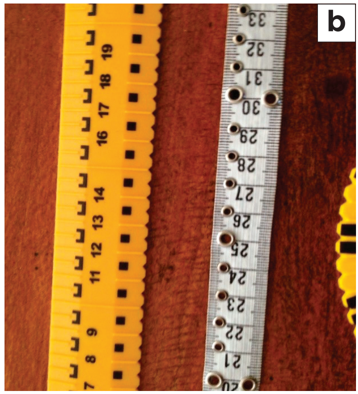


Source: DBE (2015a).

FIGURE 7.30: Exercise taken from the Grade 2 Mathematics Rainbow Workbook 2.

a) A shoe box is in the shape of a rectangular prism. Calculate the volume of the shoe box.
b) Calculate the surface area of a rectangular prism with the same measurements.





Source: (b) Photograph taken by Hestelle Viljoen, date and location unspecified, published with permission from Hestelle Viljoen.

FIGURE 7.31: Example of a Grade 5 Mathematics problem, with (a) a drawing of a shoebox, with measurements, and (b) a photograph of Braille measuring equipment.

Adaptation: For an exercise like this, it is a good idea, in support of concept development, to rely on a tactile activity. Learners can, for example, measure a shoe box by using specialised measuring tools for learners with visual impairment (pictured in Example 7.31), even though they will generally find it difficult to read millimetres accurately. For the second question, they can cut the box open and explore the net of the prism and subsequently discover the formula for the surface area of the prism themselves. In formal assessment, the drawing can be left out, with the questions reading as:

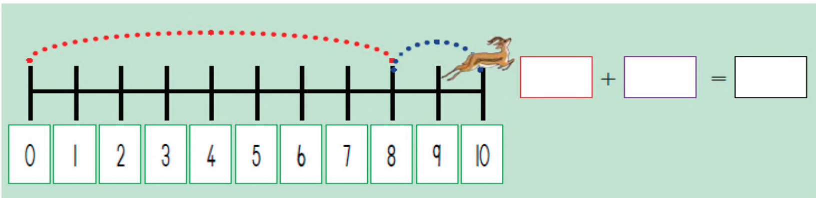
a) A shoebox is in the shape of a rectangular prism. The box is 30 cm long, 18 cm wide and 16 cm high. Calculate the volume of the box.
b) Calculate the surface area of the rectangular prism.

Removing unnecessary pictures

Adaptation: In the Figure 7.32 example, the layout is not suitable for braille and should be adapted. In addition, there is no need to include the springbuck, the many 'boxes' or the pale colours. The question can be adapted as indicated in Figure 7.33.

Adaptation: As indicated previously, pictures of 3D objects are hard to read for braille users and should thus be avoided. In the Figure 7.34 example, only the drawings of the nets can be included, changing the question accordingly: 'Choose the correct prism or pyramid to go with the nets. Write the name of the 3D object next to the correct net.'

Help the springbuck to write a sum.
Use the number line to help you work out the answers.



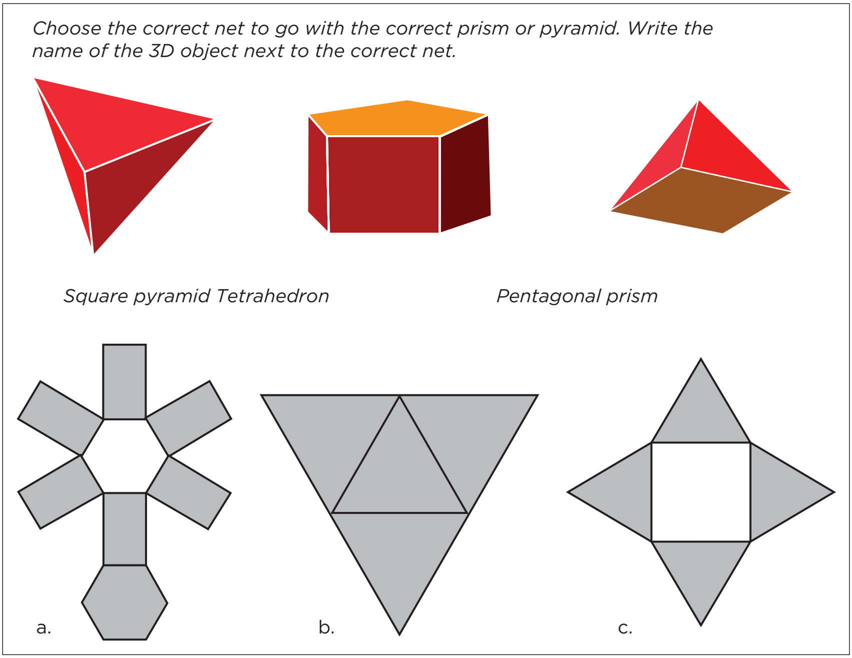
Source: DBE (2017).

FIGURE 7.32: Question taken from the Grade 2 Mathematics Rainbow Workbook 1, Seventh Edition.

Use the number line to write an addition sum.

______ + ______ = ______

FIGURE 7.33: Adaptation of the question posed in Figure 7.32.



Source: DBE (2013l).

FIGURE 7.34: Exercise taken from the Grade 7 Mathematics Rainbow Workbook 1.

Adaptation: In the example in Figure 7.35, the cartoon can simply be removed, as the questions purely relate to content and can be answered without inclusion of the cartoon.

Study the cartoon below and answer the questions that follow.
a) Define the concept inflation. (2)
b) Who regulates the petrol price in South Africa? (2)
c) Give the economic term for prices of goods and services set by government. (2)
d) Explain the effect of an unfavourable rand/dollar exchange rate on the petrol price. (2)

INFLATION DUE TO PETROL PRICE INCREASE

Source: DBE (2013a).

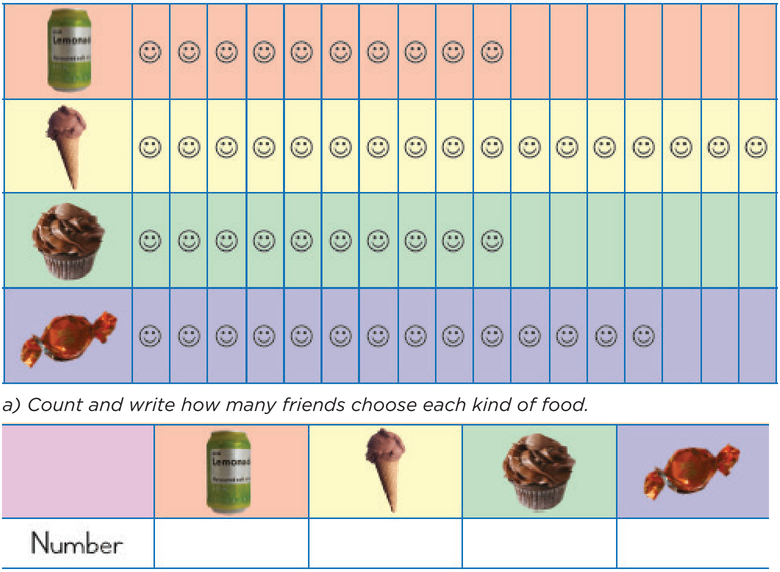
FIGURE 7.35: Question taken from Grade 12 Economics.

Reducing the amount of information

A braille page can capture a maximum of 40 characters across the page. As a result, it is often necessary to reduce the amount of information in a meaningful way, in order not to exceed the limit, yet still retaining the essence of the question or lesson.

Adaptation: In order to not exceed the possible number of characters for a braille page, the number of friends in each category can be reduced when adapting this question (Figure 7.36). The picture (smiley face) should furthermore be enlarged; however, it can also be replaced by any other symbol or character, as long as a key is provided. Finally, the pictures of food should be replaced with the names of the food, as indicated in Figure 7.37.

Busi asks all of her friends to vote for their favourite party food.
This is how they vote: 1 friend = ☺



a) Count and write how many friends choose each kind of food.

b) Which is the favourite party food?
c) How many friends does Busi ask?
d) How many more friends choose ice cream over sweets?

Source: DBE (2013i).

FIGURE 7.36: Question taken from the Grade 3 Mathematics Rainbow Workbook 1.

1 friend = ☺

Lemonade	☺	☺	☺	☺							
Ice cream	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺	☺
Cupcake	☺	☺	☺	☺							
Sweets	☺	☺	☺	☺	☺	☺					

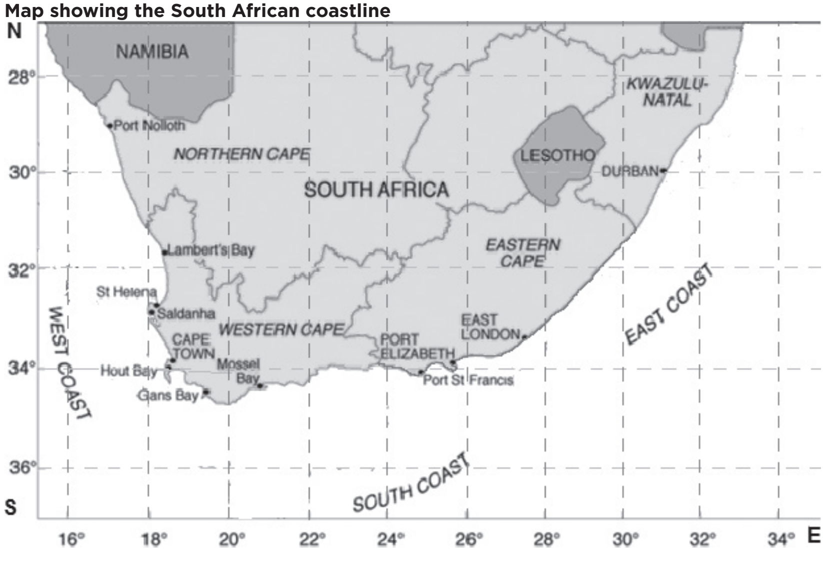
a) Count and write how many friends choose each kind of food.
Lemonade: ______
Ice cream: ______
Cupcakes: ______
Sweets: ______
b) Which is the favourite party food?
c) How many friends does Busi ask?
d) How many more friends choose ice cream over sweets?

FIGURE 7.37: Adaptation of the question presented in Figure 7.36, with larger smiley faces and names of foods replacing the pictures.

Adaptation: In this question (Figure 7.38), the map is only needed to answer Question b, which does not require exact measurement as learners can give an estimated answer. In adapting the question, a simplified map can be provided that merely indicates only the provinces, not including the names of the provinces on the map but rather providing a key or legend for labelling, as illustrated in Figure 7.39:

The South African coastline measures approximately 2798 km from the mouth of the Orange River on the West Coast to Ponta do Ouro in Mozambique on the East Coast. The Eastern Cape has approximately 800 km of coastline. The map below shows the coastline of South Africa.
a) Determine the total length, in miles, of the South African coastline if the coastline of the Eastern Cape is approximately 500 miles long. *(3)*
b) Use the map to list the coastal provinces of South Africa in descending order according to the length of their coastlines. *(3)*
c) Annie measured the length of the coastline of South Africa on her map and found it to be 223 mm long.
Determine the scale of the map in the form ***1****: …*
a) Round off the answer to the nearest hundred thousand. *(4)*

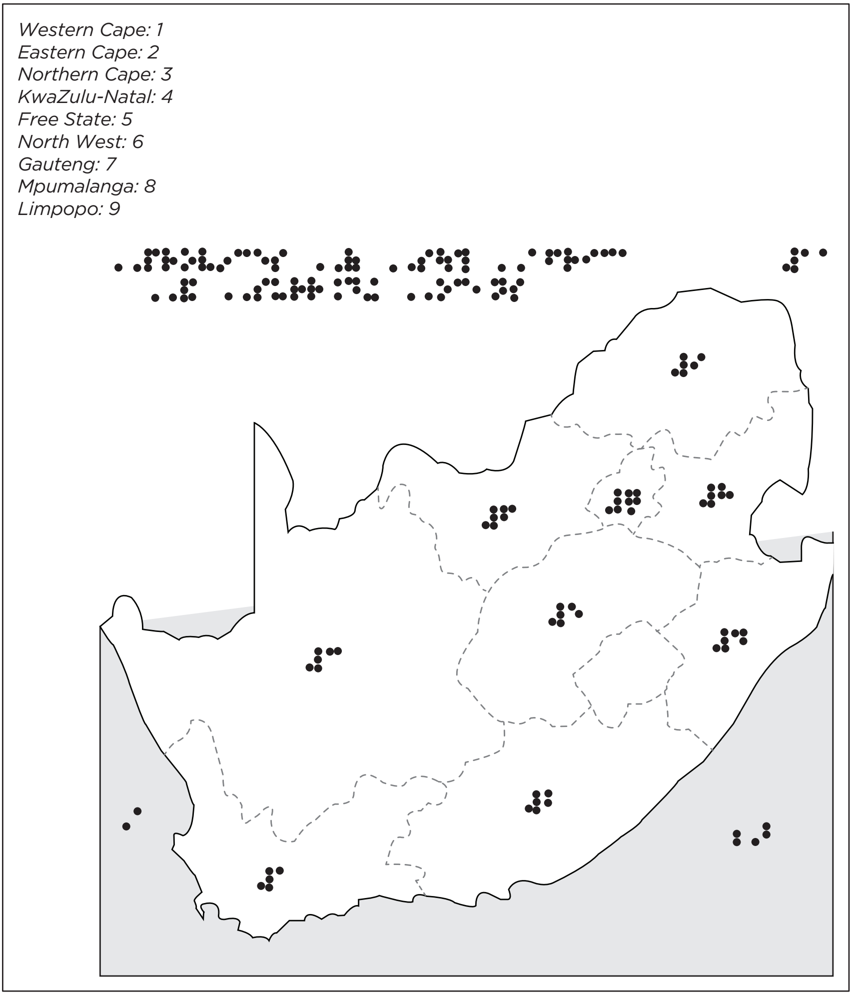
Map showing the South African coastline



Braille Map showing the South African Coastline.

Source: DBE (2013h).

FIGURE 7.38: Question taken from the Mathematical Literacy Grade 12 March.



Source: Pioneer Printers (2013).

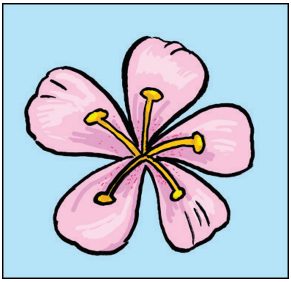
FIGURE 7.39: Simplified Braille map, with a legend provided for labelling.

Replacing inherently visual material with equivalent non-visual material

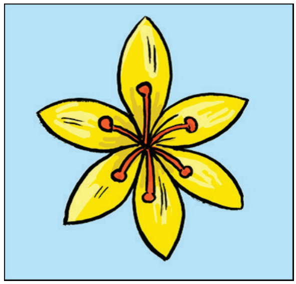
Adaptation: In order to avoid fine detail, pictures such as those in Figure 7.40 can be replaced with simple geometrical shapes of figures as in Figure 7.41.

What geometric figure do you see?

a)



b)

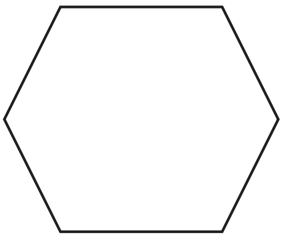


Source: DBE (2015b).

FIGURE 7.40: Question taken from the Grade 6 Mathematics Workbook.

What geometric figure do you see?

a)



b)

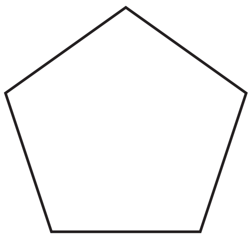


FIGURE 7.41: Adaptation of the question in Figure 7.40, making use of simple geometric shapes.

Read the poem below and then answer the questions that follow.

AUTUMN – Roy Campbell
I love to see, when leaves depart,
The clear anatomy arrives,
Winter, the paragon of art,
That kills all forms of life and feeling
Save what is pure and will survive.

Already now the clanging chains
Of geese are harnessed to the moon;
Stripped are the great sun-clouding planes:
And the dark pines, their own revealing,
Let in the needles of the noon.

Strained by the gale the olives whiten
Like hoary wrestlers bent with toil
And, with the vines, their branches lighten
To brim our vats where summer lingers
In the red froth and sun-gold oil.

Soon on our hearth's reviving pyre
Their rotted stems will crumble up:
And like a ruby, panting fire,
The grape will redden on your fingers
Through the lit crystal of the cup.

a) How does the first stanza evoke admiration for Winter? (2)
b) Explain the implication of the word 'brim' (line 14) in the context of the third stanza. (2)
c) Refer to line 10: 'Let in the needles of the noon.' Comment on the appropriateness of this image in context. (3)
d) Campbell's poem is about the interdependence of the seasons. To what extent do you agree with the above statement? Justify your response with reference to the poem as a whole.

Source: DBE (2017).

FIGURE 7.42: Question taken from the Grade 12 English Home Language Paper.

For Question c, the memorandum reads as follows (DBE 2017):

> *c) The image is a description of the actual pine needles as well as the sharp, **narrow shafts of light that filter through the trees**. It emphasises the **sharpness of the light**. It is appropriate because it creates an image of brightness and beauty while also suggesting the sharpness/harshness of the season. Autumn is associated with both destructiveness and the rejuvenation of beauty.*
>
> *[Award 3 marks for any two ideas well discussed OR three ideas.] (3)* (n.p.)

Adaptation: The poem in Figure 7.42 is packed with images that might be inherently too visual for the blind learner. Question (b) requires of the learner to comment on the appropriateness of the image 'Let in the needles of the noon'. It is questionable whether or not blind learners would be able to interpret the appropriateness of this image, as they have never seen/cannot really experience the 'narrow shafts of light' or the 'sharpness of the light'. In this case, a different poem or image may be more suitable for blind learners.

Adapting questions that require learners to draw

Questions that require learners to draw, can be adapted in various ways. The first option is to reverse the question by providing the drawing and then asking questions about it. Alternatively, different modes of responses can be used and accepted, for example, audio responses, written descriptions of the answer and so on.

Adaptation: By providing a drawing, the question posed in Figure 7.43 can be stated as shown in Figure 7.44.

Use the number line to show how you will calculate 4 + 2 + 2.

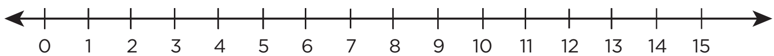


FIGURE 7.43: Grade 1 Mathematics.

Use the number line to write an addition sum.

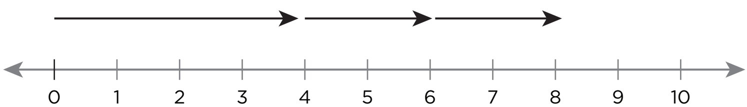
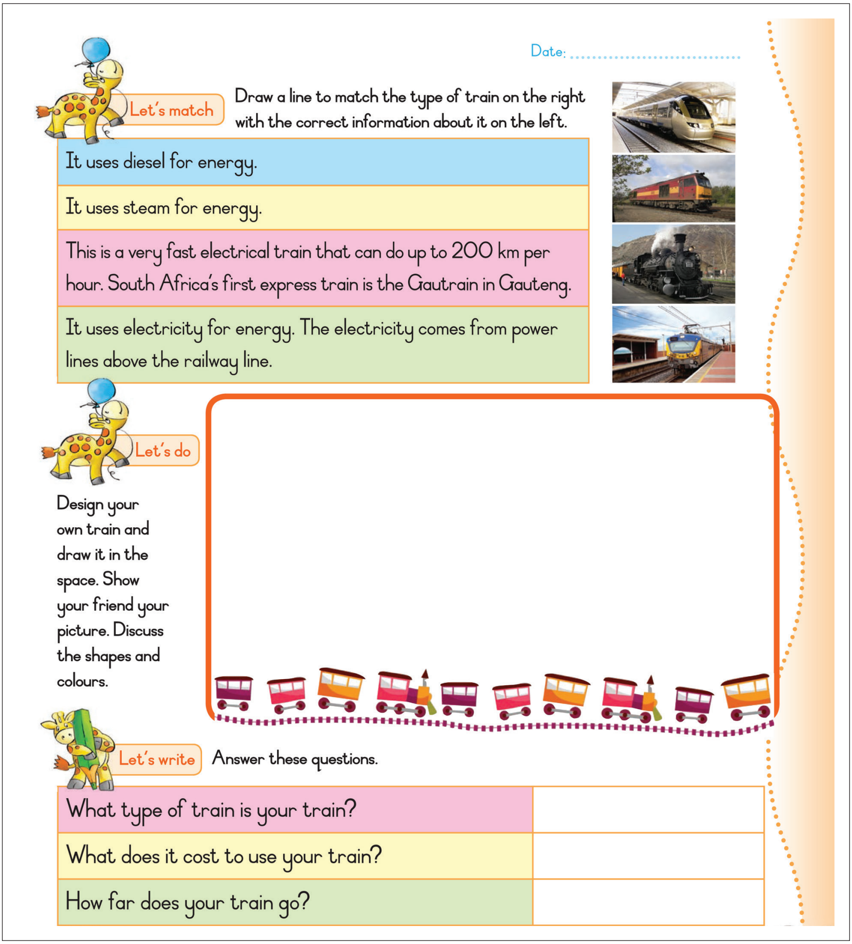


FIGURE 7.44: Adaptation of the question presented in Figure 7.43.



Date: ....

Let's match

Draw a line to match the type of train on the right with the correct information about it on the left.

It uses diesel for energy.
It uses steam for energy.
This is a very fast electrical train that can do up to 200 km per hour. South Africa's first express train is the Gautrain in Gauteng.
It uses electricity for energy. The electricity comes from power lines above the railway line.

Let's do

Design your own train and draw it in the space. Show your friend your picture. Discuss the shapes and colours.

Let's write

Answer these questions.

What type of train is your train?	
What does it cost to use your train?	
How far does your train go?	

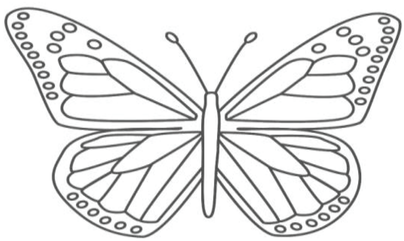
Source: DBE (2019).

FIGURE 7.45: Exercise taken from the Grade 2 Life Skills Workbook 2.

Adaptation: For the first part of this lesson, an oral discussion of different types of trains can cover that part of the content. In the second part, where learners have to draw their own train, learners with visual impairment can make a model with materials found, building blocks or clay. They may also make audio-recordings of the sounds of different trains or use a recording of a song with sounds of trains in the song.

Adaptation: To assist learners with visual impairment, some options may be provided to them in order to choose the correct answer, as shown in Figure 7.47.

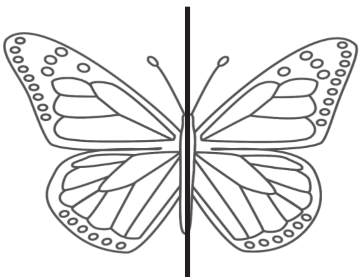
Draw a line on the picture to show the line of symmetry.



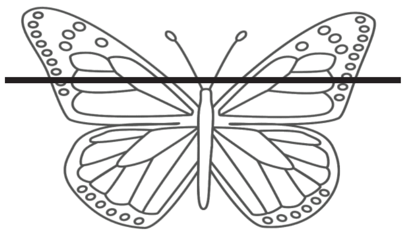
Source: DBE (2013f).

FIGURE 7.46: Question taken from the Mathematics Grade 3 Annual National Assessment.

Which picture shows the line of symmetry of the butterfly? Picture a or b?
Write down only the letter a or b.



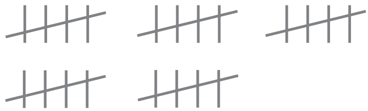
Picture a



Picture b

FIGURE 7.47: Adaptation of the question presented in Figure 7.46.

Mrs Patel keeps a record to show how many textbooks she gets. Draw tally marks to show how many she got in February.

Month	Tally marks	Frequency
January		25
February		31

Source: DBE (2011b).

FIGURE 7.48: Taken from the Grade 4 Mathematics Annual National Assessment.

Braille code for tallies:
One: dot 4,5,6
Five: dot 4,5,6; dot 4,5,6, dot 4,5,6, dot 4,5,6, dot 2

Mrs Patel keeps a record to show how many textbooks she gets.
Write the correct Braille tally marks to show how many she got in February.

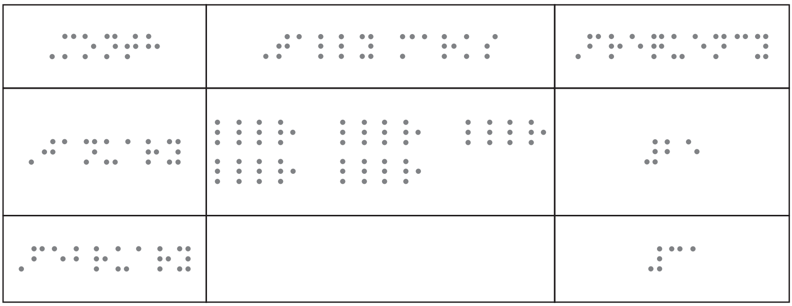


FIGURE 7.49: Adaptation of the question presented in Figure 7.48.

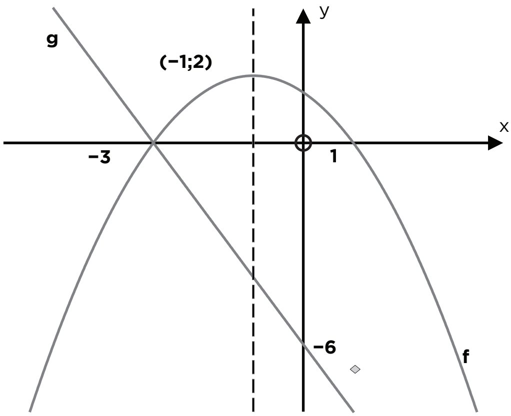
Adaptation: Tally marks are not 'drawn' in braille; they need to be written in the correct braille code, as shown in Figure 7.49.

Given the functions y and g:
$y = f(x) = -\frac{1}{2}(x + 1)^2$ and $g(x) = -2x - 6$

a) Write down the coordinates of the turning point of.	*(2)*
b) Calculate the roots of the equation f(x) = 0	*(4)*
c) Write down the equation of the axis of symmetry of.	*(2)*
d) Sketch the graphs of y = f(x) and y = g(x) on the same system of axes.	*(5)*
e) Determine the equation of h(x) obtained by shifting f(x) two units to the left.	*(2)*
f) Determine the equation of k(x) obtained by shifting g(x) two units down.	*(2)*

Source: DBE (n.d.).

FIGURE 7.50: Question taken from Grade 12 Mathematics.



5. The sketch shows the graphs of two functions $g(x) = mx + c$ and $f(x) = a(x - p)^2 + q$ on the same set of axes.

a) Write down the coordinates of the turning point of f.	*(2)*
b) Write down the equation of the axis of symmetry of f.	*(2)*
c) Write down the roots of the equation f (x) = 0	*(2)*
d) Calculate, showing all your work, the equation of in the form $f(x) = a(x - p)^2 + q$.	*(5)*
e) Write down the equation of g.	*(2)*
f) Determine the equation of h(x) obtained by shifting f (x) two units to the left.	*(2)*
g) Determine the equation of h(x) obtained by shifting g (x) two units down.	*(2)*

FIGURE 7.51: Adaptation of the question presented in Figure 7.50.

Adaptation: The question is reversed in order to eliminate the task of drawing the graphs. Instead, we give blind learners the drawing, then ask questions on the drawing (Figure 7.51).

Access arrangements and reasonable accommodations

These processes involve the special arrangements that need to be in place during assessments and the accommodations or concessions that can be applied for in the case of learners with barriers to learning. The specifics pertaining to different barriers to learning are published as policy documents in government gazettes with amendments from time to time. It is therefore important to make sure that teachers and schools ascertain the latest policies before making such applications for learners.

We will focus here on just one document, Annexure C1 of the *Amendments to the Policy Document National Policy Pertaining to the Conduct, Administration and Management of Examinations and Assessment for the National Senior Certificate*, published in Government Gazette No 37652 (DBE 2014). A selective summary of the process is listed:

- It is important that differentiated assessment and/or accommodations are put into practice early on and throughout learners' school careers to give them the opportunity to realise their potential (Annexure C1:75).
- Learners in need of accommodations should be identified as early as possible in order to put the necessary mechanisms in place and to accustom learners to the assessment method concerned, before they are externally assessed (Annexure C1:75).
- Determination of learners who are eligible for differentiated assessment and accommodations in Grades 10 to 12, should have been done as early as the Foundation Phase or at least by October of their Grade 10 year, except in a situation where the need arises at a later stage (Annexure C1:76).
- The Provincial Accommodation/Concessions Committee will consider, in its absolute discretion, applications from learners who experience barriers to learning. In terms of the policy, the

decision as to whether an accommodation will be granted lies with the Provincial Education Department and its Accommodation/Concessions Committee and not with the practitioner who conducted the assessments or with the school (Annexure C1:77).
- Visual impairment, which includes blindness and partial sightedness or low vision requiring adaptation of content, accommodations with regard to the format of the assessment as well as the use of AT (Annexure C1:77).

Learners with visual impairment may apply for the following accommodations: adapted questions, additional time, a digital player or recorder, braille, large print, computer voice to text or text to voice, accommodations for handwriting, medication and/or food intake, an oral examination, a scribe, a reader, rest breaks, a separate venue and transcription of braille. Applications are made on prescribed forms and must be accompanied by medical proof and a history of the learner's assessment accommodations. Parents have to be informed of the planned assessment accommodations and the assessment directorate must respond within 3 months of the application being received by the DBE. Additional time is granted as follows: double time for learners who are blind and time and a half for learners who have low vision. A rest period of 10 min may be granted. (Annexure C1:81).

Conclusion

There is always room for debating what the best adaptation would be for a particular task, lesson or assessment. There are two considerations we need to keep in mind when adapting for learners with visual impairment. Firstly, when we are teaching in the classroom, we allow ourselves to be guided by the learners in our class to maximise access in a way that will improve conceptual understanding of the content and skills. In school-based assessment, the same rules are followed as in an external, formal assessment. Secondly, in a formal assessment or external assessment, adaptation is done by the examiners of the particular subject according to the guidelines of the examining body. It is therefore the responsibility of every teacher to familiarise themselves with such guidelines and policies pertaining to access arrangements, accommodations or concessions.

Chapter 8

Assistive technology that may support learners with visual impairment

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Keywords: Magnification; Text-to-speech; Accessibility; Navigation; Universal design.

Introduction

As indicated throughout, learners who have low vision or blindness are usually characterised by specific functional limitations. These may include difficulty with the independent execution of functions such as mobility, literacy and daily living

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activities such as food preparation. Learners with visual impairment, may as a result, experience difficulty in accessing and benefiting from quality education. However, if learners with visual impairment have the opportunity to use AT, which has been selected through a process of functional assessment, increased access to learning is possible, aligning to that of peers with full vision.

A range of AT is available in support of the needs of people with low vision and blindness. The general goal is for these resources to address some of the challenges associated with visual impairment and support greater independence and access to educational opportunities. In this chapter, the focus falls on available technologies and adaptations that can be used to increase participation in the functional aspects of daily living such as independence in terms of O&M. All the examples of AT are discussed in terms of the related hardware and software. A case study of a person with an acquired visual impairment is included as an example of how such technologies may be functionally included in activities of daily living and education. Finally, some general guidelines are provided for consideration of AT when deciding on potential use (or not) for a specific learner.

Overview of the chapter

After defining the relevant key concepts, the case of Jacob is described. Assistive technology is then unpacked, referring to the way in which AT can support O&M, examples of hardware and software that may support people with low vision and examples of hardware and software that may support people who are blind. Next, a universal design that may benefit people with visual impairment is presented.

In the second half of the chapter, the case of Jacob is further described, and then discussed in terms of the topics covered in the first half. As such, a practical example is provided of the potential use of AT with a person with visual impairment.

Definition of key concepts

Accessibility

The extent to which a product or service can be used directly by a person with a disability, or the extent to which a product or service functions together with AT.

Assistive technology

Any form of technology that can enable a person to experience increased functional ability in any of the areas of daily living.

Closed-circuit television

A system consisting of a camera which is connected in a circuit (by means of cables) to one or more television displays.

Functional ability

The ability to independently perform tasks.

Global positioning system

A system that is able to locate the position of a connected device anywhere on the planet as well as detect speed and direction when moving.

Graphical user interface

A feature of most current technologies, which enables a user to interact by means of visual elements such as icons, tiles and pictorial menus.

Orientation and mobility

The process by which a person is able to identify their location in relation to the location of other identifiable objects in the environment, and the ability to be able to independently transfer themselves in order to reach desired locations while avoiding obstacles (also refer to vol. 1, ch. 7 by Heard).

Optical character recognition

A software that processes and recognises text that is displayed on digitally captured images. This text is then converted to a digital text format and sent to a word processing application or text reader.

Print disability

A disability which prevents a person from independently reading and/or writing by using printed letters as a medium.

Screen reader

A software that interacts with the graphical user interface (GUI) of a computer operating system, with items such as menus and icons being identified and presented as audio feedback.

Speech synthesiser

A computer-generated voice that is produced by a screen reader or TTS.

Text-to-speech

A function of some software programs to read text aloud, usually a function of a screen reader or a feature in a universal design such as in e-Book readers and web pages.

Universal design

A set of guidelines and specifications which manufacturers of products and services incorporate into their products to ensure accessibility for people with disabilities.

■ Case study (Part 1): Jacob's road to independence

Jacob is a 20-year-old student in his second year at university and comes from an economically disadvantaged background. At the age of 17, he was belatedly diagnosed with glaucoma after experiencing problems with reading. Even though the chronic use of medication was prescribed to manage the eye pressure, irreparable damage occurred as a result of Jacob not being able to attend follow-up medical consultations. As a result, Jacob has been left with the ability to merely distinguish large objects such as buildings and structures at a distance no further than 10 m away. It follows that he started experiencing profound difficulty with reading and writing activities.

At the time, Jacob was attending a mainstream school in his hometown in the Eastern Cape Province of South Africa. Following the onset of his condition, the school was no longer able to accommodate him as it seemingly lacked the human resource expertise needed as well as the necessary funding for new computer equipment for the school. In addition to the scholastic problems, an assessment by a social worker indicated that Jacob required ongoing emotional support and would have to start using aids in order to perform most of the functions of daily living.

In Grade 10, Jacob was sent to a school in Pretoria, Northern Gauteng Province of South Africa, which specialises in supporting learners with disabilities. He was provided with low vision AT in the form of magnification lenses and closed-circuit television (CCTV) devices, yet because of his functional sight being too damaged to use these methods properly, he could only read very slowly and his writing deteriorated to the point where his script was barely legible. As a result, Jacob was taught how to use Braille to read and write. Although he managed to acquire this new skill, he struggled with his reading and typing speed, leading to audio books and Braille notes being provided to him as reading material.

For tests and examinations, Jacob was provided with a scribe who would read the questions to him, and then write down the answers that Jacob dictated. For other written assignments, Jacob typed his answers using a Braille typewriter, with these being transcribed by a fellow student or Braille literate teacher, and then marked as written text.

Jacob received some rudimentary training in O&M and was able to move around at school on his own. However, as he is by nature uncomfortable with new experiences and environments, he lacked the necessary confidence to move around independently outside of the school environment.

Jacob enjoys listening to music during his spare time and was delighted when he received his first smart phone. Through the assistance of a friend, he discovered the accessibility features of his mobile phone, more specifically the TTS function. This allowed Jacob to engage in social interactions and use social media to independently communicate with his friends back in the Eastern Cape as well as those in his new school over weekends.

Jacob completed matric with university exemption and was accepted at the University of Pretoria. More information on Jacob's case is included further on in the chapter.

■ Assistive technology

In a report by Wagner et al. (2006), it was found that the performance of American learners with visual impairment was overall much lower than that of their sighted peers. A possible reason for this could be that these learners may not enjoy the same level of access to the curriculum than their peers with full vision, in the form of general educational experiences associated with reading and physical training. This may in turn potentially be related to the learners' inadequate training in, or the absence of AT, that may serve as a supportive resource to them (Corn & Huebner 1998).

Learners with visual impairment generally find themselves in positions where they are not able to fully participate or act independently because they cannot catch a ball, participate in playground activities or read from a story book on their own, to give but a few examples. There are, however, some ways of support that can allow the learner to participate in these activities in the form of human assistance, where a teacher or peer with full vision can assist the learner by physically guiding them during physical activities or reading out loud to them and writing dictations during literary activities. While such supportive actions may allow for participation to a larger extent, it will still not grant independence, resulting in autonomy and meaningful learning continuously being challenged.

Another possible approach to supporting learners with visual impairments entails the adaptation of activities by making use of technology. This may allow learners to receive information about the environment and activities which they wish to participate in. Assistive technology can furthermore be used to facilitate interaction between learners by assisting them to perform functions that they would otherwise not be able to do.

When learners with visual impairment utilise AT, they may rely on both specialised hardware and software that can provide enhanced visual or alternative feedback in the form of tactile or auditory information. For example, various software packages are available that can provide voice feedback or enhance visual output through magnification and contrast adjustment. In addition, various hardware devices are available that have specifically been designed for certain tasks such as note-taking or reading. It follows that technology can allow people with visual impairment to participate in several functions of daily living such as making a cup of coffee or matching the colours of items of clothing before getting dressed. In this manner, the collectively known repertoire of AT can assist learners with visual impairment by removing functional barriers, thereby supporting their daily functioning. For school-going learners with visual impairment, AT can promote access to literacy and reading, which forms a critical component of learning and is considered as the ‘great equaliser’ by Kelly and Smith (2016).

In this way, AT may grant learners with visual impairment the opportunity to perform activities that they may experience as impossible to do. As development progressed, AT did not merely enhance people with impairments' mobility and literacy levels through the invention of Braille and the long white cane; it has also allowed people with visual impairment to read and write with greater ease with the aid of computer technology.

In this section, some examples of AT solutions that are often used are discussed. All possibilities and existing supportive resources are therefore not discussed.

Assistive technology supporting orientation and mobility

It is important to provide basic orientation training to a learner with low vision or blindness when entering a new school environment. This would typically include training on how to navigate and become familiar with the new environment in terms of locating the classroom, bathrooms and playground areas, as well as how to navigate oneself inside the classroom. However, such training will primarily benefit learners who have already completed basic O&M training offered by qualified O&M practitioners.

According to Hersh and Johnson (2008), important functions to be considered for successful mobility include navigation, orientation and avoidance of obstacles. Assistive technology that may be utilised for such personal orientation and navigation actions includes global positioning system (GPS) applications, while long white canes and clickers are generally used for obstacle avoidance. Global positioning system applications which are available on most smart phones can specifically be used together with the native TTS software in order to provide voice navigation to users to locate places that are listed as street addresses or landmarks (May & LaPierre 2008). Recently, applications of this nature have been updated to even locate specific buildings or shops within campuses or shopping malls. In addition, wearable technologies such as smart glasses and cameras are being developed to add to the options for O&M (Liu, Stiles & Meister 2018) and are expanding the possibilities in this field considerably.

Long white canes are widely used as they provide tactile feedback to users who are to some extent familiar with an environment. When walking, the tip of the cane would typically be placed at the spot where the next footfall of the user will land, in order to receive information on possible obstacles or steps leading up or down. A recent development in technology for the long white cane is the 'Smart-' or 'Bat-' cane, which utilises laser or ultrasound technology that mimics bat and dolphin echolocation in order to detect obstacles and landmarks in the environment, and transfers this information to outputs in the form of haptic pulses and vibrations (Andò et al. 2015; Hoyle & Waters 2008).

Clickers are similarly used by people who utilise echolocation as they make a sharp sound that is bounced off nearby objects such as buildings. They are mostly used together with tongue clicks and finger snapping to produce a range of sound frequencies that provide auditory feedback on obstacles in the surrounding environment (Ashmead et al. 1998; Thaler & Goodale 2016). Service animals such as guide dogs are categorised as yet another form of assistance to a person with visual impairment that may support the person to perform the functions associated with O&M. Successful use of a service animal, however, depends on ongoing O&M training for both the person and the animal.

Hardware that can support people with low vision

Assistive technology hardware that can assist people with low functional vision includes devices that can enlarge written text, zoom in on or focus on distant objects or adjust foreground and background contrast in documents. Optical functions such as enlargement and zooming are generally performed by devices, while non-optical functions can be performed either by lens filters or electronically within devices to improve a person's functional vision (Thomas et al. 2015). These assistive devices can be categorised as fixed, portable and peripheral devices.

Fixed devices are usually large in physical size, mounted to a surface such as a desk or a wall, and may consist of a single or many components. In this regard, CCTV may be installed to be used by an entire class of learners with low vision, with a camera on the teacher's podium that broadcasts to a number of televisions, which can then each be adjusted to accommodate the learners' individual needs or the needs of small groups of learners. Desk magnifiers can similarly be used by a single learner as this device includes a large display with a downward-pointing camera and reading lamp, which are aimed at a reading tray that can be fixed in a specific place by a grip or be moved around to accommodate the manipulation of books under the focal point of the camera.

The above-mentioned devices may accommodate a variety of needs associated with visual impairment and are quite durable. In a school environment, they can, for example, be placed in the library for learners who may adjust the settings according to their individual needs. A disadvantage of these devices is that they may be costly and can only be used in the locations where they have been installed. In addition, they may be technically complex and require the services of a specialised technician when maintenance and repairs are necessary, resulting in a device possibly being out of use for a period of time if a service provider is not easily accessible or close by.

Portable devices are generally cheaper than fixed devices and can easily be transported and used in most locations, yet may, as a result, also be more prone to being damaged during transport, or can be lost or stolen. These devices are typically smaller and lighter than fixed devices and may range from low-tech magnifying lenses, binoculars and telescopes to hi-tech electronic magnification devices and tablets. Many low-tech devices are developed and specialised for specific functions or are intended for the specific needs of the user. For example, colour filter sheets are transparent covers that are placed over white paper with the purpose of altering the contrast of traditional text on white paper. Other examples include lenses prescribed by specialists such as ophthalmologists for individual use, or binoculars and telescopes that are suitable for distance viewing only.

Many hi-tech devices, on the other hand, are more versatile and can provide access to a variety of functions to more than a single user at a time. For example, portable CCTV cameras can be mounted to a small, foldable stand and then connected to a screen or laptop. When directing the camera to distant objects and zooming in, several learners may simultaneously benefit. In the same manner, a lens cover that is fitted over the camera which is pointed down onto a document can enlarge small text for learners to view, while programmable camera filters can enable a number of contrast adjustment options.

Peripheral devices do not inherently perform any of the functions mentioned in the preceding paragraphs, yet can support the efficiency in which some of the mentioned hardware can be used. Reading stands, for example, do not enlarge, zoom or change the contrast of objects but are used to position reading devices or reading material in such a way that a correct posture can be promoted during reading. In this regard, it is necessary to note the importance of a healthy posture as the use of magnification may result in increased head and neck strain which may in turn lead to long-term skeletal problems in the neck and shoulders (Zetterlund, Lundqvist & Richter 2019). Another example of a peripheral device is a larger display panel that can be connected to a fixed or a portable device in order to increase the display area. If this is used together with a device that enlarges, less magnification may be required. Other peripherals include adjustable display arms, black-out curtains and adjustable seating.

Software that can support people with low vision

Assistive technology software for low vision support is usually designed to integrate with the operating system GUI. The said software can enlarge and adjust focus areas, so that these can be optimised for reading by a person with visual impairment. Evans and Blenkhorn (2008) explained the GUI as an interface that consists of windows and represents open applications on the operating system. In alignment with focus areas being important when using screen magnifiers to be able to see and perform functions such as reading, typing or entering commands, the focus area or work area in a word processor is important when typing, with the user being able to change to a menu item or another window by using a mouse or keyboard command.

Through the use of AT software, an entire display output can be enlarged in order for this to be visible as a window that may be moved across the display area. For this purpose, the computer screen is transformed into a virtual magnifying glass, which enlarges the section of a display, with the focus area being displayed at any given time. As a result, an enlarged area will be easier to see because of reduced pixilation through edge and line smoothing. The end product will typically entail a clear enlargement that is visually enhanced and can minimise eye strain.

Hybrid electronic zooming software is yet another available option, which is also used with optional TTS functionality, in support of assisted reading in word processing programmes and web browsers. This function is intended for users with low vision who experience difficulty in reading large amounts of text because of eye strain, or who may struggle to correctly differentiate between words that may appear similar.

Hardware that can support blind users

Hardware that produces Braille is synonymous with and commonly associated with people who are blind. Wiazowski (2014) categorised Braille devices into mechanical Braille machines, electronic Braille machines and electronic Braille notetakers and keyboards. Both mechanical and electronic Braille machines produce printed Braille on paper, while notetakers and keyboards produce Braille in the form of refreshable displays that provide a single line of raised dots which change according to the reading focus in a document.

Mechanical devices include the use of stylus and slate as well as Perkins typewriters (also refer to ch. 5 by Viljoen). The stylus and slate method can be compared to the use of a pen by sighted individuals (Kway, Salleh & Majid 2010). More specifically, a slate consists of a backing board with indentations and a hinged guide with six holes in which Braille letters can be created. Paper is placed on the board and the guide is pivoted to hold it in place while using a stylus to manually punch dots from right to left. When the paper is removed and turned over, the dots are presented as Braille, which reads from left to right. Although this system seems cumbersome and complicated, it is the only way for many blind people in developing countries worldwide to independently produce Braille. It is completely portable, easy to manufacture and repair and relatively inexpensive (The Braille Authority of North America 2006).

Braille typewriters function in much the same way as other typewriters. They have six keys to produce letters, each of which embosses one of the six dots that make up a Braille cell (refer to ch. 5 by Viljoen). There is also a space bar, line feed and paper drum to direct paper through the machine. Braille typewriters are widely used in special needs schools in South Africa. They are much easier to use than the slate and stylus option, and thus more suitable for young learners.

Electronic Braille machines include electronic Braille typewriters and Braille embossers. These typewriters function in a way similar to that of mechanical typewriters but allow for typing errors to be corrected before being punched onto the paper. Many of these devices have been optimised for literacy development as they provide a multimodal interface with information as output, captured on Braille paper, as well as in the form of speech and print on a small screen. Text can be the input for both Braille or print material and can automatically be translated into both ways, in order to be read by both a sighted teacher and a blind learner. These devices can greatly support learners' participation in educational activities (Cooper & Nichols 2007).

Braille embossers can be compared to computer printers and produce Braille, which has been translated from printed documents. For this purpose, Braille translation software which is installed on a computer is used to convert documents that have been created in word processing applications into Braille code which can then be embossed. The translation software as a result translates visual print into Braille code. Available packages can allow for translations from text to Braille, graphics into tactile Braille and also the transferral of music notation into Braille. Embossers are typically not used by learners as the use of embossers requires training. Furthermore, in the case of graphic productions, a sighted person will have to draw or adjust images, with such actions potentially being expensive to maintain.

Electronic Braille notetakers and keyboards are portable devices, which contain a number of refreshable Braille cells with movable plastic pins that are raised to form Braille letters. Notetakers can be used independently or with keyboards, connecting these by cable or following a wireless router to connect to computers, laptops, smartphones or tablets, using these as augmented input and output devices. This implies that a blind user of any of these devices will be able to use the Braille display to read what is being displayed on the screen, and then type commands or use text as Braille input. These devices function in a way similar to that of smart Braille typewriters, with the added benefits of being cheaper to purchase and being usable with most mainstream computer hardware. These devices also operate quietly and can thus be used in venues where other students are attending classes or being assessed. As they allow students to read and write using touch rather than by listening, as in the case of screen readers, they will generally not be a distraction when used during verbal lessons or discussions.

Many other examples of AT hardware exist, which incorporates functions from regular and low vision hardware, or optimise them with the addition of integrated adaptive software in order to increase functional usability for people who are blind. Digital recorders with tactile buttons can, for example, be used for audio and e-Book readers with TTS software. These recorders can be used by pupils to record voice notes during class while simultaneously storing reading material such as textbooks or typed notes. Next, document and book readers can be used, which usually include an integrated document scanner or high-resolution camera that can be used to digitally capture text from books or paper. The images are then processed by optical character recognition (OCR) software (more detail included in the next section on software) and stored in an accessible format, which can be listened to by means of TTS or in the form of output on a refreshable Braille display which may be built into the device. These options can support blind learners to immediately access reading material in a variety of contexts such as the school, classroom, libraries or at restaurants.

Software that can support blind users

Computers and electronic devices have become integral tools in the completion of many everyday activities for education, work and relaxation. Furthermore, many tasks utilise specialised software such as word processing, web navigation or spreadsheets, all of which have become increasingly visual in their presentation. Screen reading software has enabled blind people and people with print disabilities to access such technology on near equal footing as it allows for audible feedback of visual elements such as icons, buttons and toolbars.

A screen reader entails software, which interacts with a computer's operating system's GUI, similar to a screen magnifier (Evans & Blenkhorn 2008). It is programmed to interpret visual elements or extract text from labels and objects in the focus area, and then produce output of the information by means of TTS and a voice synthesiser.

Text-to-speech is a function performed by a screen reader, which converts written text into speech, yet this is often mistakenly confused with screen readers. Text-to-speech software is also available on its own and can thus be used to read text only. It can be used to record speech output in MP3 format and is often embedded in applications such as web browsers and e-Book readers as part of the universal design of these products. While screen readers are able to provide access to operations and read both controls and contents of documents, TTS typically only provides reading functions of the text content of documents.

Voice synthesisers provide the audio output of TTS and screen readers. In essence, this is basically the voice that speaks when software is being used. The selection of individual voice synthesisers strongly depends on personal preference and is available in a variety of voices, with differentiations and options in terms of, for example, language, dialect, gender and age. Voices can also be adjusted in terms of speaking rate and pitch.

As current operating systems are upgraded approximately every 6 months, screen reading software is also required to be regularly updated by developers in order to ensure continued proper functioning. At present, two screen readers are commonly used by blind people. One requires an annual update to be purchased, while the other one is available free of charge. While the paid application is continuously updated to optimally function with the operating system and major software upgrades, the screen reader that is free of charge may take some time to be updated and aligned with the updates implemented by operating systems. As a result, this application tends to focus on usability with popular software.

As screen reading software is primarily designed to provide a non-visual solution to access a computer, the user will rely on keyboard commands to perform all functions when using this software. When a document or web page is opened, the screen reader will provide key information on document properties that are able to interact and can be controlled by the user. The user is then able to navigate directly to any of these elements using keyboard commands. Commands for the basic use of operating systems and web navigation are universal and can easily be learned. On the other hand, however, commands for specific software such as word processing are extensive in nature and in menu navigation techniques, requiring specialised training on the part of the user.

For reading material to be accessible when using screen reading software or Braille, it must be available in digitised formats, which can be accessed electronically. In this format, text can be read with the use of TTS or converted into Braille with translation software or through a Braille display. It is, however, often the case that reading material is available only in hard copy, in either a book or alternative paper format. For such options, OCR software focuses on the conversion of digitised copies of books and paper-based text into accessible digital text formats that can be read through the use of a screen reader or Braille display. For this option, a scanner is used to digitally capture the printed pages as images and transfer these onto a computer, with the OCR software then processing the images based on the programme's functionality of recognising the letters that form the printed text in such documents. This text is then sent to a word processing programme where it can be read with the aid of a screen reader or through Braille display (Fruchterman 2008).

The use of OCR is closely associated with the Marrakesh treaty hosted by the World Intellectual Property Organization (WIPO 2013), where signatory countries adopted a resolution to allow for books to be converted into accessible formats and freely distributed to people who are blind or have print disabilities, exempting them from copyright restrictions. However, South Africa has not yet acceded to the Marrakesh treaty, and the distribution of copyright books is still strictly controlled in this country. As a result, OCR is currently allowable for the conversion of reading materials for personal use only. This implies that any blind person who needs to use a book that is available in hard copy only will have to purchase the book in order to be able to scan and use OCR for personal use only, as such practice supports current copyright regulations in South Africa.

Universal designs which may support people with visual impairment

Products or services that meet the criteria of universal design can be used by all people regardless of factors such as race, gender and ability, in line with the recommendations of the United Nations Convention on the Rights of Persons with Disabilities (UN General Assembly 2006). In the development of the built-up environment, for example, such designs include features and modifications for people with disabilities that have been incorporated into the official building regulations for South Africa (South African Bureau of Standards [SABS] 2011). These regulations have resulted in public spaces being adapted, which include features such as tactile indicators on walkways and signage to support people with visual impairment.

Other industries have also adopted universal design principles into products and services, of which smart phones and tablets are of specific importance for people with visual impairment. Current devices in this category can support people with visual impairment through the use of assistive software that forms part of the devices' operating systems. For example, most, if not all, of the current smart phones on the market have native zooming capability, a variety of display adjustment options, haptic feedback options and screen reading software, with the latter often being the only software used by many blind users. In support of such software options, the developers of the mobile operating systems software generally offer a set of guidelines and tools for third-party developers in order to ensure the accessibility of applications for the native-assistive software. Another example of a universally designed software application is mobile applications for social riding transport services, whereby a person with a disability can request an assisted ride by using the mobile application together with a screen reader or screen magnifier. With this application, the driver who collects the user will be alerted that the person has a visual disability and will require assistance to enter and exit the vehicle. The same service is available for people using service animals.

In the same manner, popular computer operating systems can meet the criteria of universal design, by including zoom and screen enlargement functions. Furthermore, built-in screen reading software can be useful to perform functions within the operating system's user interface, even though these may not work with applications and programmes which are installed to be used on the operating system. For this reason, specialised screen readers are still recommended as they offer more in terms of functionality and versatility.

Services such as cloud storage platforms, websites, e-Book readers as well as music and video streaming applications similarly include accessibility features, resulting in the possibility of using them with AT such as screen readers or enlargement software. However, some of these services offer built-in features such as the ability to read text on specific websites or the inclusion of audio described narrations of video content. Such functions do, however, have to be activated manually by means of dedicated AT software or through human assistance.

Finally, other 'smart' devices or the so-called 'internet of things' also exist, which follow universal design principles, such as everyday appliances like refrigerators, washing machines, televisions, photo copy machines, microwave ovens, to mention but a few. Many of these devices include accessibility features, which may allow people with visual disabilities to complete everyday tasks with increased levels of independence. Even modern gaming consoles nowadays follow universal design principles and include accessibility features such as screen readers and visual adjustment options.

Examples of assistive technologies and web resources

In Table 8.1, examples of ATs and web resources are provided, as an overview of some of the available resources that may assist learners with visual impairment.

TABLE 8.1: List of products and web resources.

Product	Web resource
AT supporting O&M	
Long white cane	https://www.businesslive.co.za/bd/opinion/2019-04-24-copyright-amendment-bill-needs-to-comply-with-marrakesh-treaty/
Echolocation	https://www.youtube.com/watch?v=IAtVOK04XvA
Service animals (guide dogs for the blind)	https://guidedog.org.za/
Hardware supporting people with low vision	
Desk magnifier (Topaz)	http://www.freedomscientific.com/products/lowvision/topazxlhd/
Desk magnifier (Merlin)	https://www.enhancedvision.com/low-vision-product-line/merlin-lcd-desktop-video-magnifier.html
Portable magnifier (Transformer)	https://www.enhancedvision.com/low-vision-product-line/transformer-hd-portable-electronic-magnifier.html
Portable magnifier (Ruby)	http://www.freedomscientific.com/products/lowvision/ruby/
Software supporting people with low vision	
Screen magnifier (ZoomText)	https://www.zoomtext.com/
Hardware supporting blind people	
Braille typewriter (Perkins)	https://brailler.perkins.org/collections/perkins-braillers
Smart Braille typewriter (Mountbatten)	http://mountbattenbrailler.com/mountbatten/
Smart Brailler (Perkins)	https://www.perkins.org/services/smart-brailler
Braille display (Focus)	http://www.freedomscientific.com/products/blindness/focus-blue-family/
Portable Braille display (Orbit)	https://sensorysolutions.co.za/catalogue/note-takers/143-orbit-reader-20-braille-display-notetaker.html
Braille embosser (Braillo)	https://braillo.com/
Software supporting blind people	
Screen reader (JAWS for Windows)	https://www.freedomscientific.com/products/software/jaws/
Screen reader (NVDA)	https://www.nvaccess.org/download/
OCR (OpenBook)	https://www.freedomscientific.com/products/software/openbook/
OCR (Finereader)	https://www.abbyy.com/en-eu/finereader/
OCR (seeing AI), able to recognise text, barcodes and objects	https://www.microsoft.com/en-us/ai/seeing-ai
Resources for universal design	
Accessibility, usability and inclusion | Web Accessibility Initiative | W3C	https://www.w3.org/WAI/fundamentals/accessibility-usability-inclusion/
Accessibility guidelines for Apple developers	https://developer.apple.com/accessibility/ios/
Accessibility guidelines for Android developers	https://developer.android.com/guide/topics/ui/accessibility
Microsoft accessibility overview	https://www.microsoft.com/en-us/accessibility

AT, assistive technology; OCR, optical character recognition; O&M, orientation and mobility.

Case study (Part 2): Jacob's use of assistive technology

When Jacob started studying at the university, he struggled with almost all aspects of daily living. He needed human assistance with mobility, to travel from the residence to the campus as well as to move between classes. He was unable to independently use money to purchase books or food. Various senior students took turns to help Jacob on a daily basis. His recent training in the use of Braille implied that his reading ability was limited at the time as his reading speed was still quite slow. All of these perceived challenges affected Jacob in such a way that he lacked confidence and would visibly become anxious if he was faced with any decisions about either his studies or mobility.

The university's first course of action was to provide the services of an O&M instructor who frequently met with Jacob during the first few months of campus life. Jacob was systematically taught how to correctly use his long white cane as well as how to orientate himself and use the existing tactile walkways on campus to find his way to buses. His routes between classes, the Disability Unit and dining hall were also practiced. The O&M sessions, furthermore, focused on particular skills and priorities identified by Jacob, like how to use the Auto teller of his bank to withdraw money, how to identify different denominations of money and how to use some basic recipes for food preparation.

Jacob was initially provided with Braille reading material to start studying. Scribes were provided for all his written tests, as was the case for him in school the previous year. As part of his degree, he completed a course in computer literacy, which has been adapted for blind students and is presented with the use of a screen reader and keyboard input only.

Jacob was reluctant to use a screen reader for his other subjects but started doing so after becoming more familiar with its use. A Braille display that he could use together with the screen reading software was loaned to him, so that he could have access to duel output options when using a computer. In order to encourage him to work independently, he was asked to search for music that he enjoyed on the internet by using a popular video streaming service. To encourage independent reading, he was provided with a number of novels in electronic and audio formats to read on the computer.

After the first year of study, Jacob was able to move around campus completely independently, even though he would ask for basic orientation at the start of new terms to be able to locate his new classes. He was able to read all of his textbooks and class notes by using a screen reader and he also purchased a voice recorder to record his lectures. He continued using a scribe to complete tests but has been encouraged to practice his typing in order for him to gradually become independent in completing this task.

Jacob will receive ongoing training at the Disability Unit of the university to become as independent as possible when he graduates in an attempt to support his transition from being a student to a working professional. Jacob also started training with various OCR software for him to be able to read from books and paper-based sources independently. He will continually receive training on the installation, configuration and maintenance of relevant software packages, so that he will be able to use these without the assistance of a technician in future.

Jacob's attitude towards computers and high-tech devices thus improved as he progressed with his studies, with him using many of them on a daily basis in his second year of study, and becoming more proficient in their use. As such, he seemingly started realising the possibilities that AT can offer him as a person with visual impairment. Another example of his adaptation of AT could be seen in his request for advice on purchasing a new mobile phone with GPS functionality, because of his plan to start moving around independently outside of the university campus.

General guidelines for the selection of assistive technology

Jacob's story illustrates how a person's requirements for AT may change over time, subsequently resulting in the exposure to specific AT options being determined by the person's current needs and capabilities. For example, at school level, the goal was to introduce Jacob to AT that could give him at least some measure of autonomy because of him initially being completely dependent on other people. When he entered university, he was introduced to AT that could increase his efficiency in reading and the completion of tasks. As in the case of many other people in his position, Jacob initially experienced psychosocial challenges in adapting to the exposure to and the use of such technology.

A possible reason for this could be related to changes in a person's perceived social identity and self-evaluation, which have to be reconsidered when losing visual abilities. As people who experience vision loss at a later stage in their life may not have been exposed to such conditions, they may experience the use of visible aids and ATs as social labels, which may stigmatise them, resulting in them feeling embarrassed when using these technologies. In such cases, counselling may be beneficial.

One possible strategy that may be followed when introducing people with visual impairment to AT is to focus on using such technology to access entertainment and leisure activities. In the case of Jacob, this process started with him using the social media and messaging functions on his smart phone. He was subsequently encouraged to also start using a computer and screen reader to listen to audio books, browse music videos on the web and use these devices for social media interaction. This strategy typically removes potential anxiety related to academic performance while allowing for feelings of achievement and inclusivity when participating in activities also performed by peers with full vision.

Another strategy involves active mentorship by other people who are already using similar ATs to perform daily activities. Such support may accelerate the rate at which new technologies are adopted as strategies, with hands-on guidelines and advice being provided to the new user. In addition, the availability and examples of others using ATs may allow for perceptions to be challenged that the use of such technologies is abnormal or strange.

Throughout, it should, however, be kept in mind that not all people with visual impairment experience or perform with AT in the same way. The nature of an individual's visual condition will largely influence the way in which the environment is experienced. In addition, individual preferences and personality will play a role in the way which somebody chooses to move around. As many learners with low vision and blindness are provided with O&M training, it may incorrectly be expected that those with low vision may be more independent because of their residual vision. However, this assumption cannot simply be applied to all cases, as many blind learners may acquire the skill of independent mobility, simply with the use of an assistive device such as a long white cane.

Another assumption that is often made relates to the belief that AT for people with visual impairments is selected based on a hierarchical scale, with simple, low-tech devices such as long white canes being less effective, high-tech devices and service animals being the best and most effective tools. For example, many people incorrectly believe that a guide dog will perform the entire O&M operation simply by receiving a verbal instruction on where to go. However, service animals, just like the people who use them, have to receive O&M training – both basic and situational training.

Similarly, many opinions exist regarding the use of Braille versus the use of screen readers as a preferred AT strategy. Braille has been proven to be an effective tool in the teaching of preliteracy skills to young children as multisensory stimuli are used and the retention of learned skills is relatively good at that stage (Toussaint & Tiger 2010). This implies that young learners with visual impairment learn to read in much the same fashion as learners with full vision by using audible stimuli in the form of songs, which can assist and enforce a second stimuli. For sighted learners, this occurs as a result of visual contact with pictures and letters, yet for learners who are blind, this is accomplished through tactile interaction with objects and Braille letters.

For this reason, it seems clear that Braille is a powerful tool for the development of literacy in young learners with visual impairment. In a comparative study conducted by Clark and Stoner (2008), it was, for example, established that children who use Braille to read will possess spelling skills that are almost equal to those of learners who use print. It is also easier to identify a spelling error in Braille than to hear when a word is not pronounced correctly by a screen reader. Screen readers do, however, offer a faster reading speed and are generally preferred for older learners or students. Contextually, screen readers function optimally for reading exercises containing orthography or plain text only and are best suited for the reading of long descriptive texts such as history lessons or linguistic literature.

Consensus has not yet been reached for best practices in terms of the education of mathematics (Klingenberg, Holkesuik & Augestad 2019). However, teachers, blind people and professionals specialising in mathematics tend to slant towards Braille being essential for the successful execution of many functions associated with mathematics. Even though screen readers are sometimes used to make notes during lengthy calculations, the calculations themselves are usually completed by using Braille.

■ Conclusion

When selecting and implementing AT for learners with visual impairment, it is important to follow a holistic approach, allowing for both functional requirements and personal preferences of the user. Learners who may benefit from ATs should be exposed to various forms of technology at an age as young as possible in order for them to be assisted during their early learning experiences. Learners with visual impairment, who have access to a variety of technologies during their schooling, may be more adaptive to the demands placed on them later in life such as when studying at tertiary education institutions or transitioning to the post-schooling environment.

SECTION 4

Supporting healthy social development

Chapter 9

The value of sport and cultural activities for learners with visual impairment

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Keywords: Blind golf; Braille chess; Expanding the core curriculum for the visually impaired; Including the visually impaired within society; Visually impaired person sails alone.

> Those who educate children well are more to be honoured than they who produce them; for these only gave them life, those (the teacher), the art of living well.
>
> ~ Aristotle ~

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Introduction

This chapter highlights the benefits for learners with visual impairment to take part in sport and cultural activities. It furthermore provides some guidelines to teachers on including such activities into the regular and extramural curriculum at school. As such, this chapter aims to provide teachers with knowledge and insight in terms of inclusively educating learners with visual impairment, by presenting ways in which teachers can adapt the sport and cultural environment to allow learners with visual impairment to participate equally with their other class mates.

Whereas most sighted learners often acquire knowledge and skills by observing the environment and experimenting with new things, learners with visual impairment do not have this privilege. These learners may be challenged from birth; for example, when a baby cannot see the mother's smile, this can result in the baby not responding appropriately. For a learner who develops a visual impairment later on in school life, some skills that sighted learners typically develop may have already been developed; however, the learner with adventitious visual impairment may need adaptations to use their functional vision optimally. All children learn through play, but learners with visual impairment require much more guided play.

Regular gross motor activities should form an essential part of every learner's life. Therefore, play, recreational games, art, cultural activities and sport can support gross and fine motor skill development and lay a foundation for skills required when entering school, such as handwriting, concentration, planning, visualisation, depth perception, memory development, sensory development, following instructions, confidence building, organisational skills, social skills, creativity and team work. For this reason, all learners – from foundation phase of schooling – should be encouraged to participate in physical activities. By including learners with visual impairment in activities such as recreational games, sport, art and culture, throughout their school years, teachers can not only support the development of school-related skills but also enhance the healthy social development and social inclusion of these learners which will benefit them throughout their lives.

Overview of the chapter

The primary objective of this chapter is to provide teachers with knowledge on a variety of sports, recreational games, art and cultural activities that have already been adapted for participation by learners with visual impairment. As some of these learners may excel and subsequently participate provincially, nationally and even internationally, it will be useful for teachers to understand the classification systems in the various sporting activities. After studying the chapter, teachers should, be able to implement the suggested adaptations and develop their own variations of activities for a learner with visual impairment, which may be necessary to enable full participation in sports and recreational activities.

Definition of key concepts

Art activities

Creative activities, such as painting, music, literature and dance.

Cultural activities

Ideas, customs and social behaviour of a society.

Recreational activities

Activities performed for enjoyment when one is not working.

Sport

'Activities involving physical exertion and skill in which an individual or team competes against another or others for entertainment' as defined by Oxford Dictionary on Lexio.com.

Sporting class

Visual class of competitor in sport defined by visual acuity and visual field.

Visual impairment

Any degree of vision loss that affects an individual's ability to perform tasks of daily life, caused by a visual system that is not functioning properly or not formed correctly (Corn & Koenig 1996).

Sports classification system for the visually impaired

As many sports are performed at a competitive level, it is important for teachers to have some knowledge and understanding of the South African and the international classification systems expressed in the various sporting codes. To this end, the International Blind Sports Association (IBSA) has codified a classification system (IBSA 2018), which provides for athletes with visual impairment. Classification systems provide a structure for competitions and aim to ensure that athletes compete equitably with others. It should however be noted that the IBSA Classification Rules and Procedures (IBSA 2018) only relate to the sports governed by IBSA. For sports that are governed by other international federations, the classification rules of the relevant international federation will apply.

According to IBSA (2018), if persons with visual impairment are eligible to participate in a sport, the classification panel will assess which sport class they will compete in. The aim of sport classes is to group people with visual impairment according to similar activity limitations for competition purposes, so that they can compete equitably. In general, athletes with visual impairment will be classified as B1, B2 or B3 (B stands for Blind and the number stands for level according to visual acuity and visual field) in order to compete internationally or at national level.

To be eligible to compete in Sport Classes B1, B2, B3 in IBSA (2018), the person with visual impairment must thus have at least one of the following impairments:

- impairment of the eye structure
- impairment of the optical nerve or optic pathways or
- impairment of the visual cortex.

Some countries, such as the United Kingdom, go up to B5. The classifications provided in Table 9.1 are available on the 'British Blind Sport' website. These descriptions explain the categories used in sport for people with visual impairment in the United Kingdom.

In South Africa, eligible athletes are similarly grouped into 'classes', according to their visual abilities (see Table 9.2), so that athletes with similar visual impairments compete against each other. The determination of these classes is, however, complex and open to much speculation (H. Sacharowitz [Low Vision Centre, Johannesburg] pers. comm., 12 July 2019). To this end, much confusion still exists around assessment techniques and application forms that may be completed incorrectly by professionals in the vision field. Confusion between decimal acuity and LogMAR are common occurrences. This can result in

TABLE 9.1: Sports classes according to the United Kingdom system.

Class	Description according to 'British Blind Sport'
B1	No light perception in either eye; light perception and ability to perceive some movement in front of the eye but inability to recognise shapes.
B2	Limited vision in both eyes either in how far or how wide they can see. Being able to count fingers at 15 cm to a visual acuity of up to and including 2/60 with a visual field of under 10° even if the acuity is better than 2/60.
B3	Visual acuity better than 2/60 and up to and including 6/60. Visual field of less than 40° may have acuity better than 6/60.
B4	Visual acuity better than 6/60, and up to and including 6/24.
B5	Visual acuity better than 6/24, but not better than 6/18.

Source: British Blind Sport (n.d.).

Note: A person who falls within the sight category of 2/60 will see the top letter of the vision chart at a distance of up to and including 2 m. A normally sighted person will see that letter at a distance of 60 m.

TABLE 9.2: South African classification system for the visually impaired.

VIP class	Berkley Rudimentary Chart with LogMAR
B1	No light perception up to LogMAR 2.7
B2	LogMAR 2.6 up to LogMAR 1.5
B3	LogMAR 1.4 up to LogMAR 1.0
B4	LogMAR 0.9 up to LogMAR 0.6 together with a field of vision less than 20°.

Source: H. Sacharowitz ([Low Vision Centre, Johannesburg] pers. comm., 12 July 2019).
VIP, visually impaired person.

unnecessary challenges for both the athletes who are visually impaired and the classifier of the competitors with visual impairment.

Currently, either an optometrist or an ophthalmologist can assess the visual status of an athlete for national competitions. The assessor must have experience in low vision assessments and be independent from the athlete being assessed. Athletes for international competitions can, however, only be assessed by an ophthalmologist or a certified classifier of the athlete with visual impairment. Visual acuity is classified by using the Berkley Rudimentary Chart with LogMAR acuity criteria, while visual fields are measured with perimetry techniques (H. Sacharowitz [Low Vision Centre, Johannesburg] pers. comm., 12 July 2019).

As sporting opportunities for the visually impaired have developed, the need has grown for equitable sight classification systems. As a result, IBSA and the International Paralympic Committee recently accepted revised criteria for visual impairment assessment, which are now used at national as well as international competitions. The accuracy of these assessment results is critical as they determine eligibility or non-eligibility for athletes to compete.

Some of the key issues that still need to be addressed include the need for sport-specificity in order to account for the 'unique visual demands' (Powis, Powis & Jessica 2019:588–602) of the different types of sports and a call for further tests of visual function (beyond the sole reliance on 'visual acuity' and 'visual field tests' – Chen & Gardner 2019:11) to determine an athlete's class. Should we determine whether or not the age at which an impairment was acquired should be included in classifications: and whether or not an impairment has to be permanent to make an athlete eligible for participation in competitions (H. Sacharowitz [Low Vision Centre, Johannesburg] pers. comm., 12 July 2019).

Sport for people with visual impairment

Despite the challenges they may face, some people with visual impairment have achieved notable sporting successes. This is illustrated in the article later, describing an achievement in yachting.

The South African yachtsman, who became the first blind sailor to sail an ocean single-handedly, has arrived home after completing his gruelling trip. Geoff Hilton-Barber rewrote the record books when he successfully navigated the Indian Ocean from Durban to Fremantle, Australia.

Geoff Hilton-Barber arrived safe and sound this week back to his family and friends in Durban after his daring voyage. The 46-year-old blind sailor proved his critics wrong – some of whom had described his trip as a suicide mission. Hilton-Barber made his solo 50-day, 6000 nautical mile voyage across the Indian Ocean on his yacht 'Abacus'.

The solo trip would stretch the capabilities of any sailor, let alone one who could not rely on the most fundamental of human senses. Hilton-Barber – who before losing his sight at the age of 20 was an active runner and skydiver – used braille charts and audio electrical equipment on board to navigate. The rest of his yacht was standard. At the push of a button, an electronic voice would tell him where he was, what course he was doing and at what speed (Mail and Guardian 1998).

A large array of sporting codes exist that can be enjoyed by people with visual impairment. All of these can also be enjoyed by sighted people except for goalball and beep baseball that were created exclusively for the visually impaired. However, low vision and sighted people do participate in these two sports, wearing blindfolds. Even though only a few examples of sports suitable for those with visual impairment are discussed later, many options exist, for example, football, skiing, sailing, tenpin bowling, powerlifting, wrestling and rock climbing. It is important for teachers, also in schools, to be aware of the possibilities that exist for learners with visual impairment.

A general guideline to keep in mind when planning sporting activities is to partner visually impaired and sighted learners during these activities.

The sports that are discussed in this section are available to persons with visual impairment in South Africa at social, club and provincial level, with some of them being offered at certain schools for learners with visual impairment. A few of these sports are included in the Paralympics and IBSA World Championships, where a specific classification process is used. In this regard, sporting classes may be differently interpreted for individual sporting codes.

Archery

Archery requires accuracy, strength and concentration. The sport is open to people with a variety of disabilities, including the visually impaired, encompassing individual and team events. Competitors shoot at a target marked with 10 scoring zones, from a set distance. Archers with disabilities may shoot with assistive devices allowed under the classification rules, if required. Paralympic archery is governed by the South African National Archery Association (sourced from SANAA website), with archers with visual impairment being classified as V1, V2 or V3. Archers use tactile sights and are permitted an assistant sitting or standing 1m behind the shooting line to relay information about the position of the arrows in the target, safety and help with scoring. The archers who are visually impaired have vision that is impacted by either an impairment of the eye structure, optical nerves or optical pathways, or visual cortex of the central brain as referred to earlier. Table 9.1 and Table 9.2 above explain the visual acuity and visual field for the 'B' categories, which are specifically for athletes who are only visually impaired, but archery uses 'V' as there are varying categories of challenges with visual being an extra challenge in this sport.

Athletics

Athletics is available for the visually impaired at the Paralympic Games and the World Championships of IBSA, where the classification process of B1, B2 and B3 is used. Athletics is enjoyed at social, club, provincial and international levels and is governed by the South African Sports Confederation and Olympic Committee (sourced from SASCOC website).

Athletes who are visually impaired often participate in running events with the help of human guides, to whom they may be attached by tethers. In addition, sound-emitting devices or sighted 'callers' can be used to indicate target areas for throwing events, take-off points for jumping events and other important locations for competitors who are visually impaired.

Blind cricket

Cricket for the blind is the most unique version of this game. Even though the current Marylebone Cricket Club laws of cricket are used in general for blind cricket, the rules as well as the equipment are adapted (see Marylebone Cricket Club 1905). For blind cricket, each team has 11 players, consisting of at least 4 players who are totally blind (classified as B1), 3 partially blind players (B2) and up to 4 partially sighted players (B3). Each sight category is subject to different rules and compensations in order to make the playing field as level as possible (Disability Info South Africa n.d.). In terms of playing equipment, the major adaptation relates to the ball, which is significantly larger than a standard cricket ball and filled with ball bearings to provide audible cues. The size allows partially sighted players to see the ball and the contents allow blind players to hear it. The wickets (stumps) are also larger and made of metal tubes painted in fluorescent colours, allowing partially sighted players to see the wickets and blind players to touch them in order to be able to correctly orient themselves when batting or bowling (Disability Info South Africa n.d.).

Bowls

Lawn bowls for people with visual impairment cannot be practiced without fully sighted volunteers to assist with sighting the jack, indicating direction to bowl and describing positions of the bowls around the jack. Bowls for the visually impaired is a highly skilled game and involves the use of the same green, lawn bowls and equipment as for fully sighted players. According to Metro Blind Sport (2020):

> [*O*]ne of the adaptations in bowls for the visually impaired is that it involves the use of a thin strip or string that runs from ditch to ditch down the centre of the lane, so the bowler is better able to judge the angle according to the distance required. (n.p.)

Some people with remaining vision may use telescopes. The National Association for Blind Bowlers represents visually impaired bowlers in South Africa.

Cycling

Cyclists who are visually impaired can participate in this sport and compete at events by using a two-person cycle (or tandem) with a sighted 'pilot' in the front seat.

Golf

Blind golf is a version of this sport specifically adapted for players who are visually impaired. Blind golf is outstanding in the area of sports for people with disabilities, in that it includes only minor modifications to the standard rules of golf. For blind golf, the blind or partially sighted golf players will have a sighted coach who assists the golfer by describing the distance, direction and characteristics of the hole, and helps with club head alignment behind the ball prior to a stroke. From that point onwards, the golfer's skill will determine the result of the stroke (sourced from International Blind Golf Association 2018).

The classification system of B1, B2 and B3 is used for blind golf, and the handicaps of the golfers are adjusted according to their classifications. Golf for people with disabilities in South Africa is organised by the South African Disabled Golf Association (sourced from SADGA website).

Judo

Contact sport such as judo can be instrumental in (re)attaining independence of movement and in developing physical capacities, which can permit better adaptation to everyday life. It represents a means of escape for people with visual impairment, from a sometimes-sedentary existence and the isolation often imposed by a disability, to an active, socially inclusive and emotionally stable life.

Judo, for the visually impaired, follows the standard rules of judo, with only a few differences. These include that referees will clap once to signal competitors to move forward until contact is made. After contact has been made, competitors will grip each other's uniforms. After the grip (and competitors knowing the position of the opponent), they drop their arms to their sides and wait for the starting signal from the referee. During this process, competitors may not move their feet until contact is made with the opponent. Another important variation to standard rules relates to the use of verbal signals and touches to communicate commands and the decisions of officials (Disability Sports 2019).

Rowing

Rowing can be enjoyed by people with visual impairment, without any need for special rules or equipment. The only requirement is for one sighted person to be in the team, in the role of the coxswain. Rowing is one of the few sports, in which people with visual impairment can compete with sighted people on equal terms.

Scuba diving

Scuba diving is a popular recreational activity for both abled people and people with disabilities. The Handicapped Scuba Association South Africa (HSASA) is a non-profit company that specialises in training people with disabilities on how to scuba dive. The Adaptive Instructors and Adaptive Dive Buddies, who assist divers with disabilities under water, receive specialised training in preparation of fulfilling this task. People with visual impairment can become successful divers, by diving with a sighted diver as a dive buddy and using touch hand signals (sourced from HSASA website). However, they need to pass a diving examination and qualify for them to participate in diving.

Art and cultural activities for learners with visual impairment

Esref Armagan is a famous Turkish painter and drawer, who creates vibrantly colourful, elegantly composed and skilfully executed artwork. He was born without eyes, and the condition is known as bilateral anophthalmia. Despite his impairment (Art is Holistic 2019:n.p.), he has the following to say about his work '[n]o one can call me blind! I see more with my fingers than people can see with their eyes.'

Peter Eckert, an American photographer with retinitis pigmentosa, describes his creative processes of using a camera as follows (Art is Holistic 2019):

> I view my work during the event of taking the shot in my mind's eye. I 'see' each shot very clearly, only I use sound, touch, and memory. I am more of a conceptual artist than a photographer. (n.p.)

Eckert furthermore explains that his art, which is purely visual in nature, forges a bridge between the world of the blind and that of the sighted.

Many more such examples of success, despite visual impairment, can be mentioned. Claude Monet, for example, painted his Water Lily series when his sight began to fail, while Van Gogh often complained of vision problems and is believed to have been colour vision deficient.

In South Africa, several organisations for the blind and visually impaired have introduced art classes for their members. As a result, painting, pottery and sculpture are being introduced to many artists with visual impairment. Other people with visual impairment have been found to be teaching themselves or attending classes to acquire some skills in creative work. An example of a painting created by a South African artist with visual impairment (macula degeneration) is included in Figure 9.1.

People often tend to think that the creation of art is purely a visual process. Art and cultural activities can, however, include painting, beadwork, knitting, crocheting, creative writing, photography, music (singing, playing instruments, choirs, etc.), drama, dance (ballroom, folk, etc.), weaving, needlework and many more activities. When learners with visual impairment take part in such art activities on equal terms with their sighted classmates, they can become empowered to also participate in other areas that may traditionally be regarded as 'off limits'.

Teachers are thus encouraged to support learners with visual impairment to participate in art and cultural activities (Kuell 2009). In making adaptations for implementation in the classroom, both teachers and support staff should use objects that will allow learners to develop their own artistic vocabulary, based on descriptions and experimentation, and support these learners to overcome the challenge of not being able to learn through sight.

Source: Photograph taken by Ann Heard, date and location unspecified, published with permission from Ann Heard.

FIGURE 9.1: Picture painted by an artist with visual impairment (gift to the author from a client).

The following practical guidelines can be applied by teachers in a class:

- use materials with tactile qualities, for example, wood carvings, natural forms, scale models, sculptures, bubble wrap, fabrics, hessian, rope and string; encourage learners to bring materials to school, which can be recycled
- use audio transcripts that describe what the learners are about to feel, in order for them to better understand something they may never have seen or experienced before
- add scents and textures to dough for modelling
- use different sizes of materials for learners to experience scale

- provide learners with areas in front of them, which can allow for more control by them over the materials being used, for example, place materials on a large tray.

When adapting art lessons for learners with visual impairment, teachers can consider the following suggestions by the Royal National Institute for the Blind (RNIB) (2019):

- **Painting:** Many learners with visual impairment use paint very successfully. As some may prefer to use contrasting colours, they may need assistance to mix colours. Alternatively, scented pens or crayons can be used.
- **Sticky tape stencils:** Teachers can provide sticky tapes of differing widths and guide learners to stick the tape onto the pieces of fabric, then apply colour to the fabric with sponges or thick brushes, blot the fabric with kitchen towel when touch dry and ultimately remove the tapes to reveal stencilled patterns. For this exercise, enough contrast between the fabric colour and paint is important.
- **Photography:** Learners with visual impairment can use automatic-focusing cameras to take photographs, and then view and edit digital images on a large computer screen, or by using the magnification tools of tablets and computers.
- **Pottery:** Clay can be used for observations, models, designing and planning, making utensils and constructing abstract expressive forms. Teachers can guide learners to use different methods of decorating clay in order to produce texture.
- **Print making:** Techniques which use a raised printing block are the most useful, for example, wood, lino or potato prints, string on card or card on card. Designs can be worked straight onto the block; however, blind or partially sighted learners may be challenged to make a ‘positive block’ by cutting away the negative areas. As an alternative, a positive surface can be built up with material such as card, paper or string. These can then be pressed onto a slab of clay to make a positive raised picture. String printing is another useful technique, where a variety of yarns are used with different qualities, such as thick garden string, rope and chunky wool.

- **Sculpture:** Shapes can be explored by removing sections (carving). This can be performed by providing learners with 3D shapes to copy, using plasticine, papier-mâché or playdough; large straws made from newspaper; or 'dip and drape' plaster-impregnated gauze. When a sculpture is created within a hand span, a learner with visual impairment will be able to better comprehend the proportions than for an object that requires arm movements, where one part can be very difficult to relate to another.
- **Work with textiles:** For weaving, embroidery and dyeing, brightly coloured fabrics and textured materials can be used such as plastic twine, wire, string and different types of wool.
- **Tactile collage:** A wide range of tactile 2D materials exist that can be used when compiling tactile collages. Materials such as sandpaper and other rough materials should, however, be avoided for readers of braille as this can reduce the sensitivity in the tips of their fingers.

Recreational games for learners with visual impairment

Board games generally stimulate critical thinking and problem-solving. With learners with visual impairment, board games can furthermore support the development of memory, listening skills, visualisation, spatial awareness, planning and strategising – that are all essential skills for achievement in school. In addition, board games will also afford learners with visual impairment the opportunity to be socially included in a relaxing and enjoyable environment with family and friends.

Games adapted for the visually impaired can involve sighted learners and be used as an extension of the curriculum to reinforce learning. Such games can be purchased from the South African National Council for the Blind. The teacher can introduce the games as an extramural activity or as a part of regular day classroom activities.

In this section, a few selected games that have been adapted for people with visual impairment are discussed as examples. Other games that have also been adapted, but are not discussed here, include snakes and ladders, Ludo, dominoes, junior boggle, backgammon and draughts. In addition, technological advancement has resulted in many computer games, forming an integral part of the life of young sighted people, and increasingly those of people with visual impairment.

Chess

Even though chess can be regarded as a game merely played for fun, it can also be a sport where players compete locally, nationally and internationally. Chess is a challenge of the mind, but it also stimulates intellectual development and supports critical thinking and problem-solving skills. Chess has been adapted for people with visual impairment and is referred to as 'Braille Chess' or sometimes 'Blind Chess'. The International Braille Chess Association is the governing body that promotes chess for the blind and visually impaired across the globe. The main adaptations to the chess set for the visually impaired include pegs on the chess pieces, holes in the board and raised and indented squares (refer to Figure 9.2). In addition, modifications have been made to the rules of chess for players who are visually impaired such as verbalising moves, touching the pieces and if necessary, having two chess boards.

Chess rules for people with visual impairment have been adapted to include as follows (Braille Chess Association n.d.):

- Either player may demand the use of two boards, the sighted player using a normal board, the visually impaired player using a board that is specially constructed as all the black squares are raised about 3 mm – 4 mm above the white squares on the chessboard. By feeling the squares, the player is able to determine whether the square is a black or a white one.
- Each of the squares on the board has a hole in the centre, so that the chess pieces can be fixed into these holes.

Source: Chesshouse (n.d.).

FIGURE 9.2: Chess board adapted for the visually impaired.

- Each of the pieces has a downward projection (nail) at the base, which fits into the hole in the squares on the board, thereby fixing the piece securely on the board.
- All the black pieces have a pin fixed on their heads helping the player distinguish between a white and a black piece. (n.p.)

Scrabble

Scrabble has been adapted for people with visual impairment by having braille and raised print on both the tiles and the board.

Card games

Numerous card games exist, which can be played by people with visual impairment, together with sighted persons. For this purpose, playing cards have been adapted by using braille and/or large print. The same applies to Bingo and UNO, where cards have also been adapted.

Sudoku

Sudoku (Figure 9.3) is available for players with visual impairment, in the form of a wooden playing board with braille number tiles and a braille book with 100 Sudoku puzzles and solutions. For the person with low vision, large print Sudoku is also available.

Source: LS&S (n.d.).

FIGURE 9.3: Sudoku board for people with visual impairment.

Monopoly

This game has extra-large-sized cards with braille and large print. The 20-in.[2] game board has a special overlay moulded onto it, for learners with visual impairment to be able to identify all the spaces and location of the properties. The perimeter of each game space is labelled in both braille and large print, which allows everyone, including the blind and those with low vision, to enjoy the game (see Cowper 2016).

Team games for older learners

Older learners can be involved in a variety of team games. In this section, some examples of such games are discussed, even though these will require adaptations to be made when learners with visual impairment are included in the group (Willings 2019).

Matball or beep kickball

See https://www.nfb.org/sites/www.nfb.org/files/images/nfb/publications/fr/fr33/3/fr330311.htm.

This version of kickball is a team game that accounts for individual skills and preferences. Instead of standard bases, matball uses large gymnastic mats as bases, so that multiple players can be on a base at the same time. For this game, two teams are formed, with one starting as the kicking team and the other being in the outfield. Each kicking player advances to the first mat and then decides with each teammate's turn whether they think they can make it to the next base without getting caught out. The team with the most runs at the end of the game wins.

Adolescents generally enjoy matball, more specifically because of working together as a team, running for the bases in a large group or creating distractions to have the fastest players home. To adapt matball, when including learners with visual impairment, the ball can have a bell or beeper inside, or be wrapped in a plastic bag that makes a rustling sound, the distance between mats must be equal and mats could be of different tactile material and be brightly coloured. The mats should have a beeper that can be heard by all players.

Four-square

The object of the game of Four-square (see Four Square 2011) is to eliminate players in higher squares, so that you can advance to the highest square yourself. The game of Four-square is played with a rubber playground ball on a square court with four players, each occupying a quarter of the court. The game is adapted for people with visual impairment by bouncing the ball between players in the squares 'until a player makes an error and is eliminated' (see Four Square 2011). Eliminated players leave the court, all players advance to fill the higher empty squares and a new player joins at the lowest ranked square.

Any number of learners can play Four-square as it is high-paced and features a line for players waiting to enter the game when someone else reaches the highest level. Learners with visual impairment can participate in this game using balls with bells, having tactile and highly coloured or good contrast tape marking out the squares.

Pickleball

Pickleball[3] is a paddle sport played using a special perforated ball on a 20 foot by 44-foot court with a tennis-type net. This game combines tennis and ping pong (table tennis), featuring simple rules and follows a slower pace, which allows for people of various ages and skill levels to participate. To play Pickleball, a court like a tennis court is required, with a net, pickleball paddles and the ball. For this game, single players or small teams of people can be involved in a giant-sized ping pong game. The balls are made of

3. See https://www.usapa.org/docs/ifp/USAPA-Rulebook.pdf.

yellow plastic with holes in them and are the size of a tennis ball. The bats resemble table tennis bats but are slightly larger.

In adapting Pickleball for learners with visual impairment, the balls should have bells inside, the net can be relaxed and the top of the net can be a bright colour. The lines on the court should be tactile and have a contrasting colour to the court surface.

Shape shifter

Shape shifter can be regarded as an advanced form of follow the leader and involves a fun-filled, non-competitive game. No equipment is required, one merely needs an open space and some creative, willing participants. The group can be divided into teams of at least five people on each team, with team members standing in a line, one person behind the next.

To start, the first person in each line forms a shape or poses with their arms and everyone in line holds the same position as they start to jog. Teams then jog together while staying in a line. At any stage, the teacher calls out 'Shape shift', requiring of the teams to react, with the second person in each line forming a new arm pose and all other team members copying them. To be able to do this, the first person in line needs to turn around and start jogging backward, for the rest of the game. These actions are repeated until the entire team is turned backward. When adapting this game to include learners with visual impairment, attention should be paid to each team member having some contact by everybody holding onto a rope or each other's shoulder and verbalising the shape shift. The line of five should alternate a sighted learner in between the learners with visual impairment. Each member of a team should wear the same brightly coloured T-shirt or vest.

Discussion

Physical education is important for all learners across the various developmental stages, including those who are affected by visual impairment. Although some planning is required, it is important to include all learners in the physical education programme as it is a required component of the standard curriculum. By implementing a physical education programme in a school, learners will typically become involved in sport activities which will most likely, continue throughout their life.

As with any other learners, learners with visual impairment need to be actively involved in physical education programmes that can promote lifelong skills and support them in maintaining their general health. In order to make a physical education programme accessible to these learners, some adaptations and specialised equipment may need to be employed. Prior to determining and deciding on appropriate adaptations, it is however important to first understand the learners' functional vision and each learner's unique visual needs. One rule of thumb for all learners with any visual impairment is to keep the instructional area as uncluttered as possible.

Special attention should be paid to include learners with visual impairment in group activities, ensuring that these learners play and talk with their classmates rather than merely passively sitting on the sideline. Some guidance and support will, however, be required by learners who are visually impaired from staff members during the periods of free play on the playground, amongst other things advising them about different options. The playground should also be made 'safe' for learners with visual impairment by, for example, painting equipment in bright contrasting colours, highlighting the edges of steps, marking the edges of pathways and putting borders on swing areas. Pathways can even be marked by a bed of colourful flowers. In addition, a map of the layout of the playground can be placed strategically at the entrance of the playground, using braille or large print. When planning and adapting the playground, teachers can thus implement various creative strategies.

Some ideas for outdoor and playground activities that can be provided or facilitated by teachers include the following (Willings 2019):

- balance beam play
- ball games (balls with bells or beeper balls)
- bean bag toss at a board with a hole or at plastic bottles filled with sound-making materials
- gymnastic activities
- hoop play (roll, follow and pick up)
- jumping on a trampoline
- jumping rope
- playing catch with Velcro mitts
- pulling a friend in a wagon
- pushing a shopping cart (adding weight from, e.g. real cans, etc.)
- relay games
- running with an adult or peer along a rope strung across a safe area
- three-legged walk
- tug of war
- tumbling on a foam pit or mat
- walking in a variety of ways along a rope.

Based on the examples provided in this chapter, it seems clear that learners with visual impairment can participate in most recreational activities. The learners' self-confidence can be built by encouraging them to participate and try something when they seem hesitant. It is, however, advisable to take these learners through an activity or game a couple of times before requiring independent movement from them. Whereas sighted learners rely on motor imitations based on their visual skills, learners with visual impairment need to experience an activity physically in order to understand it and acquire new skills.

Participation in sports will support the health and wellbeing of any learner as it allows for the development of knowledge, skills, capabilities and the attributes that are necessary for mental, emotional, social and physical wellbeing. The rationale behind this is that learning that takes place through health and wellbeing-related activities (such as sport) will enable learners and young people to (cf. Bates & Eclles 2008:30):

- formulate decisions in support of their mental, emotional, social and physical wellbeing
- experience challenges, successes and enjoyment related to a healthy living and activity for themselves
- move towards the next stage of education or work
- establish a pattern of health and wellbeing, which may be sustained into adult life
- for some, perform well in sport or prepare them for careers within the health and leisure industries.

As indicated earlier, participation in sport or physical activity by learners with visual impairment is as important as for their sighted peers, as it allows them to integrate into society with their sighted peers. Learners with visual impairment will experience a range of benefits from participating in sport such as an improvement in general health, social inclusion, better balance, motor skill acquisition, communication and teamwork. As these benefits are essential for everyday living and balanced development, learners need to be provided with opportunities to engage in sport activities that can be included within the curriculum, on condition that some adaptations are made.

Similarly, participation in art and cultural activities is just as important for learners with visual impairment as these activities can provide opportunities for the development and maintenance of fine motor skills, cognitive skills and visualisation. These activities can furthermore support learners to express themselves, increase their self-confidence, be creative, relax and meet people, while being both mentally and physically stimulated. This, in turn, aligns with the broad objective of the education system, namely, to produce successful learners who are confident individuals, effective contributors and responsible citizens.

In this manner, participation in sport, art, recreational and cultural activities can support the development of successful learners, who will be able to make reasoned evaluations and link and apply different types of learning in new situations. Their success will stem from them being able to relate to others and manage themselves, pursue a healthy and active lifestyle and remain self-aware. They will develop and be willing to communicate their own beliefs and views of the world and live as independently as possible. As a basis, problem-solving, critical thinking, creativity, the development of partnerships, sound decision-making skills, and taking initiative and leadership can be developed as skills when involving learners in a variety of activities.

Implications for the classroom

As professionals, teachers who work towards an inclusive community need to keep abreast of new developments and possibilities for learners with visual impairment, enabling them to enjoy and participate in a wide range of activities, thereby supporting their social inclusion in society. It is, however, most likely that teachers of learners with visual impairment will need to be more hands-on than usual as learners may need to acquire specific skills in order to participate in certain activities. In preparing learners for this, it is important to remain informed of their needs, which may well change over time. As the learners will know their own sight conditions best, they should be involved in finding solutions to acquiring new skills.

One of the challenges of being a good teacher of art, culture, sport and recreational activities is to recognise the creativity in oneself and be able to think outside the box. Even though teachers may feel challenged by the idea of involving blind learners in art, which is often regarded in visual terms, teachers all have the ability to engender creativity and think outside the box. Art can, for example, be used to reinforce the ECC as can be seen in the example captured in Figure 9.4, where a diorama

Source: Photograph taken by Ann Heard, date and location unspecified, published with permission from Ann Heard.

FIGURE 9.4: Diorama produced by a learner.

(model representing a scene with three-dimensional figures) can involve biology (animals), writing, painting, science, fine motor skills, depth perception and construction.

When adapting activities and involving learners with visual impairment in sport, art and recreational activities, teachers should remain cautious of the following:

- As sensory loss puts extra strain on the other senses, learners may need to take more breaks or require more time to process instructions.
- Magnification can help learners with visual impairment both in exploring and in creating. As such, the use of a large liquid crystal display television screen or a CCTV or other magnification devices may support people with visual impairment in being creative and completing tasks.

- Some learners may find it easier to use a portable drawing board, called ‘The Draftsman’, which has been specially designed for blind and partially sighted users. It has a reliable base for making raised line diagrams and a plastic film that can be clipped in so that it does not slip. In addition, the sliding ruler will make the drawing of horizontal lines easy and can also be used with a set square in order to be able to draw other angles more easily.
- Good organisation always helps. As such, it is important to ensure that the classroom is clutter-free and logically laid out, and to use trays and storage boxes with tactile or braille symbols as to help for learners to find their own materials.
- Applications for adjustments (such as additional time) can be made via the school’s examination officer well in advance of examinations.
- Attention should be paid to all possible environmental effects, for example, even lighting and the avoidance of glare that can assist learners when they explore an object before drawing or painting it.

Even though not all learners with visual impairment will equally enjoy participation in sport, recreational games, art or cultural activities, just as their sighted peers, they should be given the opportunity and encouraged to participate in such activities as often as possible. Eventually, one learner may prefer the sport route while another may opt to take the arts route. A good example of this is Andrea Bocelli (Martirosyan 2019), who is a world-famous opera singer and was visually impaired (congenital glaucoma) from birth and became completely blind at the age of 12 after a football accident. Prior to a career in opera, Bocelli obtained a law degree and practised in the field for 1 year. He is a braille user, yet also uses modern technology. This example demonstrates how a person with a visual impairment can be included and function independently on social, emotional, physical and economical levels.

The importance of taking learners with visual impairment to sports matches, cultural events and museums in the same manner as their sighted peers seems clear. Even though such excursions may require more preparation and potentially education of the sighted peers in a group, the benefits of such excursions are many. For example, sighted learners can learn to act as human guides on a trip to the museum where they not only guide learners with visual impairment but also describe the exhibits. Assistive devices should also be taken along that can be useful such as telephones or tablets that can capture images of displays which can then be magnified on these devices. In terms of the attendance of sport events, a possible suggestion would be for the learners attending a cricket match to have a digital television channel on their tablet, so that they can see and hear the match as well as the replays while experiencing the ambience of the stadium and the crowd. Once again this illustrates the need to 'think outside the box'.

For all recreational events and skills acquisition (such as sport, art, culture and games), it is important to keep in mind that these need to be planned carefully and skills taught deliberately, when involving learners with visual impairment.

Conclusion

For holistic development, learners with visual impairment (just as their sighted peers) will benefit from opportunities to engage in sport and cultural activities, in addition to completing academic work. It is important to expose learners to as many age-appropriate recreational activities as possible, as recreational and leisure activities can provide an avenue for the development of numerous skills, which will promote social inclusivity of all people in society. In this regard, teachers fulfil a significant role in planning and exposing all learners to such valuable activities.

Chapter 10

Comprehensive sexuality education for learners with visual impairment

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Keywords: Comprehensive sexuality education; Learners with visual impairment; Bourdieu; Doxa; Orthodoxy; Heterodoxy.

Introduction

Existing literature emphasises the need for comprehensive sexuality education (CSE) as well as highlighting the risks of rape, abuse, unplanned pregnancy, human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) infection

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amongst learners with visual impairment (Badu et al. 2018; Mavuso & Maharaj 2015; McKenzie 2013). In addition to CSE, the materials used, which are inaccessible to learners with visual impairment given the format of the information and severity of visual loss, such literature has largely been neglecting issues of lesbian, gay, bisexual, transgender/sexual, intersexed, queer/questioning, asexual/ally, two spirited and other (LGBTIQA2S+) amongst learners with visual impairment. This includes issues of sexual identity, disclosure of sexual identity and the initiation of romantic relationships. Furthermore, available literature does not provide a comprehensive theoretical framework for conceptualising the debates around providing CSE for learners with visual impairment. One can apply the theoretical lenses of Bourdieu's (1977, 1984, 1990) doxa, orthodoxy and heterodoxy to these issues, with the doxa referring to the taken-for-granted assumption that people with visual impairments are separated from being sexual beings. Next, the orthodoxy refers to statements about the doxa, resulting in people believing that learners with visual impairment should not be exposed to CSE. Finally, on the contrary, heterodoxy entails the recognition that people with visual impairments are sexual and do embrace non-conforming sexualities.

■ Overview of the chapter

In order to understand the rights of learners with visual impairment (whether LGBTIQA2S+ or not) to CSE, clarification of CSE is important. In addition, the need for sexual education for all learners is motivated, with a closer focus on learners with visual impairment and challenges often faced by parents, guardians and teachers. Case studies and debates surrounding the stances for and against offering CSE are utilised to guide the reader to consider when conceptualising CSE material and content particularly for learners with visual impairment. The chapter concludes with examples of suitable interventions with regards to language, AT and ensuring the privacy and safety of learners with visual impairment. Furthermore, some strategies are discussed for creating an inclusive environment around CSE and addressing LGBTIQA2S+ issues to support learners with visual impairment.

Definition of key concepts

This section provides definitions of the following key concepts related to CSE: Sex, sexuality, sexuality education, gender and LGBTIQA2S+.

Sex

The term 'sex' refers to a biological make-up usually marked by male or female genes, hormones and genitalia (WHO 2017). Sex, in humans, also refers to a variety of sexual activities, including intercourse (Oakley 2016).

Sexuality

Sexuality is an umbrella term that encompasses the complexities of sexual desire, attraction, preferences and sexual orientation (Lucas & Fox 2019).

Sexuality education

In the WHO's Standards for Sexuality Education in Europe (WHO Regional Office for Europe and BZgA 2010), sexuality education is defined as follows:

> Learning about the cognitive, emotional, social, interactive and physical aspects of sexuality. Sexuality education starts early in childhood and progresses through adolescence and adulthood. It aims at supporting and protecting sexual development. It gradually equips and empowers children and young people with information, skills and positive values to understand and enjoy their sexuality, have safe and fulfilling relationships and take responsibility for their own and other people's sexual health and wellbeing. (p. 1)

Comprehensive sexuality education

Comprehensive sexuality education encompasses a wide range of sexual topics including human sexual anatomy, sexual and reproductive health, age of consent, safe sexual practices and preventative healthcare (United Nations Educational, Scientific and Cultural Organization [UNESCO] 2018). However, this should be incorporated with knowledge, skills attitudes and values to be considered comprehensive.

Gender

Gender refers to the differentiation of the masculine, feminine or gender expressions not always directly linked to one's sex (Butler 1990). Gender is a fluid, socio-cultural construct that manifests through one's identity, roles and dress.

LGBTIQA2S+

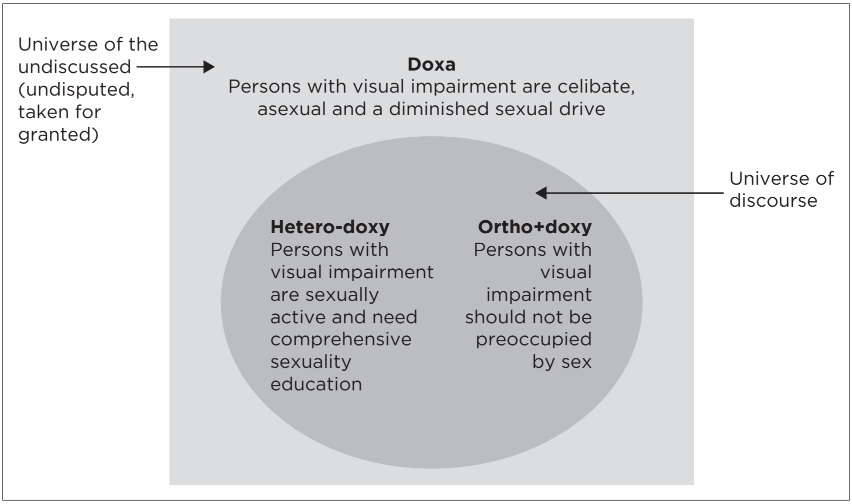
Broad term for lesbian, gay, bisexual, transgender/sexual, intersexed, queer/questioning and asexual/ally. In some countries like Canada, there is an addition of 2S (two spirited), recognising gender fluidity amongst indigenous cultures.

Comprehensive sexuality education for learners with visual impairment as a controversial topic

Parents, guardians and teachers of learners with visual impairment also have to navigate topics of sex, sexuality, gender and LGBTIQA2S+ issues at some point (Kelly & Kapperman 2012). Yet literature suggests that according to societal perceptions, persons with disabilities have a diminished or absent sexual drive (Bolt 2005; Krupa & Esmail 2010; McKenzie 2013; Milligan & Neufeldt 2001).

Over the years, researchers, teachers and parents have debated about the need of sexuality education. A useful theory to conceptualise some of these debates comes from French sociologist, Bourdieu (1977, 1984, 1986), already referred to in the 'Introduction'. Over time, people who are trusted and occupy dominant positions in societies' institutions such as religion, psychology and the State have often informed the statements and positions about sexuality education, with these positions then becoming the orthodoxy (Bourdieu 1977). For example, the State, religious institutions or individuals may take the stance that people with disabilities 'are expected to be impotent and uninterested in sex' (Foulke & Uhde 1974:199). Such beliefs may result in a situation where people with disabilities are not exposed to CSE, despite research indicating that young people with physical (Cheng & Udry 2002), intellectual (Blanchett 2000), psychiatric (Cook 2000) and visual impairments are sexually active (Kelly et al. 2002). According to Bourdieu (1977), in some cases, the 'unthinkable' allows space for a competing understanding of reality or truth to be re-examined. The findings that people with disabilities are sexually active disrupts a widespread belief that persons with disabilities have resorted to a celibate or asexual lifestyle (Bolt 2005; Finger 1992; Krupa & Esmail 2010). In other words, a doxa may persist when the majority of society assumes that they would not be presented with persons with disabilities who are sexual or identify as members of the LGBTIQA2S+ community. As a result, positions may be taken up within society to actively oppose the exposure of CSE and its materials to persons with disabilities.

Furthermore, it should be noted that the orthodoxy could take up the majority of the doxa in the form of laws indicating that people with disabilities should be sterilised to prevent them from procreating (United Nations 2003–2004). However, in times of crisis and political change, Bourdieu (1977) maintains that the status quo may be challenged and/or rejected to accommodate the opinions of disadvantaged groups. In Figure 10.1, a schematic



Source: Adapted from Bourdieu (1977).

FIGURE 10.1: Relationship of the doxa, orthodoxy and heterodoxy in terms of offering comprehensive sexuality education for learners with visual impairment.

representation is provided of the relationship of doxa, orthodoxy and heterodoxy, which parents, guardians and teachers should keep in mind when conceptualising CSE for learners with visual impairment who are, firstly, sexual beings and, secondly, have a visual impairment.

In South Africa, the National Constitution, Act 108 of 1996, recognises that people with disabilities have the right to education, access to reproductive information, healthcare services as well as to not be discriminated against based on sexual orientation (ch. 2, Section 9[3–4], 12[2][a–c], 27[1], 29, 32[1][a, b]. The *Children's Act* 38 of 2005 (Department of Justice [DoJ] 2010), Chapter 2, Section 38 recognises children's rights to information around sexuality and reproduction, with special consideration of children with disabilities in an accessible format. The *Children's Act* 38 of 2005, Chapter 2, Section 38, also maintains that the age, maturity and stage of development of each child should also be kept in mind (DoJ 2010).

The acknowledgement of the rights of all citizens to access quality education and healthcare resources related to their sexual and reproductive health, therefore, generates a demand for sexual education for youths with disabilities (Reynolds 2019). However, access to CSE and some of its materials to certain age groups has continued to be debatable amongst parents, teachers and policy makers of learners with(out) disabilities (Connor & Bartlett 2019).

Comprehensive sexuality education in South African schools

The introduction of CSE in schools, media and community platforms has been an integral part of most Life Skills and Life Orientation curricula in South Africa refer to the work of Kirby (1995, 2002, 2008). According to the CAPS, Life Skills[4] around sexuality are taught in both the Foundation and Intermediate Phases (Grade R–6). The curriculum includes content around body ownership, differences in families, appropriate and inappropriate contact as well as age of consent, amongst other topics.

In addition to the content covered in Grades R to 6, Life Orientation is offered as a compulsory school subject during Senior and Further Education and Training Phases (Grade 7 to 12) (DBE 2011a, 2011b, 2011c, 2011d). The content covered during these phases includes sexuality, peer pressure, unplanned pregnancy, sexually transmitted diseases, relationships and related topics, as stipulated by the National Adolescent and

4. Available generic manuals and broad guidelines to assist teachers in providing CSE to leaners include Action Health Incorporated (2003), United Nations Population Fund (2014) and UNESCO (2018). For visually impaired learners, CSE resource teachers can consult Kapperman et al. (1993), Davies (1996), Kapperman and Kelly (2013), Krupa and Esmail (2010) and Reynolds (2019).

Youth Health[5] policy (Department of Health 2017). However, as of 2023 in Grade 10, and 2025 in Grade 12, Life Orientation will be phased out as a compulsory school subject (SA News 2018). This phasing out of the subject requires of parents, guardians and teachers to come up with new strategies of imparting much-needed sexual education to all young people, including learners with visual impairment (Krupa & Esmail 2010).

The implementation of comprehensive sexuality education

The nature of CSE and the need for CSE for learners with visual impairment are described below. It unpacks some of the themes incorporated by teachers and other professionals when a CSE programme is conceptualised. A case study is used to discuss some of these considerations and present what a CSE curriculum should consider for learners with visual impairment. Further, the challenges of providing CSE to learners with visual impairment will be discussed in detail, while also unpacking CSE with LGBTIQA2S+ learners in mind.

Understanding the concept of comprehensive sexuality education

Comprehensive sexuality education entails any material, lecture or talk that offers content on sex, sexuality, gender and skills of safe sexual practice (UNESCO 2018). The goal is to prepare learners (and adults) who receive sexual education to establish good communication skills, clarify beliefs and values around

5. The goal of the National Adolescent and Youth Health policy is 'To provide guidance to departments and organisations working with the Department of Health on how to respond to the health needs of young people. This requires an integrated approach that is not just problem-oriented, but with focus on promotion of healthy life-styles, mitigation of risk factors and puts in place "safety nets" for prevention, early detection and intervention' (Department of Health 2017:1).

sexuality, and inform behavioural practices in relation to their own bodies as well as the relationships they have with others (McCormack 2015). The themes covered in most CSE programmes include what Newman (2008:2) considers as a comprehensive definition of sexuality, being 'sexual anatomy, physiology, gender, sexual orientation, fantasies, life experiences and spirituality'. Sex positivity teachers will generally add teaching consent, communication and a positive attitude towards safe sexual practice as key to any sexual education curriculum (Barker 2016; Cookney 2018; Feast 2018). More specifically, sex positivity involves more than just transforming negative beliefs and assumptions about sex or sexuality (Barker 2016), or imposing non-monogamy, promiscuity and at-risk sexual practices (Cookney 2018); it encompasses positive and healthy sexual practice, attitudes, communication, safety, intersection, trauma awareness and discussions around consent (Feast 2018).

Comprehensive sexuality education can be provided through platforms such as schools, churches, civil organisations, online forums and even adult entertainment shops (Feast 2018; Newman 2008; Preskey 2019). The majority of sexual education[6] that occurs in primary and secondary schools is often accompanied by basic, practical demonstrations, for example, on how to use a condom (McCormack 2015). Many schools prefer to provide sexual education separately to boys and girls (Reddy 2019), with some learners, particularly learners with disabilities, often not receiving any form of CSE (De Reus et al. 2015; Krupa & Esmail 2010; Rohleder et al. 2009).

6. Some authors or organisations may choose to distinguish CSE from sexual education as content related to sexual anatomy, physiology, sex intercourse and other sex-related practices are performed, as well as the associated rights, risks, infections, benefits, prevention strategies and ways to enjoy a healthy sexual lifestyle. Comprehensive sexuality education incorporates the values, beliefs, attitudes and behaviours around all the aspects within SE (UNESCO 2018).

The need for sexuality education for all learners

The attitudes and values of a society, community and households will determine how much children and adults relate to and can talk about sex (Wisnieski, Sieving & Garwick 2015). Some families may hold more liberal, modern beliefs and values towards sex and sexual expression, while many families remain conservative about sexual discussions, often for religious and cultural reasons, believing that it is the responsibility of the school, religious organisations or life experiences, which will inform individuals about taking the right course of action (Muhwezi et al. 2015). In this chapter, the assumption is made that every learner has the right to learn about their own and general topics of sexual development (UNESCO 2018).

With that said, it should, however, be noted that the offering of sexuality education can be complicated because of the specific needs and unique situations of the various learners in one group or class. For example, learners in one group may represent different ages, genders, special needs and histories, which need to be considered when deciding how much information and possible referral to report (De Reus et al. 2015; Krupa & Esmail 2010; McKenzie 2013). Specifically, the age and any form of disability of a learner may indicate the level of vulnerability and the nature of the sexuality education and guidance required (Groce 2004; Hanass-Hancock 2008; Rohleder et al. 2009). The following case study is used throughout the discussion to highlight the possible scope and nuances of sexuality education.

Case study of Lesiba as example

Lesiba is an 18-year old blind and wheelchair-bound Grade 10 learner at a school for the blind in South Africa. Lesiba is an orphan who lives with his older sister Phabalo in a one-bedroomed house. Phabalo has to both bath and dress Lesiba. Upon going steady for two years in their relationship, Lesiba and his partially sighted girlfriend, Mathlodi, decided to engage in sexual intercourse. Lesiba has been growing anxious by the talks from his classmates about how men should 'perform' during sex. Given the severity of visual impairment, Lesiba has experienced frustration that he could not find any Braille material on first-time sexual education for the visually impaired. As a result, Mathlodi has taken it on as her duty to explore and report to Lesiba in order to ensure that they are safe and comfortable for their first-time experience. However, Lesiba still feels anxious and frustrated that he will not know how to respond to what he cannot see. In addition, Lesiba has had to rely on Phabalo to get him condoms at the community clinic. Mathlodi feels that if her parents were to find out through the community clinic that she was planning to be sexually active, they would object and punish her.

For most parents, guardians and teachers like Mathlodi's parents, discussions around sex, sexuality and LGBTIQA2S+ issues are regarded as awkward and even to an extent embarrassing to discuss with their children (Wisnieski et al. 2015). In this regard, many parents may feel unprepared or think that the discussion of sexual topics could encourage their children to partake in early sexual activities (Malacane & Beckmeyer 2016; Moore 2012; Nash et al. 2019). On the other hand, many young people believe that sexual education programmes, or having general discussions around sex with their parents, are often presented with the aim of abstinence-only, providing incomplete or even inaccurate information about sex, expectations, condoms or gender roles (UNESCO 2018). Young people like Lesiba and Mathlodi are often influenced by their parents' or peers' attitudes regarding sexual-related topics such as sex, kissing, masturbation, pornography and contraception (Newman 2008). In addition, current debates around CSE for learners in schools are ongoing, from as early as Grade 4 (Govender 2019), because of some learners engaging in or experimenting with sex-related activities before that stage.

According to Malacane and Beckmeyer (2016), young people often view sexuality education programmes as being presented from the point of view of reducing harm, sexually transmitted infections and unplanned pregnancies. As sexuality education may result in adolescents feeling stigmatised as promiscuous when sexually active (Wisnieski et al. 2015), they may not feel safe to ask questions about any related topics (Brown 2015; McCormack 2015; Simon & Daneback 2013). However, advocates for early sexual education maintain that sexual education and the material used should encompass appropriate language, values, behaviours, material and resources that can support learners in navigating the dynamics of sex and sexuality (Malacane & Beckmeyer 2016; Moore 2012; Wisnieski et al. 2015). Of further importance is the creation of a natural environment where learners may feel free to discuss openly their sexual development (Brown 2015).

With that said, sexuality education should not ignore the risk factors around sex and sex-related activities (Wisnieski et al. 2015). Young people, including learners with visual impairment, have a high risk of being exposed to risk factors such as rape, contracting sexually transmitted diseases, being abused or being infected with HIV and AIDS (Kelly et al. 2002; Preskey 2019; Rohleder et al. 2009). Although young people may take the necessary precaution when it comes to safe sexual practices, depending on the sexual beliefs of each partner, falling into an unhealthy pattern of pleaser/to be pleased may also be detrimental (McCormack 2015; Moore 2012; Nash et al. 2019). According to Pound, Langford and Campbell (2016), young couples should be prepared with informed knowledge, skills and attitudes to address relational problems within their relationships, and know-how to access support from health practitioners when required. For example, Lesiba needs to be reassured that men often experience performance anxiety[7] (Johnson 2018).

7. Performance anxiety refers to anxiety, expectations or worry around performance of sexual intercourse (Johnson 2018).

The need for sexuality education for learners with visual impairment

The sexual needs of learners with visual impairment are not that different from those of sighted learners (Kef & Bos 2006; Krupa & Esmail 2010; Reynolds 2019; White 2003; Wild et al. 2014). In fact, their sexual formation follows the same individual processes as sighted learners in the development of their physiological, emotional, social and cultural differences (Kef & Bos 2006). However, the phenomenon of immediate differentiation from the perspective of learners with visual impairment may differ from that of sighted learners as the ability to see provides an opportunity to assess, judge and make decisions about one's environment (Van Deventer & Mojapelo-Batka 2013). The gift of sight can for example allow one to distinguish a dangerous situation from a familiar one, or an emergency from a normal everyday activity (Van Deventer & Mojapelo-Batka 2013). This fits with the proverb, 'forewarned is forearmed', which implies that knowledge given in advance will enable one to be prepared of what can be expected (Dictionary.com 2019).

In terms of sexuality and related matters, the gift of sight allows individuals to process and respond to eye contact, posture, bodily movements, gestures and facial expressions (Van Deventer & Mojapelo-Batka 2013). It enables one to see the emotions of fear, sadness, happiness, confusion or flirtatious behaviour (Davies 1996), and thus to respond appropriately to signals and messages communicated on a verbal and non-verbal level (Perkins School for the Blind 2012). In short, sight is a practical mechanism that allows one to navigate safely one's space and encounters with others (Subramanian 2006). On the contrary, learners with visual impairment have to rely on other senses to orientate themselves to their surroundings (Migliozzim n.d.), thereby removing or engaging themselves with an object, person or situation based on other senses other than sight (Perkins School for the Blind 2012). As they cannot readily 'see' how an act may be socially frowned upon, they have to be taught acceptable and unacceptable behaviours in public spaces (Perkins School for the Blind 2012).

More specifically, learners with visual impairment need to be provided with meaningful scenarios, examples and verbal accounts of behaviours that may not be allowed or be considered socially or legally inappropriate (Migliozzim n.d.). For example, standing too close to a person in a queue at the bank, or more objectionable having an erection in the presence of others are topics that require discussion with these learners when conducting sexuality education or guidance. In this regard, because of the limited information these learners may have about their environment, issues such as maintaining physical space, interpersonal boundaries and appropriate ways of displaying certain behaviours may need to be explicitly communicated to learners with visual impairment (Davies 1996; Kapperman & Kelly 2013; Krupa & Esmail 2010; Reynolds 2019). Thus, from an early age, it is crucial to teach learners with visual impairment age-appropriate sexual content (e.g. privacy, safety, age of consent and physical boundaries) in order to prepare them for their sexual development (Kelly & Kapperman 2012).

Early sexual education for learners with visual impairment around basic human physiology, body ownership, one's private body parts and protection thereof form the building blocks for learners starting school (DBE 2011a). Later on, the development of social and interpersonal skills is important for psychological adjustment as learners with visual impairment transition into adolescence (Kef & Bos 2006). As they become more independent, learners with visual impairment should be gradually introduced to more complex topics such as gender, sexual orientation, fantasies and sexual experimentation as well as the risks associated with these practices (Reynolds 2019). As they reach puberty, learners with visual impairment, such as Lesiba and Mathlodi, should be empowered to respond to their own sexual bodies as sexual beings, also discussing topics such as pleasure and explicit consent (Wood et al. 2019). According to Brunes and Heir (2018), Smith and Harrell (2013) and Kelly et al. (2002), the risk factors of neglect, sexual abuse, substance abuse, early sexual debut, rape, attempted rape and forced sexual acts are much greater in the case of children with visual impairment than in the case of sighted learners.

When a learner's history indicates sexual trauma, the necessary referral needs to be made to an appropriate professional, respecting the principles of confidentiality and right to privacy (Smith & Harrell 2013). However, in some cases, parents and practitioners may potentially neglect sexual trauma experienced by young people with visual impairment based on the assumption that people with visual impairment are not interested in or may be sexually inactive (Kelly et al. 2002; Krupa & Esmail 2010; McKenzie 2013). Finally, parents and teachers should guard against assuming or imposing a specific gender onto young people with disabilities, especially those with visual impairments, simply because they may not know what a boy or a girl, or a father or a mother 'looks like' at an early age (Davies 1996; Migliozzim n.d.; Perkins School for the Blind 2012). As most of these learners' socialisation happens verbally and via tactile stimulation (Carney et al. 2003; Sacks & Wolffe 2006; Salleh & Zainal 2010), they can only report on their gender based on the extent of the information provided to them by their parents and guardians.

■ Challenges when providing sexuality education to learners with visual impairment

As mentioned earlier, the sexual needs of learners with visual impairment are not different from those of sighted learners (Kelly & Kapperman 2012). However, access to suitable sexuality education and preventative healthcare for these learners with visual impairment is still a practical and social concern (De Reus et al. 2015; Kapperman, Matsuoka & Pawelski 1993; Krupa &

Esmail 2010). The first challenge relates to the format of sex education informational material, often taking the form of television programmes, pamphlets and magazines, in written or visual format (Rohleder et al. 2009). It is, however, not sufficient to merely translate such material into Braille (Kapperman et al. 1993), as specialised instructional methods are required to make sexuality education meaningful and practical for these learners (Bass 1974). Secondly, most learners with visual impairment are dependent on a parent or guardian, teachers and other caretakers at home or at school for daily living and functioning (Reynolds 2019). As in Lesiba's case, in order for him to obtain material on sexuality or preventative resources implies that he needs to ask someone he can trust to assist him (Rohleder et al. 2009). This may pose a specific challenge if the learners with visual impairment has no immediate access to a healthcare facility such as a clinic at school.

Furthermore, when assistance is provided to access sexuality education material or preventative resources, learners with visual impairment are often concerned about privacy and confidentiality (Davies 1996; Reynolds 2019; Wild et al. 2014). A breach of confidentiality may pose the potential of possible deterrence by unprepared parents or teachers to sexuality education, as well as issues of invasion of privacy for the learners with visual impairment (Krupa & Esmail 2010). It should be pointed out that a practitioner disclosing sensitive patient information implies a human right violation act (*Constitution of the Republic of South Africa,* Act 108 of 1996, Section 10; 12(2) (a-c); 14). According to the *Children's Act* 38 of 2005 (ch. 2, s. 129[2][a-b]; 130; 133; 134), a child may consent to medical treatment or a surgical operation without a parent's permission if the child is over 12 years old and has the sufficient maturity and mental capacity to understand the benefits and risks of the treatment (DoJ 2010). However, the *Children's Act* 38 of 2005 (ch. 2, ss. 6; 7; 9; 32) further notes that, in extenuating circumstances, an intervening person not holding parental rights such as a caregiver or school nurse should act with the utmost care.

At the same time, confidentiality should be adhered when bringing up such a matter with the parents or relevant authorities in cases of suspected harm (DoJ 2010).

The challenge of offering sexuality education does not only apply in the school context but also concerns daily activities at home (Krupa & Esmail 2010; Reynolds 2019; Sacks & Wolffe 2006). Some learners with visual impairment have to rely on a parent, guardian or caretaker, for example, to help them bath (Migliozzim n.d.) which may be complicated when the caretaker is of another gender, more specifically when the child grows older, with the related sexual development taking place. These situational barriers to privacy can become a distinct challenge, especially when the young person starts to mature and wishes to explore their own body and sexual changes (Kapperman et al. 1993; Kapperman & Kelly 2013; Wild et al. 2014).

According to McKenzie (2013), Bolt (2005), Shakespeare (2000) as well as Finger (1992), the discourse around limited rights and recognition of the sexuality of people with disabilities is an artefact of a largely uninformed culture that not only infantilises but also may even socially castrate the sexuality of people with disabilities. A view such as the celibacy of people with disabilities is often based on entrenched beliefs, assigned roles and everyday practices in a specific cultural setting (Bolt 2005; Finger 1992; Shakespeare 2000). Accordingly, in some cultures, people with disabilities may be regarded as lower in a hierarchy of superiority and the ability to contribute within society or be regarded as people possessing unfavourable qualities (Leshota & Sefotho 2018). In addition, Nyirongo (1997) notes that people with disabilities may be denied the majority of rites of passage (e.g. initiation, marriage and burial rituals) because of societal beliefs that they are not able to function as adults. Finally, cultural beliefs such as that children should not be exposed to sexual content until they reach adulthood, implies the challenge of considering the variety of beliefs when preparing and selecting sexuality education material and assistive devices for heterogeneous groups of learners such as in South Africa's multicultural setting.

Lesbian, gay, bisexual, transgender/sexual, intersexed, queer/questioning, asexual/ally, two spirited and other (LGBTIQA2S+) issues

A far-reaching notion, which many teachers may not yet have come across, relates to not all learners with impairment being cisgender or heterosexual (McRuer & Mollow 2012; Shildrick 2007; White 2003), with the concept cisgender referring to the alignment of one's gender identity (especially feminine and masculine) with their assigned sex at birth (female or male) (Halberstam 2017). Heterosexuality (normativity) refers to the dominant narrative that favours the idea of male–female relationships and social organisation (in marriage, family and sexual division of labour, et cetera) to be organised according to the male–female sex-binary, sexuality, gender roles and identity (Orzechowicz 2010). According to Davis (2016), Luczak (ed. 2015) as well as Clare (1999), gender and sex are complicated concepts that intersect with other forms of identities such as queer, crip and gender non-binary.

LGBTIQA2S+ encompasses a spectrum of gender identities including lesbian, gay, bisexual, transgender/sexual, intersexed, queer and other identities (LGBTIQA+) (Orzechowicz 2010). The other identities relate to other non-conforming (queer) sexualities, romantic, physical or sexual attraction to members of all gender identities (pansexual) or to neither (asexual with its subgroups), questioning, ally and many more groups (ed. Nadal 2017). As briefly highlighted earlier, gender is a social construction that people learn, imitate, or 'pass', but is subject to individual expression, gender non-conformity and insubordination (Butler 1996; Garfinkel 1967, 2006). Sexuality and gender expression can manifest, shift and be complicated by how one configures one's gender identity, role or social structure at any given time (Butler 1986; Connell 1987; De Beauvoir 1949). In a culture invested in the physical appearance of others when it comes to sexual attraction, society often wonders how persons with visual impairment form sexual attraction, more so same-sex attraction (Nissim 2017).

Sexual attraction is believed to occur mostly on verbal, visual and aesthetic appeal interwoven with cultural differences (Dion & Dion 1996; Smith et al. 2013; Ting-Toomey & Dorjee 2018). However, much like their sighted counterparts, people with visual impairment form sexual attractions through non-verbal cues (Chester 2018). Sensations like touch, body shape, smell, accent and tone of voice are heightened indicators of sexual attraction for people with visual impairment, which may or may not be gender-specific at some point (Schocket 2017) and is not by choice. However, people who identify as LGBTIQA2S+ remain oppressed, marginalised and form part of minority groups (Türk 2013). Learners with visual impairment who identify as LGBTIQA2S+ will therefore carry both the social oppression, marginalisation and minority status of being LGBTIQA2S+ and of being a person with a disability (Leary 2017; ed. Luczak 2015; Lynn 2017). According to 'RedzandBluez' (in Nissim 2017), learners with visual impairment may wish to explore their identities as LGBTIQA2S+ individuals as early as age 12, emphasising the importance of education around sexual identity, 'coming out the closet' to family and friends, as well as initiation of romantic relationships (Chester 2018; Leary 2017; Reynolds 2019).

Sexual identity or sexual orientation identity relates to a person's perception of himself or herself in relation to whom one is romantically or sexually attracted (Dillon, Worthington & Moradi 2011; ed. Nadal 2017). One can either identify with a particular sexual orientation (e.g. heterosexual or homosexual), dis-identify or choose not to identify with a sexual orientation (American Psychological Association 2009). As such, there is a distinction between sexual identity (how one thinks of themselves), sexual behaviour (actual sexual acts performed by the individual) and sexual orientation (romantic or sexual attractions towards people of the opposite, same, both, or multiple genders or to no one) (American Psychological Association 2009). 'Coming out of the closet' refers to the individual psychological process (decision-making, personal ordeal, self-acceptance of one's personal or sexual identity) by LGBTIQA2S+ members of announcing their sexual orientation to their family, friends or person of interest (Utahpridecenter.org 2009). According to Butler (1990), 'coming out the closet' does not guarantee that an individual will experience rejection, oppression or stigma from others or their sexual or romantic partners. It should always be kept in mind that the initiation of a sexual or romantic relationship is each individual's choice, as is their choice to disclose a specific sexual identity.

■ Implications for parents, guardians and teachers

The available literature around sexuality education suggests a plethora of international guidelines for CSE (Action Health Incorporated 2003; Loeber et al. 2010; United Nations Population Fund 2014), for example captured in UNESCO's (2018) 'International technical guidance on sexuality education: An evidence-informed approach'. In South Africa, the DoE designed an early CSE programme with lessons for young children as early as Grade 4 (Govender 2019). However, the format and materials used in these programmes are not always accessible to learners with visual impairment (Kapperman et al. 1993; Martinello 2016; Rohleder et al. 2009). As in Lesiba's case, it is also important to keep in mind that the timing and unique circumstances of each learner ought to inform the extent and timing of knowledge that is shared (Reynolds 2019). Some guidelines are provided below for early interventions that may guide parents, guardians and teachers, focusing on the role of language, AT, privacy and the importance of creating an inclusive environment in the classroom and public spaces when providing CSE. To some extent, most of the recommendations offered here have been referred throughout the chapter. The recommendations are not exhaustive or applicable to all different situations but are meant to guide parents, guardians and teachers to understand the complexities that surround CSE for learners with visual impairment.

The importance of language, assistive technology and privacy

Language is not only an important vehicle of instruction (Van Deventer & Mojapelo-Batka 2013), it also informs early conceptions of acceptable social behaviour by creating ingrained images, habits, dispositions, mannerisms (habitus) and shared socio-cultural schemas of behaviour in a particular setting (Bourdieu 1977). Migliozzim (n.d.:3), a visually impaired CSE teacher argues that when sighted people are told about people at the beach in their bathing suits, 'That's information about the human body, the sex organs, the size, the shape, the location, those important concepts that are sort of ingrained, they're natural, you observe them'. However, for learners with visual impairment, such information needs to be communicated more explicitly using simple and age-appropriate language (Davies 1996; Kelly & Kapperman 2012; Krupa & Esmail 2010).

Migliozzim (n.d.:4) suggests frank and explicit communication and language usage with learners with visual impairment 'about the body parts, explaining how they work, explaining what they look like', using correct terminology for all body parts, indicating which body parts need to be covered and for which parts clothing is optional. Parents, guardians and teachers can use various materials and methods such as reading for learners from children's books about the human body, explaining the biological and genetic differences in the male and female body, yet using the same language as for sighted individuals (Migliozzim n.d.).

In addition to having open discussions, converting information to braille or using audio formats for CSE (Krupa & Esmail 2010), teachers are encouraged to use AT in support of their discussions with learners with visual impairment (Kapperman et al. 1993; Kapperman & Kelly 2013; Krupa & Esmail 2010). Comprehensive sexuality education teachers should also keep abreast of recent specialised instructional methods and apply these as far as possible (Foulke & Uhde 1974; Kelly & Kapperman 2012; Krupa & Esmail 2010).

Assistive technology (also refer to ch. 3 by Ramaahlo and ch. 8 by Erwee) relies on an experiential learning model using auditory and tactile sensation to create long-lasting learning (Kapperman & Kelly 2013; Krupa & Esmail 2010; Torbett 1974). These devices, which include anatomically correct models with body movements, are available online and in specialised stores (Kelly & Kapperman 2012). Such CSE models contain realistic, human-like models distinguishing features of the shape, size and location of the genital organs (Holmes 1974; Kelly & Kapperman 2012; Krupa & Esmail 2010), in order to create holistic representations for learners with visual impairment. As already stated, the correct vocabulary for body parts should be used during physical demonstrations (Migliozzim n.d.). For demonstrations to be more meaningful, Krupa and Esmail (2010) advise that learners with visual impairment should be provided with the instructional models before and after any group demonstration. It is furthermore important for schools to include parents and guardians within discussions on the use of AT (Kapperman & Kelly 2013).

The importance of safety and privacy cannot be emphasised enough for early CSE interventions with learners with visual impairment (Rohleder et al. 2009). As highlighted earlier, the limited privacy of learners with visual impairment implies vulnerability to sexual abuse and violence not only in the home but also in the classroom or community (Kelly et al. 2002; Reynolds 2019; Rohleder et al. 2009). Parents and learners with visual impairment should thus be provided with vocabulary and accessible mechanisms to report any form of sexual abuse, rape, harassment and exploitation they have experienced of others or themselves (Smith & Harrell 2013).

Finally, the safety and privacy of one's thoughts, innocence, bodily integrity, freedom of movement, information, association as well as access to preventative healthcare is a constitutional right of all learners (*Constitution of the Republic of South Africa,* Act 108 of 1996, s. 12[2][a-c]; 14; 15; 16; 18; 21; 32). Therefore, no family member or school principal has the right to forbid learners with visual impairment from initiating a relationship or accessing preventative healthcare on family planning options.

Creating an inclusive classroom environment

Inclusivity refers to 'the [practice and] quality of trying to include many different types of people and treat them all fairly and equally' (Cambridge Dictionary 2019). Inclusive CSE is largely informed by the history and tenets of inclusive education (Martinello 2016), as discussed in the White Paper 6: Special Needs Education: Building an Inclusive Education and Training System which was proposed to redress the exclusion and accommodation of learners with disabilities (DoE 2001b). As indicated elsewhere (refer to vol. 1, ch. 4 by Ferreira-Prevost), inclusive education refers to the various national and local processes of transformation of education institutions to cater for the needs of all learners, including those with visual or multiple disabilities (UNESCO 2008). The central aim of inclusive education is to increase active participation, visibility and elimination of exclusion of children with disabilities within education (UNESCO 2008), based on the vision that teachers will possess the necessary skills, knowledge and resources to ensure that all learners are included, despite any type of disability or special needs (UNESCO 2008).

Inclusive CSE recognises that varieties of learners are present in one class, including learners who may belong to minority groups such as the LGBTIQA2S+ community. Inclusive CSE entails deliberate proactive education that focuses on avoiding sexist and other marginalising practices such as using gender-specific, (cis)heteronormative terms and referring to stereotypical gender roles (Martinello 2016; Reynolds 2019; White 2003). For example, in a classroom lesson on families, not all learners will come from a nuclear family with a mother and father, neither may all families follow heteronormative gender roles within the family structure, for example in the case of a child with two fathers or transgendered parents (Martinello 2016). In some cases, some learners may respond to other learners with instilled stigma and prejudice from friends and family, for example learners from LGBTIQA2S+ families (Almeida et al. 2009).

In this regard, inclusive CSE aims to create support, awareness and resistance against issues of ableism, homophobia, biphobia, transphobia, heterosexism and/or genderism that may affect the sexual and gender expression of all learners (Martinello 2016). The motif of inclusive CSE can be mirrored in those of queer theory and disability, namely to create agency, advocacy and representation of the sexual and reproductive rights of all people, including those with disabilities (Kafer 2013; ed. Luczak 2015; Shakespeare 2000; Sherry 2004). For learners with visual impairment, this implies the acknowledgement that sex and components of sexuality are part of their sexual and reproductive right (Reynolds 2019). In fact, teachers can set up opportunities in class for learners with visual impairment to present their own family backgrounds including those who come from LGBTIQA2S+ families. Should the learners with visual impairment not have the language to articulate these concepts, a professional such as an educational psychologist can be approached to be present regarding the differences of families. In any case, the role of parental involvement (or legal guardians for those without surviving parents) becomes crucial in an inclusive CSE curriculum (Reynolds 2019).

Conclusion

This chapter focused on the importance of CSE for learners with visual impairment, with the ultimate aim of equipping these learners with appropriate vocabulary, communication skills and recognition of healthy versus risk-taking behavioural practices (Feast 2018; Newman 2008; Preskey 2019). According to the available research in this field (Bolt 2005; Krupa & Esmail 2010; McKenzie 2013), the need still exists for awareness and acceptance of people with disabilities as sexual beings just as those without disabilities. Various challenges can be associated with CSE for learners with visual impairment, including for example inaccessible formats and specialised instructional methods (De Reus et al. 2015; Kelly & Kappermann 2012; Krupa & Esmail 2010). Just as in the case of sighted learners, learners who are visually impaired and identify with the LGBTIQA2S+ community need to be considered when designing materials and discussions around CSE (Martinello 2016; Reynolds 2019; White 2003). The chapter concluded with some ideas for early intervention strategies around language as a tool for socialisation of age-appropriate sexual content to children. Furthermore, it was recommended for teachers to use available AT for meaningful demonstration of CSE for learners with visual impairment. Lastly, the importance of creating inclusive classroom environments in order to support all learners in exploring their own unique sexual and gender experiences was discussed as a strategy for effective CSE.

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- Assistive technology vendors in your province – These people will be able to provide information on specific devices, prices, and implementation strategies. They are a good source for thorough information on the specific assistive technology they represent. However, be aware that they will often show bias to the products they represent.
- Disabled People Organisations (DPO) – Many different organisations such as the National Council for the Blind or Blind SA exist on both a national and regional level are a great resource for information. These resources can often connect the potential assistive technology user with an expert in their area to discuss assistive technology options.

- National Resources – The 2018 Draft National Guidelines for Resourcing an Inclusive Education System by the South African DBE (2018) provides information on assistive technology allocation and provision.
- SETT Framework – Get SETT for successful inclusion and transition (http://www.ldonline.org/article/6399/).
- Texas School for the Blind and Visually Impaired (https://www.tsbvi.edu).
- WATI Guidelines – Wiazowski, J., 2009, 'Assistive technology for students who are blind or have low vision', in Assessing students' needs for assistive technology, viewed n.d., from http://www.wati.org/wp-content/uploads/2017/10/Ch12-Vision.pdf.

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Index

Teaching Learners with Visual Impairment is the second volume in a series of books focusing on research that aids in understanding and efficiently supporting learners with visual impairment. Contributing authors draw on a recent large-scale research project that was conducted with teachers and stakeholders in five of the nine provinces of South Africa, as well as on years of experience and case studies, to add to existing theory in the field of visual impairment. Throughout, authors propose best practices for this specialized field. The aim of opening the eyes and broadening the lens of scholars in this neglected field of study can ultimately strengthen equitable access to the world for learners with visual impairment. In this second volume of the Opening Eyes series, the focus falls on the teaching of learners with visual impairment, against the international drive to implement inclusive education more effectively in countries across the globe. As such, this volume aims to provide a repertoire of examples to apply specialized knowledge and teaching practices that are suitable for learners with visual impairment. Areas of discussion include school leadership, adaptation of teaching material and assessment practices, the use of assistive technology, and learner support practices. In addition, chapters are included on curriculum differentiation, the effective teaching of literacy and mathematics, and ways to support the healthy social development of learners. The ultimate aim of this volume is thus to highlight and provide the necessary knowledge and skills for the effective education of learners with visual impairment, focusing on learner-centered and pragmatic teaching strategies. As with all volumes in this series of books, contributing authors base their discussions on research and experience, providing examples that can be applied in international contexts, in support of optimal functioning of learners with visual impairment.

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