

CHAPTER 1

OUTLINE OF THE RESEARCH INVESTIGATION

1.1 INTRODUCTION

Blind children are excluded from biology because the subject is so visual by nature, but they need it for their understanding of the natural reality in the world in which they live and for their own academic development. The focus of the present research is on learners at special schools because that is the school setting where they currently receive their education. However, in the light of the Department of Education's policy of inclusion, Outcomes-based Education, resource centres and full-service schools, (White Paper 6) a model through which blind learners can access biology is absolutely necessary, and it is for this reason that the study aims at developing and suggesting mechanisms which will be relevant to all education settings.

To be able to achieve this goal, one had to comprehensively study the mediation of life sciences to blind learners in special schools with special reference to biology for visually impaired learners. During that exigent but gratifying process, the researcher learnt valuable lessons from visiting a number of schools for the blind, which could be of tremendous worth towards developing an inclusive education policy for outcomes-based education in South Africa. The visually impaired learners referred to in this research, are individuals who cannot perceive light, or who could not distinguish between light and darkness, or who could not distinguish or recognise any object but have perception of light, or are able to perceive objects as vague images or outlines only, either in motion or stationary.

Great strides have to be made in the improvement of special education as well as the mediation of live sciences to blind and visually impaired learners, since some of the special education facilities would be transformed into resource centres and special school personnel would become members of district-based support teams (who have the task of giving expert advice and support to inclusive schools). Gee, Alwell, Graham and Goetz (1994:13) wrote that the primary focus, therefore, of the support team planning the instruction of the student must be to determine the means by which the student will receive information, how instructional techniques will be adapted to suit the needs of the learner, and how the learner will be allowed to demonstrate knowledge and participate in the instructional and social activities which take place at school and in the classroom. According to the researcher's understanding, the team referred to in the previous quotation consists of educators and support staff.

1.2 PROBLEM STATEMENT

In this work, the researcher comprehensively scrutinised the following problems that were inter-related to and inter-dependent:

1. Most special schools for blind learners lack basic adaptive equipment and resources necessary for the mediation of life sciences. Therefore, blind learners are given much theory but experience

minimal life sciences' exploration, experimentation and expressive practices. Approximately 20 % of blind learners are accommodated at special schools, according to White Paper 6 (2001:8), that is 280 000 such learners. Since blind learners at existing special schools do not have adequate resources, this implies that a large number of blind learners who are at inclusive schools or out of school also do not have resources. Unfortunately, the National Department of Education (Inclusive Education Sub-Directorate) revealed that the Department does not possess statistics regarding blind learners at inclusive schools (Telephone discussion 31 March 2004). If this were the case, blind learners doing life sciences would not receive relevant support in terms of both human and material resources. The implication is that many learners would not be catered for at inclusive schools unless a record could be kept of learners needing learning mediation resources.

2. The learning mediation of life sciences tends to pose both major challenges and difficulties to blind learners in an Outcomes-based classroom as this lays much emphasis on the visual ability of learners. Gettys and Jacobsen (2000:1104) supported this sentiment by noting that: "(i)n the chemistry lab however, most of your observations are visual, such as reading a scale or noting a colour change."
3. Lack of visual ability in the learning mediation of life sciences in an outcomes-based classroom places additional pressures on blind learners. These pressures are in the form of expectations created by peers, parents, educators, the government, and the public in general. According to Webson (1997:40) such expectations constitute a good example of pressure on blind people. There are, as well, negative pressures and expectations that blind learners are unable to perform up to standard on life sciences, "... because they are blind". Such expectations definitely put tremendous pressure upon blind learners learning life sciences.

Furthermore, because the inclusive education system is a relatively new system in South Africa to be offered at specific schools, the researcher is of the view that:

4. Educators in special schools for visually impaired learners as well as those at inclusive schools lack the competency to mediate life sciences to blind learners. Therefore, the lack of competences and the lack of visual ability would make it tremendously harder for the blind learner to both effectively and fruitfully learn, access, understand and acquire an equal life sciences' knowledge that is not distorted or reduced, as compared to that acquired by his/her non-blind class or schoolmates.

The researcher further believes that the facilitation of life sciences needs to be adapted or modified in a suitable and special way in order to permit all learners, regardless of their blindness, both to receive and access quality education in an outcomes-based education classroom on terms which are both reasonable and accommodating. In other words, the study seeks to investigate and fully understand the provision of special education to blind learners in terms of the mediation of life sciences and lessons that could be drawn regarding an inclusive education policy for the Outcomes-based classroom.

As there are differing types and degrees of visual impairments, the work, in particular, gave attention to the totally blind as the researcher considers them to be the most vulnerable individuals in terms of the learning mediation of life sciences in an Outcomes-based classroom. Because of their unique needs and the ever-challenging life sciences, adaptations have to be made so that they could access, experience through all practicable means, learn, understand and be totally accommodated in various learning mediation and learning life sciences environments, including and not limited to the classroom environment, laboratory environment, field trips environment, and other natural environments; for example, viewing the rainbow, sun and moon eclipses, climate change, cloud formations with their various types and structures, germination of seeds in their very early stages, et cetera.

The research afforded the researcher ample opportunities to discover, develop and promote new approaches, strategies, tools, techniques, et cetera, that are essential for the improvement and encouragement of the full and active participation, as well as the active contribution, of the blind learners in special schools and in the learning mediation of life sciences in an Outcomes-based classroom or the community in particular. Mahatma Gandhi in Webson (1997) argued that each of us should be the change we want to see in the world.

1.3 AIM AND OBJECTIVES OF THE STUDY

1.3.1 AIM OF THE STUDY

The main aim of the investigation is to determine how the learning of the life sciences is facilitated (mediated) in special schools for visually impaired learners and to establish how the lessons learnt from this experience could be implemented to the advantage of visually impaired learners in the Senior Phase and Further Education and Training Band in inclusive Outcomes-based education settings.

1.3.2 OBJECTIVES OF THE STUDY

To achieve this aim the following objectives are envisaged in the study:

1. To determine how the lack of visual ability, during the learning mediation of biology and other life sciences, impacts on blind learners, life science educators, special schools and Outcomes-based education.
2. To assess whether the present teaching of blind learners in special schools is in line with the Outcomes-based policy and to determine whether educators are achieving the learning outcomes specified for the teaching of the life sciences.
3. To determine (assess) the outcomes specified for the teaching of the life sciences/biology in secondary schools in terms of the revised national curriculum statements.
4. To expose the characteristics (substance and syntax) of the life sciences/biology as a subject and to use these characteristics as criteria for the selection of appropriate learning mediation strategies.

5. To evaluate existing learning mediation strategies and methods for the life sciences against the outlined national curriculum statements and to determine to what extent these strategies and methods are being met by educators in special schools.
6. To determine whether and how visually impaired learners achieve the learning outcomes specified for the life sciences/biology and to establish which variables restrict effective teaching and learning in the life sciences/biology classroom.
7. To apply and assess the findings regarding the mediation of the life sciences/biology in special schools to the practices and strategies proposed for the mediation of learning in the life science/biology in inclusive educational settings.
8. To identify possible adaptations that could be made to our traditional classroom practices in support of blind and visually impaired learners in inclusive Outcomes-based classrooms.

As an adjunct to the above-discussed objectives, the researcher endeavours to make both society and the government aware of the plight of blind learners in special schools and to apply the experiences of blind learners at open schools under an inclusive education policy. It is also imperative for the researcher to mobilise and urge all sectors of society in South Africa to educationally support these learners and those community structures that worked and still work assiduously to proffer blind learners considerable assistance. Abantwana-Phambili (2001:2) has asserted, “(t)his is an urgent need for action from all of us.”

What further triggered the researcher’s thinking and reaction is that, as far back as 1967, Haring and Schiefelbusch (1967:282-297) reported on various issues related to the education of visually impaired learners. They focused primarily on the importance of vision and the mode of reading, and attempted (in classical positivist style) to illustrate how intelligence manifests itself in blind and visually impaired learners as compared to the deaf. Their work emphasised the significance of blindness and information processing (1967:267) and also illustrated the maximum utilisation of available sensory data during learning mediation as well as the translation of visual stimuli. Attitudes towards blindness as well as the social adjustment of the blind were also highlighted in this early publication.

Freeman (1986:106) emphasised the importance of visual impairment as a handicap to gifted learners as follows: “(i)n them visually impaired learners, conceptual development and abstract thinking seem to be delayed by the absence of visual stimulation or images; cognitive development occurs more slowly, and norms for chronological age groups are invalid.”

The significant role of visual stimuli as prerequisites for conceptual development in the facilitation/mediation of the subject content in general and the life sciences more specifically, has been recorded by many authors such as Falk (1980:156), Perkins (1974:529), Erwin, Perkins, Ayala, Fine and Rubbin (2001:338-351) and Fraser, Loubser and Van Rooy (1996:68-72).

Wittich and Schuller (1973:51) explained more than three decades ago that perception remains the foundation of learning. They stressed the fact that without a sufficient conceptual foundation, learning would be severely impaired and thinking would be severely limited (1973:53). What also has to be taken into consideration, though, is that various developments in technology have significantly contributed, and

will still do so, towards improving the plight of the visually impaired in the facilitation/mediation of learning.

Learning mediation aids such as computers with speech (JAWS), interfaced speech synthesisers, closed-circuit television (CCTV), taped materials, reading machines, talking machines, hand-held magnifiers, Braille, paperless Braille machines, talking calculators, sound sonification, auditory analogues of visualization, instruments with auditory (and not visual) readings, touch and voice-based interfaces, touch and large print components have become standard equipment for the teaching of the blind and visually impaired Kumagai (1995:82); Trief and Feeney (2003:138-143); Collette and Chiappetta (1986:282); Wareham (1995:16); Siekierska, Labelle, Brunet, McCurdy and Pulsifer (2003:491).

It is generally accepted that with the loss or absence of vision, the amount of sensory data available to the learner would be reduced Haring and Schiefelbusch (1967:268). It is for this reason that the teaching and learning of the blind and visually impaired have to be firmly grounded in a multi-sensory approach Erwin *et al.*, (2001:339). Various socio-educational factors might also impact on the performance of blind and visually impaired learners in the classroom. Van Wagner (1994) and Trief and Feeney (2003:138) highlighted the importance of social integration and assertiveness training and explained why pre-registration for classes, communication with professors, the planning of schedules, the early ordering of books, effective orientation and mobility instruction remain essential for meaningful learning of blind and visually impaired learners.

On the other hand, Kumagai (1995:82) has the following to say about blind and visually impaired learners and the acquisition of the science process skills: “(a)t its heart, science is about observation: looking at things, measuring them, analysing their properties, figuring out how they work. How then does one proceed when nature’s most basic and powerful tool for observing – that of sight – is missing?”

Carin and Sund (1989:215) listed a number of cases where the teaching of science to blind and visually impaired learners in the school curriculum has become a reality through the accommodation of specialised equipment. The authors referred to materials that are hands-on, multisensory and which contain discovery oriented activities (1985:216). Collette listed similar comments and Chiappetta (1986:282) emphasised the importance of raised and textured diagrams in the teaching of blind and visually impaired learners.

Erwin *et al.*, (2001:339) and Van Wagner (1994:82-84) reinforced these arguments by emphasising the fact that visually impaired science students should be given ample opportunity to manipulate and explore equipment and materials related to tactile and auditory interactions. These suggestions are supported by Gage and Berliner (1998:178), who emphasised the importance of interactions with the physical environment as a teaching strategy. The multidimensionality and feasibility of sensory stimulation (concrete-empirical props) find support in the argument that multiple educational media have to be used to enhance the quality of learning.

However, one could search for a solution to the problem in Ausubel’s view that concrete-empirical props serve to enhance the transition from concrete to abstract cognitive functioning (Ausubel 1968:201; 219).

Although this theory would normally not hold for adolescents, functioning at the formal operational level (1968:203), Ausubel (1968:220) argues that the use of concrete-empirical props and discovery methods should only be used during the early stages of instruction. This is one reason why Haring and Schiefelbusch (1967:271) as far back as 1937 highlighted the importance of maximising “...(t)he blind learner’s ability to use those sensory data which do come in through his intact sensory modalities.”

This study further focuses on maximising the learning opportunities and experiences of blind and visually impaired learners by making relevant stakeholders aware that their drastic and sustained intervention is urgently needed in the mediation of life sciences as well as the inclusion of blind learners. Furthermore, the government in general, and the Department of Education in particular, should play a constructive role which fosters changes in attitude and behaviour as far as education for blind and visually impaired learners is concerned. The Government and the Department of Education should both share the compulsion to guarantee that the educational rights of all children, including the blind and visually impaired child in inclusive education, are protected in an enabling learning mediation environment that facilitates their overall growth and holistic development into educated, productive and self-reliant citizens of our country. Webson (1997:39) supported the previous statement by maintaining that blind people are people with the same rights, interests, needs, fears, and abilities as any other cross-section of the general public.

However, according to the researcher, the blind learners’ lack of visual ability complicates and multiplies their difficulties and inabilities in the learning mediation of biology and other life sciences subjects. If those complicated and multiplied difficulties and inabilities are not addressed during learning mediation of life sciences, it would be still more intricate for blind learners to learn and benefit from the life sciences in general and biology in particular.

Arentz and Van Genderen (2002:1) remarked that seeing is not only the perception of light or patterns by the eye but also the transmission of these patterns to the cerebral nervous system (a physiological process). In the brain the stimuli have to be translated into images, movements, colours et cetera.

The authors further remarked that understanding visual information is a complex process that takes many steps, like:

- Separating foreground from background;
- Seeing colours and forms;
- Recognising forms;
- Perceiving different parts as one entity;
- Recognising images and faces; and
- Understanding the meaning of images.

As indicated above, lack of vision complicates and multiplies problems. Arentz and Van Genderen (2002:2) argued that lack of vision causes visual-cognitive problems, such as "where" is something and "what" is it. The "where" gives information about the location of an object in space, if it is moving or not, and the orientation of an object.

The "what", as they put it, becomes active when people have to recognise objects and faces, and is closely related to people's memory.

The Constitution of the Republic of South Africa (1996:7; 14) states that all citizens must have equality and enjoy all rights and freedoms. This is to say that the blind learner in a special or open school must enjoy, without impediments, basic education including adult basic education and training. The blind learner is entitled to enjoy and benefit from Further Education, "... which the state, through reasonable measures, must make progressively available and accessible."

This assertion includes even the learning mediation of life sciences and biology. The Constitution of the Republic of South Africa (1996:14) further states that in order to ensure the effective access to, and implementation of the right to education, the state has to take into account equity, practicability and the need to redress the results of past racially discriminatory laws and practices.

Owing to this stipulation, the researcher is of the view that there is therefore a call for a comprehensive and continuing programme of action that would galvanise the entire nation to deal with the exigent reality facing blind learners in both special schools and inclusive education settings, as well as regarding the learning mediation of life sciences (biology) in an Outcomes-based classroom. According to the researcher, the learning mediation of life sciences in an Outcomes-based classroom shows intimidating trends that need to be stopped and reversed.

Furthermore, through this work, the researcher attempts to bring to light the effects of special education on the learning mediation of life sciences to blind learners in an Outcomes-based education classroom. The researcher hopes to accomplish a great and noble task, but his "... chief duty is to accomplish small tasks as if they were great and noble" (Ntsika Enterprise Promotion Agency 2001:25).

1.4 RESEARCH QUESTIONS

This investigation interrogated the following questions, which are informed by the fact that education is moving away from the three Rs (reading, writing and arithmetic) to three Xs (exploration, experimentation and expression).

It is undoubtedly true that a prerequisite for the learning mediation of biology and other life sciences is one's visual ability.

Therefore:

1. How does the lack of visual ability during the learning mediation of biology and other life sciences impact on blind learners, life sciences educators, special schools and Outcomes-based education?
2. Is the present teaching of blind learners in special schools in line with the Outcomes-based education policy and are educators achieving the learning outcomes specified for the teaching of life sciences?

3. What are the learning outcomes specified for the teaching of the life sciences/biology in secondary schools in terms of the revised national curriculum statements?
4. What are the characteristics (measured in terms of substance and syntax) of the life sciences/biology as subject and what would be the most appropriate learning mediation strategies in terms of these criteria?
5. What would be the most appropriate learning mediation strategies and methods for the teaching of the life sciences measured against the outlined national curriculum statements and to what extent do educators use and apply these strategies and methods in special schools?
6. To what extent do visually impaired learners achieve the learning outcomes specified for the life sciences/biology and which variables restrict effective teaching and learning in the life sciences/biology classroom?
7. How compatible is the mediation of the life sciences/biology in special schools with the practices and strategies proposed for the mediation of learning in the life sciences/biology in inclusive educational settings?
8. What adaptations to our traditional classroom practices will therefore be required in support of blind and visually impaired learners in inclusive Outcomes-based classrooms?

1.5 RESEARCH HYPOTHESIS

According to the researcher's point of view, it is not common practice for the researcher employing qualitative research methodology with its techniques and strategies to formulate hypotheses as they are applicable to quantitative research methodology.

Some of the reasons why the researcher nevertheless formulated hypotheses for this research investigation include, but are not limited to, the following:

- a) Hypotheses are good and valuable tools for both the verification or the falsification of one's beliefs or suspicions.
- b) Hypotheses also provide a platform for researchers to work from.
- c) Through formulating hypotheses, researchers are able to establish the true value of the study, its applicability, its consistency as well as its neutrality. Other reasons why hypotheses were specifically formulated for this research investigation are furnished in chapter five-paragraph 5.3.2 subsection (a).

The following hypotheses were formulated:

1. The mediators of the life sciences/biology to visually impaired learners in secondary special schools are well-acquainted with the envisaged learning outcomes to be achieved in science classrooms but rely heavily on the transmission of information as delivery mode, as opposed to investigative and inquiry teaching strategies, mainly because of the lack of visual ability of learners and inadequate resources.
2. Visually impaired life sciences/biology learners rely heavily on instructional support mechanisms as principles for effective teaching and learning in the science classroom but these conditions are not

met because of the lack of resources and of the necessary financial and logistical support in special and inclusive schools.

3. Life science and biology educators apply creative and innovative learning mediation strategies in special schools for the blind and visually impaired learners.
4. Educators responsible for the mediation of biology and life sciences in special schools for the blind are fully equipped to optimise the potential of their learners in terms of the requirements put forward by the outcomes for biology and the life sciences in an Outcomes-based learning environment.

As explained in the introductory part of this subsection, the researcher would hold the view that the above-discussed hypotheses are true and correct unless the data gathered and analysed proves the contrary.

As a supplement to the above-highlighted hypotheses, the researcher would further hold the following views that:

- Drawings are problematic to blind learners because they are not taught how to draw but are given ready-made drawings. Owing to this, the researcher is convinced that there are no other activities to supplement a loss in their drawing ability.
- Many educators have a tendency to engage their blind learners very seldom in practical work, field trips or related activities.
- Practical activities that blind learners are involved in are limited, very simple and elementary in nature, therefore calling for very minimal intellectual challenges or advanced problem solving skills.

Therefore, the researcher will be guided by the following things:

- i) statement of hypothesis
- ii) research questions and
- iii) questionnaire and inventories in his quest to acquire relevant information necessary for these study.

1.6 TARGET POPULATION

The intended population of this research is primarily the targeted schools referred to in chapter five, educators at special schools for the education of learners with special education needs, blind learners, education authorities at local, provincial and national level, associations of and for the blind, parents/guardians of learners who are blind, members of the community who are interested in blind people's issues, and academicians. The study is aimed at conscientising the above indicated groups regarding the challenges and difficulties which Outcomes-based Education policy and the learning mediation strategies of biology to blind learners in an Outcomes-based Education and Training classroom pose for blind learners.

1.7 METHODOLOGY

This researcher investigated the mediation of life sciences to blind learners at special schools in South Africa and its effects on the mediation of biology to blind learners in an Outcomes-based classroom. The

researcher employed the Qualitative Inquiry methodology as well as its techniques and strategies for data gathering. This is discussed in detail under 5.2.1. In addition, hypotheses were interpreted and discussed even though they are quantitative in nature. Reasons for doing so are provided in paragraphs 1.5 and 5.3.2 (a).

1.8 DEFINITIONS OF TERMS/CONCEPTS

Terms/concepts found in the title of this thesis or related to the title, are defined.

Before the researcher defines terms and concepts used in this work, the researcher needs to elucidate the notion of inclusive education and training.

According to White Paper 6 (2001:16), inclusive education and training is about:

- ❑ Acknowledging that all children and youth can learn and that all children and youth need support.
- ❑ Accepting and respecting the fact that all learners are different in some way and have different learning needs which are equally valued as an ordinary part of our human experience.
- ❑ Enabling education structures, systems and learning methodologies to meet the needs of all learners.
- ❑ Acknowledging and respecting differences in learners, whether due to age, gender, ethnicity, language, class, disability or HIV status.
- ❑ Acknowledging that learning also occurs in the home and community, and within formal and informal modes, and structures.
- ❑ Changing attitudes, behaviour, teaching methodologies, curricula and the environment to meet the needs of all learners.
- ❑ Maximising the participation of all learners in the culture and the curricula of educational institutions and uncovering and minimising barriers to learning.
- ❑ Finally, empowering learners by developing their individual strengths and enabling them to participate critically in the process of learning. According to the government, some of the results highlighted above could be achieved through Outcomes-based Education.

(a) OUTCOMES-BASED EDUCATION AND TRAINING

Some literature refers to Outcomes-based Education as “OBE/OBET”. The acronym/s could be used interchangeably.

Though Malcolm (2000:4-5) advised that Outcomes-based Education defies simple definition because it is essentially a management system which could be fitted to different philosophies of education, and specifies learning as including and not limited to prescribed outcomes and assessment criteria, phase organisers, learning programmes, expected levels of performance and illustrative learning materials, the researcher nevertheless chose the following definitions because of their meaning and implications. Spady is the architect of the philosophy of Outcomes-based Education. What is heartening, according to Malcolm (2000:4-5), is that both Spady (1994:1) and South Africa's definitions talk about transformational Outcomes-based Education. This does not mean that the two definitions are not different; for example, unlike Spady's definition, South Africa's definition focuses more on the social, economic and cultural

transformation of the nation while Spady's definition is limited in scope and value, as emphasis is laid on transformation of the structure and content of schooling.

Van Der Horst and McDonald (1997:7) defined Outcomes-based Education as: “...(a)n approach which requires teachers and learners to focus their attention on two things. Firstly, the focus is on the desired end results of each learning process. These desired end results are called the outcomes of learning and learners need to demonstrate that they have attained them. They will therefore continuously be assessed to ascertain whether they are making any progress. Secondly, the focus is on the instructive and learning processes that will guide the learners to these end results. Teachers are required to use the learning outcomes as a focus when they make instructional decisions and plan their lessons.”

On the other hand, Spady (1994:1) regards Outcomes-based Education as clearly focusing and organising everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning experiences.

The Outcomes-based Education and Training definitions/explanations furnished above caused the researcher to understand and regard it as a system with a clear picture of outcomes to be attained and demonstrated by all learners at their own pace and rate, through the guidance of instructive and learning processes. As a point of departure, the system should both ensure and determine what all learners are able to do, then organise the curriculum according to learners' ability and unique needs, then carefully plan instruction and assessment in order to make sure that learning mediation ultimately happens and is also effective. Furthermore, Outcomes-based Education should be regarded as an approach, which makes use of clear statements about the knowledge, and skills that learners should acquire as a result of their learning. Clear statements are also made about the values and attitudes that are being promoted as learners engage in Mediated Learning Experiences or processes.

(b) CURRICULUM

“(C)urriculum is everything planned by educators which will help develop the learner. This can be an extra-mural sporting activity, a debate, or even a visit to a library” (Curriculum 2005 Lifelong learning for the 21st century 1997:10).

According to Bertram, Fotheringham and Harley (2000:3), a curriculum could further be understood in the following two ways: “(f)irstly, ... as a plan (which may be written in a document). This plan reflects the knowledge, skills and attitudes that any society chooses to pass on their children.” In their view curriculum should secondly be seen as the learning and teaching experiences that happen in any site of education. Therefore, a curriculum is a carefully planned and well written document that explicitly reflects the knowledge, skills, values and attitudes of societies that are intended to be passed to or mediated to the future generation, comprising both the old and the young. This document gives educators room to manoeuvre as well as to take their ideas, which are embodied in the curriculum document, and enact them in their respective institutions of learning and classrooms.

In addition, the way in which educators would interpret a curriculum depends on and is highly influenced by the knowledge, skills and beliefs of that particular educator as well as by the context, milieu, and conditions in which the educator finds himself/herself during the learning mediation. Curriculum comprises the following components: academic programme, practical programme (trait oriented) and skills training programme.

(c) TEACHING AND LEARNING MEDIATION STRATEGIES

Van Der Horst and McDonald (1997:123) regard teaching and learning mediation strategies as a real plan of attack. According to them, this plan of attack “...(o)utlines the approach you intend to take in order to achieve outcomes.” Furthermore, they aptly stated in their work (1997:124) that teaching strategies are “...(a) broad plan of action for teaching activities with a view to achieving an aim.”

In simple terms, instructional or teaching and learning mediation strategies can best be understood as methods, tools, techniques or approaches with which the educator communicates ideas, expectations, intentions and new knowledge to the learners. (The researcher’s own definition.) However, it is of paramount importance that before educators decide on a teaching and learning mediation strategy to be used during an activity, they have, as a matter of fact, to be clear about their specific outcomes, learning outcomes and the main content of their envisaged lesson.

Landman (1988:548) understands and regards teaching to be “...(a) medium of education but not all teaching is educative. Teaching concentrates on intellectual actualisation, including in its scope bodies of knowledge (such as knowledge of values and norms) and skills useful for communal existence.”

Teaching should not be confined to school or formal teaching. It does take place out of school in informal or non-formal circumstances and schools do not exist mainly for teaching but also for education provided by means of other forms of mediation. Therefore, teaching encompasses both formal and informal processes where the educator at school or out of school employs methods, techniques, tools, approaches, et cetera, to communicate ideas, intentions, expectations and new knowledge to the learners or students. (The researcher’s own definition.)

Teaching and learning mediation are indispensable to one another. They share many common features of which the most important are imparting or acquiring knowledge, acquiring essential skills and gathering experience.

Pauw (1990b:31) maintained that learning mediation is “...(t)he process through which an individual develops or acquires knowledge, skills or attitudes. It is influenced by the interaction of many individual or environmental variables, is highly related to language development, and its development or acquisition may be originated or modified through planned educational intervention.”

On the other hand, Landman (1988:432) considers learning mediation to be implying the acquisition of significant content, the realisation of meaningful conduct, experiences and acts of volition, and the revelation of meaningful ability (to do activities) and skills.

Kruger, Smit, Du Pr`e and Le Roux (1996:129) maintained that learning mediation is a process that underlies or gives rise to perceivable (observable or noticeable) changes in behaviour in situations involving practice, teaching and life experiences. An individual, who is engaged in learning mediation, should be able to know, understand and perform things accordingly, with a feeling of competence and skill. It does not matter whether an individual has learnt through associative, cognitive, social and/or moral learning mediation; what matters most is that an individual should, at the end of the day, be able to recall, remember and reconcile things learnt, heard, seen or read. Finally, learning mediation involves goal setting, distribution of learning time, proper utilisation of learning resources, constant feedback, determining the value and meaningfulness of learning material, self-motivation and explaining and distinguishing sense from non-sense.

(d) BLINDNESS AND VISUAL IMPAIRMENTS

The world health Organisation defines blindness as 3/60 (finger counting at three meters) (Vaughan, Asbury and Riordan-Eva 1999:384)

However in S.A., a person is registered blind if he/she has a visual acuity of less than 6/60 with correction. It must be emphasised that in the context of the measurement of visual acuity, the figure 6/60 does not represent a fraction. It means that the person with a visual acuity of 6/60 would be able to see at 6 metres what someone with normal vision would be able to see at 60 metres (Best 1992:2)

Although the term visually impaired is used in many countries to describe both those who are blind and those with low visions the terms ¹blind and partially sighted are widely used in S.A., being endorsed by the S.A.N.C.B.

For the purpose of this study, the term blind will be used to refer to those persons who are either totally blind, that is, having no light perception, or those who have limited light perception, but are unable to either read print, even with optical or magnification devices, or to identify objects.

Pauw (1990b:10) indicated that someone who is blind “...(l)acks the normal ability to see, possibly because of developmental defects in the eye itself or because of a neural defect disrupting communication between eye and brain.” Words such as “visually challenged, visually impaired, visually handicapped, visually disabled, experiencing visual barriers, et cetera” might often be used to refer to an individual who is blind. Blind individuals could also suffer from other causes of visual impairments. Visual impairments could be used interchangeably with the term visual disability and are defined by Corn and Koenig (1996:9) as a term that encompasses both those who are blind and those with low vision.

¹ In his study the researcher used blind and visually impaired to be meaning blind and partially sighted.

Arter, Mason, McCall, McLinden and Stone (1999:8-9) have distinguished different types of visual impairments, such as myopia (short sightedness), albinism, retinitis pigmentosa (a disease that affects the retina, causing tunnel vision and night blindness). Other impairments might include strabismus, retinal detachment, photophobia, macular degeneration, nystagmus, hyperopia, astigmatism, glaucoma, cataracts, et cetera.

In addition to these issues, Wang, Reynolds and Walberg (1989:155) also maintained that "...the seemingly simple term visual handicap covers a wide range of children.... Included are those who have never had any visual function, those who had normal vision for some years before becoming gradually or suddenly partially or totally blind, those with handicaps in addition to the visual loss, those with selective impairments of parts of the visual field, and those with a general degradation of acuity across the visual field. Thus it is misleading to think of visually handicapped children are being all alike, with the implication that they may all be treated alike with uniform success in educational or other settings. In fact, this is an extremely heterogeneous population, and one which places correspondingly mixed demands on the people and agencies which deal with it."

Individuals who are partially sighted or who have low vision, fall into this category. Corn and Koenig (1996:4) defined a person with low vision as one experiencing "...difficulty accomplishing visual tasks, even with prescribed corrective lenses, but who can enhance his or her ability to accomplish these tasks with the use of compensatory visual strategies, low vision and other devices and environmental modifications." According to them, low vision further implies a vision loss that is severe enough to interfere with the ability to perform everyday tasks or activities and that could not be corrected to normal by conventional eyeglasses or contact lenses.

According to Corn and Koenig (1996:7) partial sight refers to "...persons with best-corrected visual acuity in the best eye of 20/70 to 20/200." Both persons who are either partially sighted or have severe low vision are able to function with a substantial or a negligible amount of usable vision without relying entirely on the tactile and auditory senses.

According to the researcher, the disparity between low vision, partial sightedness and blindness occurs in that low vision and partially sighted persons have usable vision while blind persons do not. Low vision and partially sighted persons could employ compensatory visual strategies, low vision and other assistive devices, environmental modifications and vision to accomplish learning mediation activities. It is argued by Wang *et al.* (1989:157) that blind individuals depend on tactile and auditory senses in acquiring information and the accomplishment of learning mediation activities. Lack of visual ability impacts in a negative way on their learning mediation, as vision is crucial for seeing relevant data.

(e) BIOLOGY

Hornby (1987:82) defines biology as the "(s)cience of physical life of animals (Zoology) and plants (Botany)."

Biology is defined by Van Aswegen, Fraser, Nortje, Slabbert and Kaske (1993:1) as “...(h)uman activity which is directed towards seeking knowledge about living matter.” Biology is a field of study that deals with the collection, investigation, observation, analysis, identification, interpretation, explanation, and evaluation of the facts and concepts regarding living matter in order to seek answers and solutions by observing, attaching new meaning to an observation, discovering, investigating, et cetera.

The learning mediation of biology at schools involves exposing learners to learning environments such as the laboratory, natural environments, field trips, practical environments involving observation, exploration, experimentation, expression, inquiry, analysis, interpretation, acquisition of experience, knowledge and skills. The teaching and learning mediation of biology at school presently encourages biology learners to be initiative, innovative and creative.

(f) INCLUSION AND INCLUSIVE EDUCATION

According to UNESCO, inclusive education is a developmental approach seeking to address the learning needs of all children, youth and adults, with specific focus on those who are vulnerable to marginalisation and exclusion. Ref: <http://www.unesco.com>.

The principle of inclusive education was adopted at the World Conference on Special Needs Education: Access and Quality (Salamanca, Spain, 1994) and was restarted at the world Education forum (Dakar, Senegal, 2000). The idea of inclusion is further supported by the UNESCO standard rules on the Equalization of Opportunities for persons with disabilities proclaiming participation and equality for all.

Asmal (2004:5) regards inclusion as referring to an education system that:

- Recognises and respects the differences among all learners, and builds on the similarities;
- Supports all learners, educators and the system as a whole so that the full range of learning needs can be met. The focus is on teaching and learning actors, with the emphasis on developing good teaching strategies that will benefit all learners;
- Focuses on overcoming barriers in the system that prevent the system from meeting the full range of learning needs. That focus is on adapting the curriculum, and strengthening support systems in the classroom.

He (2004:10) further considers inclusive education as involving three important factors:

- Changing mainstream education so that learners experiencing barriers to learning can be identified early and receive appropriate support;
- Changing special schools and specialised settings so that learners who experience mild to moderate disabilities can be adequately accommodated within mainstream education through appropriate support from district-based support teams, including special schools as resource centres and specialised settings; and

- ❑ Upgrading the quality of special schools and specialised settings so that they, together with district-based support teams, can provide high-quality service for learners in full-service and “ordinary” schools.

According to White Paper 6 (2001:8-9) inclusion entails moving away from the category system which allowed only those learners with organic, medical disabilities access to support programmes, and

- ❑ Basing the provision of education for learners with disabilities on the intensity of support needed to overcome the debilitating impact of those disabilities;
- ❑ Placing an emphasis on supporting learners through full-service schools that will have a bias towards particular disabilities depending on need and support;
- ❑ Directing how the initial facilities will be set up and how the additional resources required would be accessed;
- ❑ Indicating how learners with a disability will be identified, assessed and incorporated into special, full-service and ordinary schools in an incremental manner;
- ❑ Introducing strategies and interventions that will assist educators to cope with a diversity of learning and teaching needs to ensure that transitory learning difficulties are ameliorated;
- ❑ Giving direction for the education support system needed; and
- ❑ Providing clear signals about how current special schools will serve identified disabled learners on site and also serves as a resource to educators and schools in the area.

As stated in Asmal (2004:5) inclusive education is based on the following principles:

- ❑ Acceptance of the principles and values contained in the South African Constitution and White Papers on education and training;
- ❑ Human rights and social justice for all learners;
- ❑ Participation and social integration;
- ❑ Equal access to a single, inclusive education system;
- ❑ Access to the curriculum, equity and redress;
- ❑ Community responsiveness; and
- ❑ Cost-effectiveness.

According to Van Steen Landt (1995:4), UNESCO regards inclusion as a more general school reform, aimed at accommodating pupil diversity, including disability, and offering quality education to all pupils.

On the other hand Burden (1995a:47-48) suggested that inclusion should be understood as a practice that “...(e)xpects the society to facilitate the acceptance of those who do not fit in by accepting them just as they are. Inclusion in its pure form should rather be defined as a warm and embracing attitude, accepting and accommodating the other unconditionally (without preconditions).” Furthermore, inclusion implies that because of the existence of a different attitude in a society, the needs of people with disability are also addressed differently, that is following the bottom-up approach where society responds to the diversity with an attitude that embraces learning, interpreting, widening perspectives and reflective enquiry.

The guiding principle of inclusion according to Engelbrecht, Green, Naicker and Engelbrecht (1999:32) is that schools should accommodate all learners regardless of their physical, intellectual, social, emotional, linguistic or other conditions. This should include disabled and gifted learners, street and working learners, learners from remote and nomadic populations, learners from linguistic, ethnic or cultural minorities and learners from other disadvantaged or marginalised areas or groups. Inclusion is simply a means of extending educational opportunities to a wide range of marginalised groups who may historically have had little or no access to schooling.

By “low institutions” the researcher refers to early intervention programmes for blind learners offered at kindergartens stretching up to Junior Phase. “Middle institutions” are institutions offering Intermediate education, Senior Phase and Further Training Band. “High institutions” are tertiary institutions such as universities.

According to the researcher, inclusion should be understood as an educational integration of both disabled and able-bodied learners at any educational institution, either for academic or vocational training (low, middle and high), in order for both groups to equally access, acquire and effectively participate in all mediated learning experiences, processes and activities, where all learners are granted ample opportunities and pleasant situations to get used to each other, and, also, to accommodate, appreciate and fully know and understand each other’s conditions.

Asmal (2004:6) recognises the following as key differences between special education and inclusion:

- ❑ Special schools focus on the individual while inclusion focuses on society; that is, if society cannot cater for people who experience barriers to learning, then it is society that must change.
- ❑ Special schools focus on disability in terms of a medical and welfare framework that represents a perception of the disabled as "ill" and "needing care", while inclusion focuses on human rights of learners, parents/guardians et cetera and on development, and is thus an agenda of redressing past inequalities, and transforming education to serve a new social order, to meet pressing national needs, and to respond to new realities and opportunities.
- ❑ Special schools focus on barriers to learning presented by the disabled learner, and getting learners to fit into the existing educational system, while inclusion focuses on identifying barriers to learning, existing in the system itself, that prevent access to learning.
- ❑ Special education segregates learners in terms of both race and category of disability, while inclusion focuses on an inclusive, redress approach, and on provision of education based on the levels and intensity of support which learners require.
- ❑ Special schools render support at low, moderate and high intensity levels, while inclusion does not render support services at high intensity levels.

(g) MAINSTREAMING

In Meisel's (1996:155) view, mainstreaming refers to the temporal, instructional and social integration of eligible exceptional children with normal peers. It is based on an ongoing, individually determined educational needs assessment, requiring classification of responsibility for coordinated planning and

programming by regular and special education administrative, instructional, and support personnel. The intentions of mainstreaming are similar to those of inclusion. Mainstreaming is a system that enhances mutual acceptance and appreciation of one another by able-bodied learners and disabled learners at regular schools.

The difference between inclusion and mainstream education is that mainstream education is a temporary, instructional, social and educational integration between the disabled and the able-bodied, while inclusion is meant to be a permanent arrangement. Furthermore, classification of learners, programming and planning for mainstream policy is decided upon by a group of experts including regular and special educators, instructional and support personnel. This means that inclusion strives to promote permanent acceptance and accommodation of the disabled unreservedly, while mainstream education concentrates on the temporary instructional and social integration of eligible exceptional children with normal peers which, according to the researcher, could be terminated at any time. According to the researcher, why should the disabled children enjoy the benefits of mainstream education only on a temporary basis? Would this not have serious implications, such as not accepting and accommodating the disabled at all?

(h) NATURAL SCIENCES

According to LIBERTY INDEPENDENT NEWSPAPER [s.a] [s.p] the definition of natural sciences is, “...(t)he systematic study of the material universe - including natural and human-made environments - as a set of related systems. A variety of methods, that have in common the collection, analysis and critical evaluation of data, are used to develop scientific knowledge.”

1.9 OUTLINE OF THE RESEARCH

The researcher intends to achieve the following in the following chapters:

Chapter 1 covers the following aspects: the introduction, problem statement, research question, aim and objectives, research hypotheses, methodology, the audience, definition of terms/concepts featuring prominently in this work and outline of the research.

In **chapter 2** the researcher critically analysed previous education systems in order for the reader to know their strengths and weaknesses in paving the way for Outcomes-based Education and Training. These systems are African education, People’s education, the inclusive education policy and a historical perspective on Outcomes-based Education and Training.

Chapter 3 addresses the nature and structure of biology and the impact this subject/learning area has on blind learners and their learning mediation in general. The researcher covers the following aspects: the importance of biology to blind learners and society in general, the nature of the subject of biology, the structure of the subject of biology, the syntactic structure of the subject of biology, the commencement of science process skills, the relationship between substantive and syntactical structures, the instruction of biology to blind learners through inquiry, factors influencing the learning mediation of biology and the qualities of the biology educator, especially regarding blind learners.

Chapter 4 focuses on learning mediation strategies for blind learners, the origin of blind learners' mediation needs, the importance of learning mediation strategies to blind learners, the role of biology educators during learning mediation processes, the requirements to foster blind learners' talents, guidelines for mediating biology to blind learners in an Outcomes-based Education and Training classroom, how learning mediation takes place and the importance of educator-training in order to effectively include blind learners at inclusive schools.

Chapter 5 deals in much detail with the data collection techniques and strategies applied, the data and content validation of inventories, the composition of the research sample and the selection of the participants, data collection processes and the application of the focus group, and the method of data analysis. **Chapter 6** discusses the findings while the final chapter (**Chapter 7**) provides a synopsis of the research, evaluates the significance of the research, and furnishes resolutions, recommendations and possible research questions.

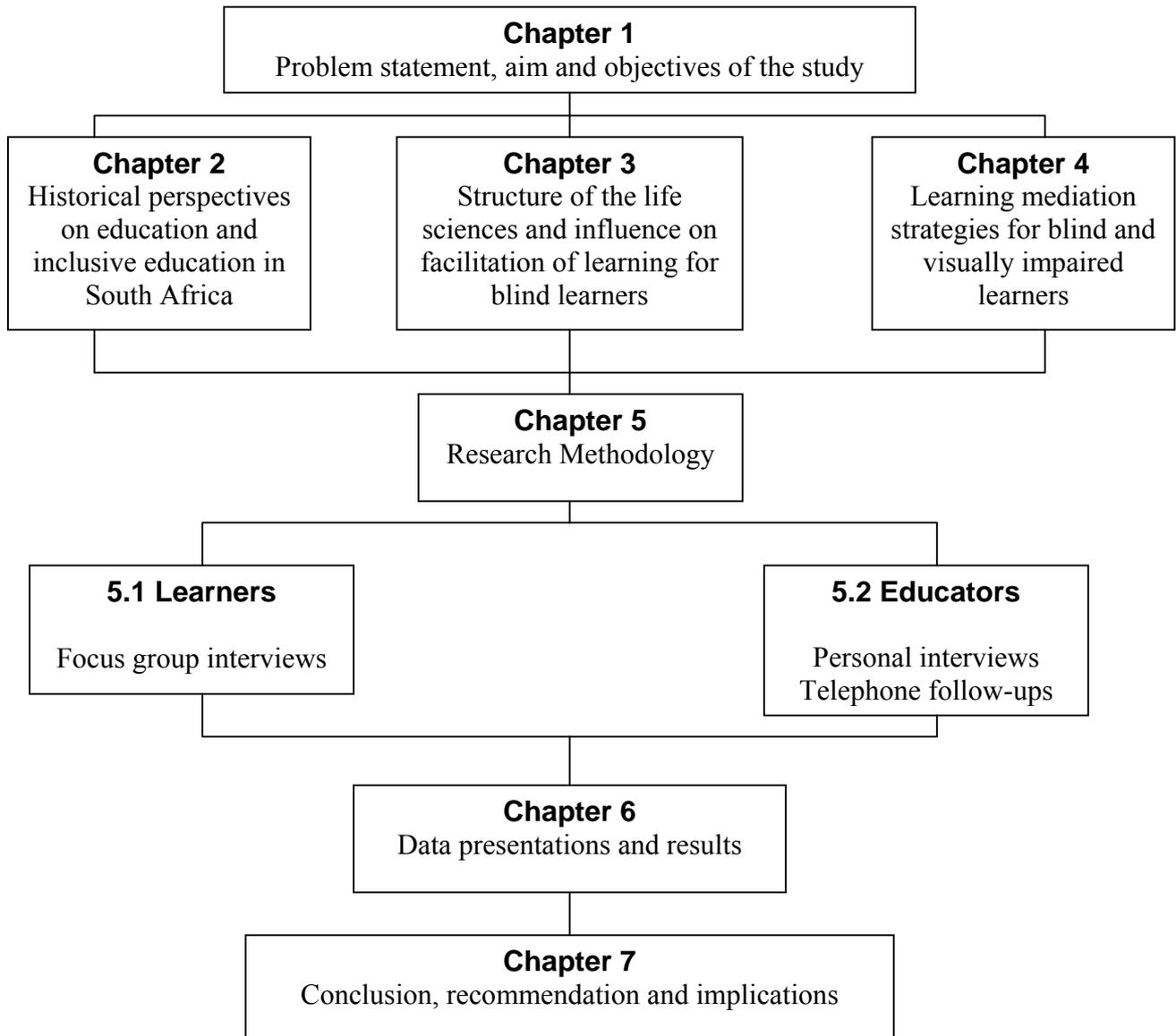
According to the researcher, this work has achieved its goal because it has been able to draw attention to, as well as to expose, the challenges and difficulties posed by both biology and Outcomes-based Education to blind and visually impaired learners, as too much emphasis is laid on visual ability. Further, the work endeavours to suggest appropriate mechanisms of addressing those challenges and difficulties. The researcher also highlighted the neglect of blind learners in special education and the lack of adequate government support and resources, emanating from either ignorance or the lack of educator competences, and mentioned the skills necessary to be accurately and effectively used during the adaptation of learning mediation and learning techniques in the educators' quest to mediate and accommodate blind learners.

A fundamental change in how educators in special and inclusive education approach and mediate Outcomes-based Education to blind learners is essential. To be able to do this, these educators' mind-set has to change. Educators/facilitators and the public at large have to heed Kehoe's advice, as indicated in Ntsika Enterprise Promotion Agency (2001:45), when he said: "(s)omewhere during this decade we find ourselves living in the future. Its arrival is both thrilling and overwhelming. Thrilling because of the tremendous opportunities it presents us, and overwhelming because it necessitates that we redefine who we are and where we are going. To survive and prosper in the new millennium means to change, learn and constantly re-invent yourself."

In addition, the researcher intends to dispel the misconception in the minds of many people that blind and visually impaired learners cannot learn, benefit from and cope in life science subjects, and at later stages use biology in their careers or fields of study. Finally, the researcher compared and contrasted Outcomes-based Education with inclusive education in order to establish their similarities, differences, and importance to blind learners and to consider how adaptations could make both Outcomes-based Education and inclusive education user friendly.

FIGURE 1.1: OUTLINE OF THE RESEARCH

The figure illustrates issues dealt with under 1.9



1.10 SUMMARY AND CONCLUSION

It has been the researcher's aspiration to comprehensively cover the aspects discussed under the researcher's intended achievements. As a result, the purpose of this research has been realistic and realisable. The researcher has been able to acknowledge the findings, apply those recommendations and above all, attain his envisaged goal by investigating the teaching of the life sciences to visually impaired learners in special schools and its implications for an inclusive life science education policy in an Outcomes-based learning environment.