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**Experience of people with visual  
impairment in education and the role of  
assistive technology**

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## **Abstract**

In old time people with visual impairments have been excluded from the society, they did not have the right to enjoy the same rights as other e.g. education. Then with the passage of time, this discrimination was noticed, and different laws were made and implemented for the rights of impaired people. A high number of countries signed the petition to implement that law in their countries. In this research two countries from the global south, Pakistan and Mozambique have been chosen to investigate the problems experienced by the Visually impaired students.

The research has been conducted through the qualitative methodology and deep down the research, semi-structured interview technique was used to answer the research question. The research explored that both countries have different education system for their visually impaired schools e.g. Mozambique follows Inclusive education system and Pakistan follow separate schools for impaired students. Eight interviews were conducted in both countries and the conclusion shows that in Pakistan, students with visual impairments have to experience less problem than Mozambique.

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## **Chapter 1 – Introduction**

Now a day life has become very easy as compared to the past. Impairment used to be a big issue in old times. It was very difficult impaired people to live their lives like nonimpaired people. There were many barriers that kept them excluded from society. Their education was a big problem. Because without education it is very hard to be independent and maintain a lifestyle. Now we have the technology to help and support us in every field of life. Even different types of technologies are available for impaired individuals to equip them to live their life at its best. Assistive technology is very helpful for visually impaired individuals in their education as well as in their professional life.

### **1.1 History and Background**

Before 1800, there were only a few schools for ordinary student and the concept of a school for impaired learners was uncommon Pritchard (2013) and Nordstrom (1986). Residential schools were not able to meet all the special requirement which were necessary for visually impaired children because, at that time, schools were considered insecure for children with impairment (Nordstrom, 1986). The school's staff was not well-trained and there were small number of visually impaired children in individual community, for whom the whole procedure and resources could be managed and the parents used to ignore their impaired children, rather than encourage to become independent they made them feel comfortable with dependent on others (Nordstrom, 1986). In the nineteenth century, few public schools for visually impaired learners were started and later, visually impaired teachers were hired because Some people argue that visually impaired teachers can best understand the strategies to teach visually impaired students (Heck, 1940) and (Nordstrom, 1986). By the middle of 1900, the public school improved their education standards and teacher training for visually impaired students also progressed in, the result, a high number of impaired children started integrated into schools (Nordstrom, 1986).

On 13 December 2006, the United Nation Convention on the rights of People with disabilities was approved by the UN General Assembly (Hendricks, 2007). Article 9 of CRPD obligates National Government (Fraser Butlin, 2011), this article provides rights to the people with impairment in different aspects of life, it also says that states parties should make special



measurements to know if the people with impairments are treated on equality bases with others in physical environments like transport, information communication technologies services in both rural and urban areas.

In 2000, an institute named National Assistive Technology Research Institute was launched to investigate AT and AT services in the schools of impaired students (Satterfield, 2016). The term Assistive technology has been driven by technology and considered as a technology that has been designed for people with different impairments (Bhowmick & Hazarika, 2017).

Assistive technology has been used broadly in education and federal law define it (Congress, 1990) and (Hasselbring & Bausch, 2005) as, a piece of equipment, item, or product which is used to increase, expand, recover or modify the functional abilities of individuals with impairments.

This research was carried out in two countries of the Global East and Global South. The purpose of the research was to find out the barriers experienced by visually impaired students during their learning process. In past few decades, the research has been conducted about the availability of braille and Screen reader in URDU (local language) but no research has been conducted to identify the barriers restricting blind students in their schooling, in specifically Pakistan and Mozambique. This research will investigate the barriers occur in education with AT in Pakistan and Africa and present results with barriers, similarities, and dissimilarities.

## **1.2 Purpose Statement**

The purpose of this study was to present the challenges both countries faces while giving education to students with vision impairments. Why these countries have been chosen for comparison because of these reasons:

1. Pakistan ratified CRPD on 5 July 2011 (M. Winzer & Mazurek, 2017) and Mozambique ratified CRPD on 30<sup>th</sup> January 2012 (Manhique & Giannoumis, 2018), it is a short difference of approximately five months and with this short difference, this research will present a clear assessment of both. Both countries follow federal law.
2. Both are low-income countries a, low literacy rate, technological constraints and shortage of trained manpower.

3. This study will generate results, reviews and feedback from students about AT and enable them to live an independent life and become an economically valuable person in society.
4. The results will be useful for the management of schools and bring them in a way of providing meaningful education using AT in their learning system.
5. The results will be beneficial for educational departments who monitor the special education, they will be able to perform their steps to overcome the barriers coming across the progress of blind students.

### **1.3 Objective**

The main objective of this study is to find out the barriers experienced by the visually impaired students and based on these experiences, the relation with AT in the classroom could be measured. The research also aims:

To figure out whether people with visual impairment have access to AT in common.

1. To figure out which country is leading based on the learning process and on which bases.
2. To figure out the barriers the country is lacking on which bases.

### **1.4 Research Question**

This research will answer the following question:

1. How were the experiences of visually impaired students in their learning with assistive technology in high school education?

### **1.5 Introduction to main topics (inclusive education, special education, assistive technology facilities, and experience of blind and visually impaired students)**

Inclusion has become a big problem in school systems around the globe (Ainscow, 2005). According to UNESCO inclusive education is widely taken as modification that welcomes the diversity between students (UNESCO, 2001). The diversity is about different social background, age, gender, psychological or mental disability and physical disability. Vitello and Mithaug (1998) and Ainscow (2005) have explained that objective of inclusive education is to

diminish the social segregation caused by attitudes towards diversity in nationality, social class, background, religion, gender, and ability. Inclusive education means educating impaired students with nonimpaired students. However, inclusion means the impaired students do not feel left out in the inclusive education system and are provided the necessary support to get education, to socialize and to feel at the same level as every individual. Impairment should not become a barrier to get education.

Special education is provided to impaired students in special schools where they have all the facilities specialized technology to support impaired students. World's first special school for blind students was established in Paris in 1784 (Lyles, Sarkar, & Osborn, 2014). Later many special schools were opened in different countries. The environment is a very important element in the special education system. It includes many things for instance accessibility of the building, equipment to improve learning and friendly environment. This study also examines the experience of blind and visually impaired students at the special education system. According to Reed (2007) assistive technology is helpful in special education for impaired students: in education, to improve self-confident, for being independent and to have a better lifestyle.

Assistive technology has played a vital role to eliminate the barriers for impaired individuals in their education. It was very difficult for impaired individuals to get education in old times because the technology was limited. According to Lancioni, Sigafoos, O'Reilly, and Singh (2013) assistive technology include devices that target to support impaired individuals in education and rehabilitation. Since there are different types of impairments. So, each type of impairment requires technology according to its nature. For example, hearing impaired individuals require different ICT than visually impaired individuals.

All the important parts and topics of this study are presented in the above paragraphs to introduce readers with main topics. This study is conducted in Pakistan and Mozambique. In Pakistan, data collection was done in special education institutes and participants were blind and visually impaired students and teachers. However, in Mozambique data collection was done in inclusive education institutes, and participants were blind and visually impaired students and teachers. The main objective of this study was to analyse the experience of blind and visually impaired student in their education and their experience with assistive technology.

## **1.6 Introduction to thesis chapters**

The very next chapter presents the literature review. All the topics of this study (inclusive education, special education, assistive technology facilities, and experience of blind and visually impaired students) are discussed with the help of literature. A model named figure one is presented which shows the link between different factors. The relation between the links in the model is explained with literature.

Chapter three demonstrate the methodology used in this study. A qualitative research methodology is used as a research approach. Semi-structured interview technique is used for data collection. Model names figure two is presented which shows the three main entities (in both countries Pakistan and Mozambique) that played their role in this research. Four stages from the seven stages proposed by Brinkman and Kvale (2015) are used as study design in this chapter.

Chapter four highlight the empirical findings of this study. Findings are divided according to the main theme of research (human support, assistive technology, and financial affordability) and answer the main research question. These three themes were identified through the semi-structured interviews and based on these three themes the experiences of visually impaired students are explained.

Chapter five establish a complete discussion about findings and observation. A complete discussion about findings and observation is presented and is linked with literature.

Chapter six shows the conclusion of the study, the recommendation for future researches, and contribution to the field.

## **Chapter 2 – Literature Review**

### **2.1 Introduction**

Literature review the topics: conceptualization of disability, conceptualization of education, inclusive and special education, assistive technology for visually impaired individuals. Conceptualization of disability provides grounds to understand it from an impaired individual's perspective, about the problems they face because in this research study focus is on visually impaired individuals. Special education and inclusive education are two different systems, participants from both inclusive education and special education took part in this study. Assistive technology for visually impaired student related to this study as it is observed how assistive technology has helped visually impaired individuals in their education.

### **2.2 Conceptualization of Disability**

Disabilities is an umbrella term or blanked term, which covers different types of impairments, the limited ability of activity and participation (Rony, 2017) (World Health Organization). Disability is basically a thought-provoking and debated concept that has different meanings in different societies (Linton, 1998). There are many types of disability related to physical and mental health; for instance, physical disability might be about not being able to walk properly, or see things clearly, or not being able to hear or speak; whereas due to mental disability person might not be able to understand things or have problem to think (Turnbull, 1995). Accident or natural causes can be a reason behind the physical disability. However mental illness and natural causes might be the cause of mental disability.

Shakespeare and Watson (1997) stated that disability is a result of the connection between a person's "functional status" and its environment (physical, cultural and policy environment). According to Ahmad (2015) the social model of disability identify factors, that define disability comprise: systematic barriers, adverse attitudes, and social exclusion. Here it is very important to understand the term disability. Shakespeare and Watson (1997) stated that disability is derived from the collaboration of a person's 'functional status' with its environment (physical environment, cultural environment, and policy environment). It is understood that the environment has a big influence on disability. The environment is arranged in a way that it provides a complete range of human functioning and it combines suitable spaces and support so that individuals with functional limitations can enthusiastically

join the society (Ahmad, 2015; Lang, 2001). The social model factors, disability, and environment are related to this study, these will guide us about the barriers that blind individual face in their study environment.

Over the last decade, the way disability is defined and understood has changed (Scott, 2007). Scott (2007) said that World Health Organization (WHO) is now focusing more on practical status over diagnoses, furthermore, the International Classification of Functioning (ICF) provides a framework which is not only useful to understand about people with traditionally acknowledged disabilities, but it is for everyone. According to Scott (2007) the ICF focuses on evaluating the connection between capacity and performance; the gap between both should be removed by eliminating barriers and recognising facilitators.

This research mainly focuses on the visually impaired individual. According to Alves, Monteiro, Rabello, Gasparetto, and Carvalho (2009) visual impairment is separated in two different groups based on characteristics and needs: (1) people with low vision and (2) people with blindness. According to Maberley et al. (2006) the term blindness means complete vision loss or near to complete vision loss. Visual impairment means the decreased ability to see. In this study blind and visually impaired students are the participants. Interviews were conducted with blind and visually impaired students and teachers for data collection.

This research study focuses specifically on visually impaired individuals. The social model relates to this research because one objective this model focus on barriers for individuals with a disability while socializing in classroom, however, this study also focuses on barriers faced by visually impaired individuals in their education. So, these issues are related to each other. WHO is concentrating on practical status instead of diagnostic status. Same is the case with this study. Its emphasis is on the practical status of assistive technology used by visually impaired individuals.

### **2.3 Conceptualization of Education**

Omede (2015) said that education improves the talent of individuals and support them to improve their lives regardless of the region where they are located. Education plays a vital role in our lives. Formal educations take place at educational institutes. However informal or traditional education pass to the next generation through different means for instance story telling. Traditional education ways are typical ways of transferring knowledge or history to

the next generations. According to Dewey (1938) the main objective of traditional education is to transmit the skills, facts, and moral values and social behaviour to the following generation, that adults consider essential for the success of next generation.

Farah (2018) said that technology has brought several changes in the education field for example now we use a whiteboard or smart boards instead of traditional blackboards; technology has also helped in gaining knowledge, research and teaching. The modern education system has also introduced online learning system where students do not need to go to college or university to attend classes because lecture is delivered online. Even the results of exams and grades are also available online.

Professional development is a very important task in our education. Guskey (1994) stated that the clear vision about the “ideal” is called professional development; students, teachers, and school are involved in this process. According to Forum (2015) education must teach all the necessary 21<sup>st</sup>-century skills to the students in order to equip them with the requirements of the current job market.

Literature suggests that it is necessary to learn the latest skills and gain professional expertise in order to compete in professional life. Since this study emphasizes barriers face by visually impaired and blind individuals in their educational life, that’s why it was important to discuss the conceptualization of education in literature. Education increases the chances of getting employment afterward whether the learner is facing any disability or not. It is equally essential for individuals with disabilities to get education and learn skills to avail the equal chance of employed.

## **2.4 Inclusive Education**

The term inclusion is used here to refer to the sense of being included in a specific group. Ainscow (2005) said that inclusive education is taken as an approach to facilitate disabled children within the general education setting. Inclusive education is understood broadly as a reform that back and welcome diversity among the students (UNESCO, 2001).

Nowadays, “Inclusion” has become one of the major issues in educational policies and practice (Farrell & Ainscow, 2002). In 1980s, the term “integration” has been used to refer people with disabilities and there were three kinds of terms which further used to describe different classes that include locational, social and functional (Warnock, 1978). Warnock

(1978) explained that “location integration” refers to that type where individuals with impairments were positioned separately from their peers without disabilities; “social integration” refers to these groups that used to meet only their peer in social activities, lunch breaks; and “functional integration” refer to the group where all the students with and without impairments were placed in the same class. In 1990s, the term “inclusion” was used to describe the variety of educational terms used in Warnock report (Farrell & Ainscow, 2002).

The goal of inclusive education is to minimize the social exclusion which is a result of attitudes towards diversity in race, social class, background, religion, gender and ability (Ainscow, 2005; Vitello & Mithaug, 1998). T Loreman and Deppeler (2002) stated that one target of inclusive education institutes is not only to admit students with disabilities but also welcome them. In order to welcome disabled students along with others, it is important to make the building of school and environment very comfortable and suitable for them. Tim Loreman (2007) has presented seven pillars to support inclusive education, these include: development of encouraging attitudes; supportive policy and leadership of school; research-based practices in school and classroom; flexible curriculum, the contribution of the community; meaningful reflection, and; obligatory training and resources.

According to Smith, Austin, Kennedy, Lee, and Hutchison (2005) assistive technology is helpful to educate children with physical, mental and developmental disabilities in the same classroom. Children with disabilities find assistive technology supportive for them. It minimises the barriers and helps students get education in a convenient environment. Alves et al. (2009) stated that information technology is a significant instrument in the inclusive education process, and it promotes freedom and self-sufficiency of students with impairment. In inclusive education system information technology has helped disabled students to work at the same level as other students in the same classroom.

One part of this study focuses on visually impaired students getting education in inclusive education institutes with students without visual impairment. Above discussed literature is related to this study as it refers to the use of assistive technology and makes the same classroom equally useful for the visually impaired students and normal students. Especially seven pillars to support inclusive education are very useful and are related to this study because they cover every aspect a disabled student can face at inclusive education institutes.



## 2.5 Special Education

According to New Zealand's Ministry of Education, special education is about providing extra help; adapted programmes, supportive learning environments, or specialised equipment and materials to support individuals to learn and participate in education (Zein et al., 2016). World's very first special school was founded in Paris in 1784 and basically, it was established for blind students, later it became a model for the world (Lyles et al., 2014). This was a big step for impaired individuals because afterward this type of institutes was opened in different countries. According to M. A. Winzer (1993) in the middle of twentieth-century special schools and termed institutes were encouraged, where disabled students were admitted and resided with other individuals that had mental illnesses; formally they were not given much or proper education.

Edyburn (2001) stated that the assistive technology used in special education is changing with the passage of time. Advancement in Technology is happening. Day by day new features in technology is being introduced. Gierrach and Stindt (2009) stated that assistive technology is helpful for students with disabilities to learn the skills and apply them in practical life. There are many software available that are helpful for visually impaired students and them also in their professional lives for example in offices.

Jorgensen (1998) declared that classroom and outside environment can be collaborative for the student to get involved in learning. Reisberg and Wolf (1988) has given some example of technologies that are helpful for students with disabilities: (1) audio books instead of printed books, (2) typing instead of handwriting, (3) text to speech software to improve fluent reading skill, (4) talking calculator instead of only with visual display. Reisberg and Wolf (1988) have also highlighted the use of elevators in the building so that disabled individuals can easily access the classrooms on different floors. Reed (2007) said that assistive technology support people with special education needs in various ways, for instance, in education, be self-confident, being independent and have a better lifestyle.

An additional part of this research work focuses on visually impaired students getting education in special education institutes in Pakistan. In those institutes, all the students either have low vision issue or facing visual impairment. Literature suggests that in special education institutes only impaired children are given trained with education and necessary skills. The

literature has a connection with this research study because these children with disabilities are understood at their level with their disability and taught with strategies which are most suitable for them. The way of teaching or environment can be different than the general teaching environment. Technologies highlighted by Reisberg and Wolf are helpful for this research because most of them are suitable for the sample population of this research which consists of visually impaired individuals.

## **2.6 ICT Accessibility**

In ancient times visually, impaired people faced more difficulties as compared to now a day. Because Access is the key to education, which removes the difference between individuals with impairment and without impairment (Farrell & Ainscow, 2002). When the students with disability and without disability study in the same classroom then basically it is not an equal learning level. Disabled students are at a lower level of learning as they face barriers that others do not face. So, ICT plays its role and equip the disabled students with the technology they require to learn at the same level as other students.

If the disabled students are not provided ICT support to learn at the same level as others, then it is unfair. The term “Non – discrimination” in education refers to the fact that every individual has an equal education opportunity disregarding their social class, culture, and disabilities (Bocconi, Dini, Ferlino, Martinoli, & Ott, 2007; Klironomos, Antona, Basdekis, & Stephanidis, 2006). ICT is very helpful to eliminate discrimination in education. Lancioni et al. (2013) said that assistive technology consists of devices that aim to help and support people with disabilities in education and rehabilitation; to function properly in routine life. Since this study emphasizes on visually impaired and blind students, so mainly the ICT suitable for blind and visually impaired individuals will be highlighted.

Armano, Capietto, Illengo, Murru, and Rossini (2015) has highlighted separate technologies for visually impaired people and for blind people. According to Armano et al. (2015) visually impaired individuals widely use speech synthesis software such as NVDA or JAWS (Windows), ORCA (Linux), and Voiceover (Apple). However, blind individuals benefit from braille displays (Armano et al., 2015). The literature suggests that visually impaired and blind students require totally different support from each other. Technology suitable for one group (visually impaired individuals) is not suitable for other groups (blind individuals).

According to Ahmad (2015) individuals with visual impairment experience barrier, while accessing visual material on screens or in printed form, however standard keyboard can help to access braille input device that has braille key labels. Ahmad (2015) specified that assistive technology available for children that have an issue with their vision includes eyeglasses, magnifier, screen magnifier, screen reader, braille print books, CCTV, lessons in audio form. Optical Braille Recognition (OBR) software is a great invention which has helped impaired people specially in educational and career-related tasks. Ahmad (2015) described that the OBR (Optical Braille Recognition) software help visual impaired user in various ways, for example, it helps them to (1) read Braille documents on standard scanner, (2) scan braille document, (3) analyse (braille) dot pattern, (4) translate the text, and (5) present document on screen.

In this study, it will be observed that which of above-mentioned information and communications technologies are being used these days in inclusive education instituted and special education institutes. It will also be observed that to what extent the available technologies are successful to eliminate the barriers in education for blind and visually impaired students. Student's and teacher's suggestions and feedback about the ICT will be helpful for further improvements and the best use of technology. The gap between the ICT availability in market and ICT availability in the classroom will be observed as well.

## **2.7 Research on ICT Accessibility in Global South**

Research on visually impaired students in developed countries and developing countries shows a huge difference in term of available assistive technology. A brief discussion on work is done for visually impaired individuals in both developed and developing countries is presented below.

The literature presents that Uruguay is focusing on education of visually impaired from their young age. Lermen González (2016) said in his report (report on the educational inclusion of visually impaired children and young persons in Latin America) that in Uruguay, initial, primary and high schools are associated with the council (help children with impairments). Lermen González (2016) explained braille foundation has been designed to provide guidance to individuals from the early stage and it also involves visual rehabilitation. It presents that their staff is well trained, and they know how to educate and introduce young children with the

braille system. National Blind Union also show their trust on teachers who provide academic support to students enrolled in secondary education and their preparation and command on technical material (Lermen González, 2016).

Research shows that Columbia has done a lot of work for visually impaired people. Lermen González (2016) stated that Colombia has a strong connection between its National Ministry of Education and Ministry of ICT which guarantees the access and usage of ICT by students. According to Lermen González (2016) Ministry of ICT has introduced a Live Digital Plan to provide nationwide access (1,200,000 visually impaired Colombians) to screen reader software with free download from internet, and each screen reader software license will be available free unlimitedly for online download within Colombian territory. The purpose of this project is to make sure about the availability of 12000 software in places where these are necessary, for instance in public educational institutes, libraries and universities (Lermen González, 2016).

Kritzer (2014) stated The Bureau of Special Education Administration in Thailand, is responsible to provide facilities for children with impairment across the country (Kritzer, 2014).76 special education centres integrated primary and secondary schools for children with impairments have been opened by Ministry of Special Education (MSE), (Kritzer, 2014). The Ministry of Special Education not only facilitate children in their learning process but also provide 15 days of training sessions to their parents (Kritzer, 2014). This is a very positive and supportive step because it ensures that impaired individual gets the same support in their homes as well.

Research on a learning system for visually impaired students in developed countries represents the advancement and acceptance of technology among people. They have enough resources and advanced technologies to support their impaired individuals. They have planned properly to support their visually impaired individuals. They have made unions on a national level to present on the behalf of impaired individuals for example national blind union. Their ministries are also supportive and working for impaired individuals.

On the other hand, in developing countries challenges are bigger as compared to developed countries. Developing countries have fewer resources and more problems. Kritzer (2014) stated that in low-income countries no policy, plan or program has been established that

guarantee the access or usage of ICT facilities for people with vision impairments. In these circumstances, teacher training might also be an issue. Kritzer (2014) clarified that there is a lack of awareness, knowledge, and capabilities among teachers who are responsible to train students in the learning process (Kritzer, 2014).

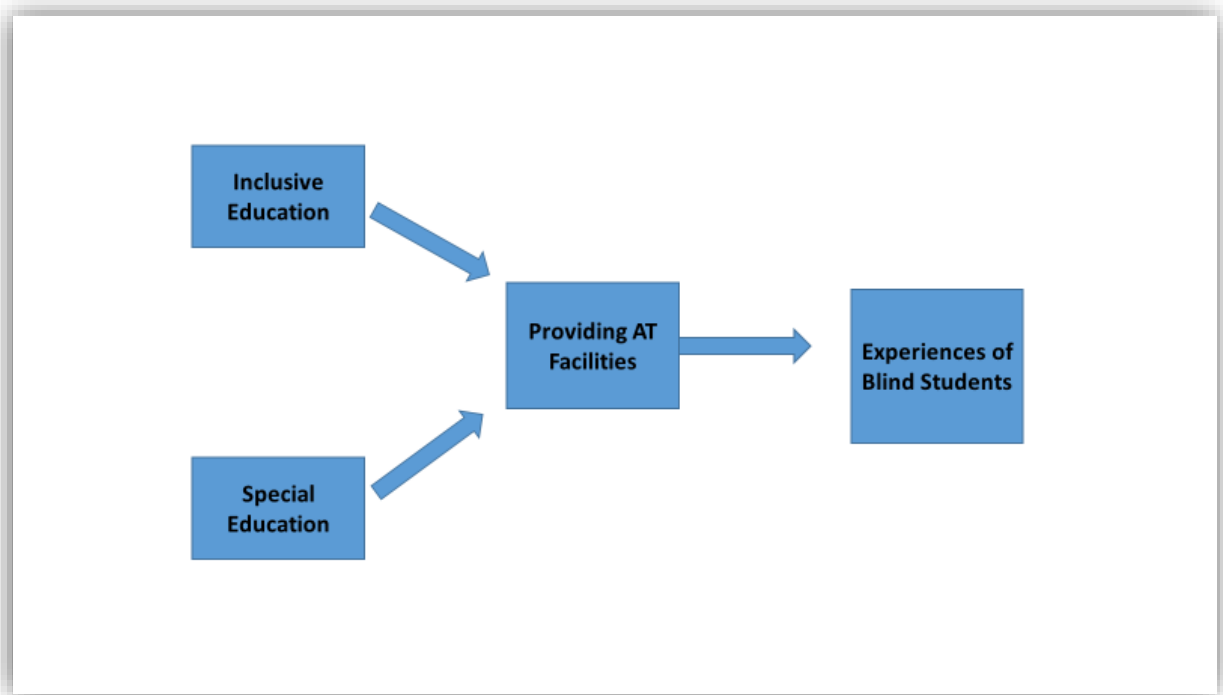
Visual impairment has different limitation on individual bases. They do not get equal facilities, opportunities, and support around the globe. Providing equal facilities to people with visual impairment in developing countries is sometimes controversial because of different barriers e.g. cost of education, technical equipment (Kritzer, 2014). It has been observed that unlike developed countries, the least facilities are provided to the people with impairments in developing countries.

Studies show that in developing countries even in Pakistan, educating children with visual impairment has not been given priority (Khidri<sup>1</sup>, Memon, & Jameel, 2014). Most of the schools for impaired children lack in basic facilities and are in a poor state. Though Pakistan has ratified the UN Convention in Sep 2008, but still, this country lacks in providing enough technical support for the visually impaired group in their education (Khidri<sup>1</sup> et al., 2014). Assistive devices are available in the market which can be used for personal support but these equipment are either expensive or complex to operate (Khidri<sup>1</sup> et al., 2014). These complexed technologies require proper training to operate them. According to WHO (world health organization), 90% of people with visual impairments live in developing countries and the cost of living of per person, is less than \$1.25, with this short living expense, it is almost impossible for parents to send their children with vision impairment to special schools (Khidri<sup>1</sup> et al., 2014). This condition is not favourable for individuals with vision impairment. Due to lack of facilities, they stay behind in every field of life including education and career. Without education and career, they will not be able to become successful independent citizens.

Above mentioned barriers, available facilities, technologies, and all the factors will be observed in this study. The other factors which are not available will be determined through this research study. As literature presents that the countries in the global south are not that advanced in terms of available assistive technology, policies, and resources. The study is conducted in Pakistan, both are in Global South. The study will examine whether in Pakistan and Mozambique situation is the same as the other countries in the global south or is it different. Whether advanced assistive technology is available for blind and visually impaired

students in schools or not. And if it is available then how familiar and comfortable students are with its usage at a practical level.

## 2.8 Analytical Framework



**Figure 1: Analytical Framework**

The above-mentioned figure represents the analytical framework. In the light of the literature review, this model is prepared. This model guides this research study and is followed during the analysis process. The study will examine about: inclusive education, special education, providing assistive technologies facilities, and experience of blind students. The model helps us to understand how the factors are related to each other. Their connection with each other is explained with the help of literature in the below sections. The model helps us to frame the topic and helps to understand the flow of research.

In the presented model, for each section different questions are prepared for the interview. In Mozambique, data collection is done from visually impaired students studying in inclusive education institutes. However, in Pakistan data collection was done by conducting interviews from visually impaired students studying in special education institutes.

This framework explains the inclusive education system and special education system both are analysed through the interview by teachers and further teacher's interviews will be further summarised by focusing on learners' interviews. Then the results will be generated by analysing both interview guides and then-current status of both territories will be observed.

#### 2.8.1 Inclusive Education and Assistive Technology

Inclusive education is linked to assistive technology. Merbler, Hadadian, and Ulman (1999) declared that computers and technologies have grown into allies of students and teachers in inclusive education. There are several positive impacts of assistive technology on inclusive education, but at the same time, it requires the understanding about that technology from the user (Merbler et al., 1999). There are different types of assistive technology being used in inclusive education institutes. These technologies are already discussed above with the help of available literature.

#### 2.8.2 Special Education and Assistive Technology

Special education is also connected to AT facilities as there are various technologies available to be used in special education institutes. Mull and Sitlington (2003) stated that teachers in special education must be used with technological tools, which support students to eliminate their academic shortcomings. Providing proper training to students with assistive technology is advantageous for them in their educational achievements (Alnahdi, 2014; Mull & Sitlington, 2003).

#### 2.8.3 Assistive Technology and Experience of Blind Students

Providing assistive technology facilities is related to the experiences of blind students. Availability of assistive technology facilities is very important for visually impaired students because their learning process is somehow dependent on it. Students with visual impairment face difficulties even if they are using a visual aid (Alves et al., 2009; Carvalho, Monteiro, Isaac, Shiroma, & Amaral, 2004). According to Alves et al. (2009) technology is helpful for these students. Assistive technology helps visually impaired persons to conquer a huge part of their struggles; and offer them freedom (from dependency) and self-sufficiency with information management and communication (Alves et al., 2009; Bueno & TORO, 1994). These arguments of authors suggest that assistive technology has a strong connection with the visually impaired and blind students and is helpful for them in different aspects.

## **Chapter 3 – Methodology**

### **3.1 Introduction**

This chapter describes the methodological procedures used in the study. This chapter includes research design, sample population, data collection instruments, data collection procedures, validity, and reliability. Interview technique helps the researcher to explore the topic of their research by asking questions and analysing verbal and nonverbal responses of subjects. This chapter focuses on the methodology used in this research and explain it. Ultimately the research questions will be answered through selected answers that are used in the interview.

### **3.2 Research Approach**

Ashraf (2018) stated that the decision about the choice of research approach depends on two factors: (1) main topic of research; and (2) research questions. Gelling (2015) stated that research approach is helpful to develop and approve facts based on previous literature, solve problems and establish new theories. Research questions determine that the research will be qualitative or quantitative. If the topic and research questions demand the whole scenario or current situation and require finding out further details about the topic then qualitative research methodology is relevant for this kind of research work. However, if the confirmation is required in the form of numbers and involved factors need to quantify then quantitative research approach is best for it.

Nunkoo, Hall, and Ladsawut (2017) presented four methods of research, which are: (1) qualitative; (2) quantitative; (3) mixed method; and (4) conceptual. Qualitative research methods are designed to ensure the relevance and validity of the words of people and data (Kees de Joncheere, 2015). A qualitative approach has been chosen for this thesis. A qualitative research method is subjective. It gives a detailed description of data and topic. In this research study, qualitative research method is used. The reason behind using a qualitative research approach is the nature of the main topic. It was aimed to study in a detailed manner about the availability of assistive technology for visually impaired children and student in Pakistan and Mozambique. Qualitative research approach helps to explore the hidden aspects and subjects are free to answer according to their knowledge. The blind students are the participants for interview, and the detailed data is collected; their views are observed and



that might indicate factors which were never observed before. Knowledge about those factors might be helpful for students, school administration, teachers and policymakers.

Qualitative research methods are designed to ensure the relevance and validity between the words of people and data (Kees de Joncheere, 2015). All the small details whether verbal or nonverbal are marked and are helpful in qualitative research. Bricki and Green (2007) stated that qualitative research method is prominent because of its objective that enable a reader to understand social life from different perspectives. In this study qualitative research approach is used to examine the social life of students with visual impairment from different perspectives including the perspectives of teachers, the perspectives of care givers, the perspectives of other students and the perspectives of administrators.

In-depth knowledge on the topic helps to explore new directions and areas where research is needed to be done. Qualitative research is more concerned with the relevance of people's real-life experience, and gather in-depth empirical data on the experiences of people to provide a robust analysis of particular themes (Kees de Joncheere, 2015).

Blind students are facing real-life issues about the environment, ICT, teaching methods, behaviours, and many other things. They can best provide detailed knowledge and highlight the issues and areas that need the research.

### **3.3 Qualitative Data Collection**

The qualitative research approach has been used in this research study. According to Rony (2017) there are several motivations for conducting qualitative research, the foremost motivation is the nature of research and secondly, the choice of the researcher. The research procedure involves participant's interview, emerging questions, data analysis and explanation of the meaning of data (Creswell & Creswell, 2017). The natural process was chosen during the research problem description and exploration phase. Results are derived from the interviews conducted with candidates with visual impairment in their educational life. The qualitative approach considers social reality by personal experiences and emphasizes on the social phenomena experienced by an individual (Kothari, 2004). Target group for data collection purpose is blind students in this study. Because our research determines the issues faced by visually impaired students. That's why only visually impaired students can share their experience from their academic and social life. Their experiences and views are analysed and

used as a guide in this study. The subjective answers or subjects provide comprehensive information. Through which sometimes researchers find some remarkable points.

### **3.4 Research Design**

Research design is a framework for analysis and data collection which further support the systematic conduct of the study. Ashraf (2018) stated that research design works as a bridge that connects research questions with findings, that's why it's important to select a research design prior to the data collection step. The main topic of this research study and the research questions require in-depth and very detailed answers from visually impaired students. The main research question for this study is: 1. How were the experiences of visually impaired students in their learning with assistive technology in high school education? This specific research design is chosen because it relates to this study.

The seven stages suggested by Brinkman and Kvale (2015) are: (1) thematizing; (2) designing; (3) interviewing; (4) transcribing; (5) analysing; (6) verifying and (7) reporting.

In this research study, four stages proposed by Brinkman and Kvale (2015) are used as a research design. These stages are designing, interviewing, transcribing and verifying. The whole process is followed step by step and is explained. The purpose of using this specific research design is the nature of the study and the data collection technique (interview). This study requires a detailed description of data and analysis; so, stage three to seven are chosen and followed in this chapter, since thematizing and designing is already done in previous chapters. These stages are helpful to explain the whole research comprehensively and step by step.

#### **3.4.1 Interviewing**

Brinkman and Kvale (2015) stated that interviews are conducted with the help of prepared questions, to get the required knowledge via observing and monitoring the whole interview. Commonly used interview methods are (1) structured, (2) semi-structured and (3) unstructured interviews. However, in this study the semi-structured method of interview is used. Interviews are tactic which goes deep down to the theme of study. Since this study is an exploratory research work that is why the semi-structured interview method is used.

According to Bechhofer and Paterson (2012) the semi-structured interview is convenient technique when the subject matter is pre-determined; researchers collect information from available literature about that specific topic or incident and then they try to connect things by interviewing the most relevant people who have been involved or been through those specific circumstances or incident. Semi-structured interview is used because disclosure from visually impaired students is required regarding their experience with assistive technology in the classroom.

The research was conducted in high school of visually impaired students. The researcher visited those schools and asked for permission to recruit participants and requested them to participate in the research. Some of them agreed but they were nervous and not willing to share their experiences completely. After asking ice-breaking questions they felt comfortable and started answering the research question. The procedure started with introductory statements and end up with the questions and comments by the participants. The whole procedure lasts 30 minutes with each participant. Conducting an interview, was a sort of mind game, because, sometimes, participant does not answer the question properly, at that moment keep them on track is an important job. A researcher can complete flawless research, if they know the trick to keep participant on the right track, by smiling, agreeing and by explaining their point of view and examples from their own experiences. These are the tricks to make the participants feel comfortable and let them speak fluently.

### 3.4.2 Questions for Interview

For gathering predetermined knowledge interview questions are prepared. The main research questions are kept in mind while selecting and developing interview questions. Many types of questions are added in the interview to get the most relevant information. Usually, introductory questions are added at the start of interviews but in this study, introductory questions are not added. However, some problem-solving questions, straightforward questions. And some twisted questions or indirect questions are also a part of this interview.

Mainly two different interview guides were used, one was for students whereas the second guideline was for instructors, deans and administration department. The questions in the guideline for students were related to assistive technology in their classroom, about required

change or development, about department, good or bad experience in school, message for authorities etc. There were total of 6 questions for students. However, there were only four questions in the guideline for instructors, deans and administration department. The questions were related to their objectives about teaching, about their organization, outcomes of their teaching strategies and about the future of technology. The questions asked in interviews are attached in the Appendix section.

### 3.4.3 Data Collection

Data collection is done by conducting interviews with relevant target sample. The subjects consist of visually impaired individuals including students and teachers from Pakistan and Mozambique. In this study individual interviews were conducted to collect data. Direct conversation with participants was helpful to get useful and relevant data for this study.

In qualitative research, the concept of sampling revolves under the impression of purposive sampling. Sampling consists of eight participants (learners, deans' instructors). After, taking permission from different high school's departments for special education this research has been conducted. The criteria for selecting institutes were to ensure they have some facilities of ICT for their students under the standard education policy. The group of participants shared their opinions, assessment and understanding of technology and inclusion in the classroom. Coaches clarified the importance of education, advantages, disadvantages on inclusive education.

This study follows the triangulation procedure to compare the results collected from both countries. In this triangular procedure, three main entities are involving e.g. students, teachers and organizational policies.

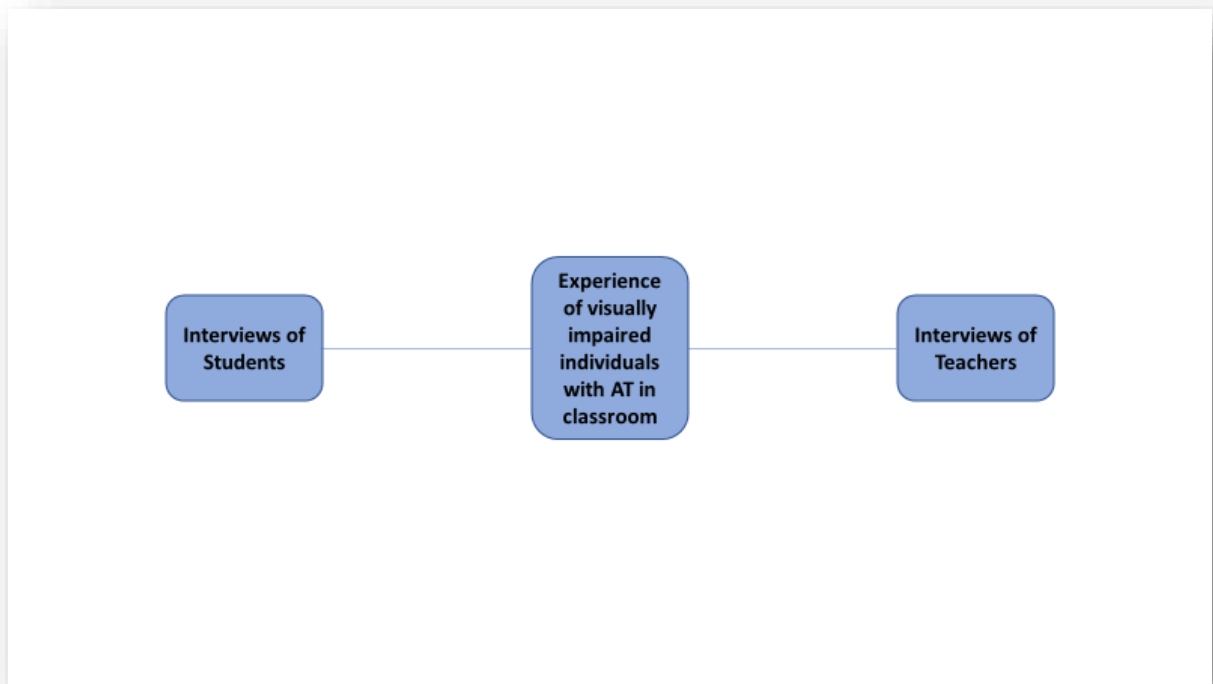


Figure 2 illustrates a triangular strategic analysis of two main entities in both countries.

Experience of visually impaired individuals with AT in the classroom is the main part of this triangular analysis. This main entity has further three sub-entities which are students, teacher, and organizational policies. All of them have their responses to this system. Their responses will help this research to build a theme according to their feedback and then this theme will help to generate results.

The participants of this research were a group of visually impaired students who did not have assistance in the early ages of their academic life. This research focuses on their experiences with and without technical assistance in their educational carrier. Approximately eight, interviews were supposed to be conducted from participants of different age groups, sponsored and raised by different organizations related to vision impairments. Four interviews were conducted in Mozambique. Participants were: students of high schools; teachers; and administration. They were all natives of these countries (Pakistan and Mozambique) but belonged to different regions and backgrounds, including rural and urban areas, educated and uneducated families, financially supportive and un-supportive family background. Variety of participants took part in the interviews and shared their views, understandings, flaws and suggestions for the higher authorities to take another step towards

accessible learning. The purpose of conducting interviews with these participants was to seek more about how these different situations make a person with vision impairment more powerful that they fight independently to fulfil their dreams.

The details of interviewees in Mozambique and Pakistan varies according to their age, study fields, and professions. The very first interview conducted was with visually impaired instructor. The second interviewee was a student of high school and he completed his primary education without assistance of AT. The third interviewee was the student of 10th grade in a government high school. Fourth, the interviewee was again high school student who diverted the attention towards the fact that government has managed to provide the technical support for students with impairment in government training institute for blinds, but they did not provide recovery of these equipment.

#### 3.4.4 Transcribing

Brinkman and Kvale (2015) said that at transcribing stage the collected data is assembled and prepare it for analysis. At initial stage, interviews are saved in recording form. Later these recorded interviews are written down and prepared for analysis. The whole process of writing down the recorded interviews, keeping the relevant material and removing the unnecessary details, is a time taking process. Being a researcher, I tried my best to stay nonbiased during this whole process.

In this study, the interviews were recorded, and notes were taken about all the non-verbal behaviours. Afterwards, recordings were listened carefully and written down so that no points are missed. Then their written notes were refined, and all the unnecessary data was removed. The remaining data were coded to give a proper theme to each response of participants.

The questions were prepared according to the theme of the study and were made sure that these questions will lead the research to answer the main research question. The whole data prepared for analysis was examined whether it answers the main research question and it measured what was supposed to be measure. The detail about the results and analysis is given in the following chapters.

### 3.4.5 Verifying

Brinkman and Kvale (2015) stated that verifying stage confirms the generalizability, reliability, and validity of results; the reliability shows the level of rationality of findings, and the researcher studied what was planned and expected to be studied.

In this study, the results are verified with the support of literature. Reliability and validity testing are discussed below.

### 3.4.6 Reliability and Validity

Reliability means that if researchers do the research on the same topic and the research question and interview questions are same then the results will be like this study. As a researcher, I tried my level best during the data collection process to create a comfortable environment for my participants. The language used in Mozambique was English for data collection. However, in Pakistan, English, and Urdu both languages were used to communicate with participants and to collect data. At transcribing stage when data was written down, I wrote all the answers in English and tried my level best to avoid double meaning sentences. I have also observed a few things other than recorded interviews. I would explain all those things in the discussion chapter. Though the research period I have tried my level best to be honest and neutral towards the study and responses so that readers can trust my research work.

Reliability and validity both have a connection with the level of trustworthiness from the reader. According to Denzin and Lincoln (1994) four things usually express trustworthiness, these include: (1) dependability, (2) confirmability, and (3) credibility and (4) transferability.

Dependability has the same meaning as reliability. Confirmability is only possible if a quantitative research approach is used and data is in numerical form. Credibility means the results answer the main research question and measure what was supposed to be measured. Transferability means the results of the study are appropriate for the researches that have similar nature of the study. In this study validity and reliability, both are checked and are discussed in later chapters and the main research questions are answered.

### 3.4.7 Clarifying my position as a researcher

In qualitative research, the researcher's background matters a lot because that have an impact on the interpretation of data. Being a researcher, I have tried my level best to be neutral and stay non-biased. So, I would like to clarify my position first. I am a citizen of Pakistan. I am living in Norway for the last three years and studying here. previously I have completed my studies in Pakistan. I have visited different European countries as well as the Middle East. After getting my bachelor's degree from Pakistan I decided to move to Norway and continue my studies here. I am working and studying In Norway for last three years. My classmates, teachers, and colleagues are from different nationalities. It is a great experience and I have got a chance to understand different cultures and behaviours. I have used all my knowledge and experience while interpretation of interviews. Firstly, I have coded the interviews and given each answer a theme. I totally understand that the trustworthiness of the reader in this study is based on the fairness of the researcher's role. Therefore, I tried my level best to examine what is already decided to be examined and stick to the main topic.

### 3.4.8 Quality Assurance and Rigor:

This research elucidates the quality assessment and consolidation of data approached in qualitative research (Reynolds, Naiga, Taaka, & Chandler, 2013). It was a need to develop guidelines which are applicable to assure the quality of research conducted so that consistency level could be measured (Reynolds et al., 2013). In this study, a proper guideline for interviews was prepared before actual interviews took place. That interview guideline is attached in the appendix. The strategy to find the assessment and strengthening in quality assurance makes qualitative research team able to get response and guidance on what steps should they take to strengthen the quality of project progresses (Reynolds et al., 2013). In this study at the time of data collection quality of data was given prime importance. The researcher tried her level best to keep the interview according to the guideline. Even at some point, the unnecessary discussion was also a part of interviews, but those irrelevant discussions and irrelevant data were removed carefully. Only the data which was supposed to be collected and was according to theme was kept assuring the quality of research.

In qualitative research, two types of strategies are followed to promote the quality of research e.g. authenticity and trustworthiness of analysis of data (Sargeant, 2012). These strategies



further refer to the analysis which indicates to quality of data and procedures of data analysis for example sampling, data triangulation, interviews, etc. (Sargeant, 2012). Selection of appropriate questions which are going to be addressed to the participants or sample group (Sargeant, 2012). Data triangulation is the most important analysis which uses multiple approaches about the same fact and presents a comprehensive phenomenon (Sargeant, 2012).

In this research study at both levels' selection of questions and during analysis authenticity and trustworthiness of study was kept in mind. The whole process was done carefully.

### **3.5 Ethical considerations**

Ethics becomes a special ingredient between the relationship of a researcher and reader while conducting research (Cieurzo & Keitel, 1999). Studies raise several concerns relevant to ethics for example respect for privacy, trustworthy and open interaction and being polite and friendly with participants (Sanjari, Bahramnezhad, Fomani, Shoghi, & Cheraghi, 2014). Some challenging situations might occur if the researcher deal with issues and have to choose a strategy to fix the issue (Sanjari et al., 2014). For instant, a conflict between participants, the researcher, the funding body (sponsor) and society (Sanjari et al., 2014). For these kinds of issues, some ethical concerns are designed to provide safety to the participant and assure them their information will be anonymous (Sanjari et al., 2014). Some important ethical concerns which are considered while conducting qualitative research are anonymity, informed consent, and confidentiality (Sanjari et al., 2014).

According to Yin, "ethical consideration arises for all aspects especially human subject" (Rony, 2017). In social science research, ethical consideration for human being is always taken priority (Rony, 2017). Educational researcher always shows respect to participants while addressing and emphasizing on ethical concerns (Rony, 2017). During the research, it is important to be prepared for any kind of cultural, regional, religious or gender differences in participants (Rony, 2017).

This study aims to respect attitude, rights, needs, and desire of data privacy about their appearance, name or special kind of impairments (Rony, 2017). The following privacy will be assured to the participant about their information (Rony, 2017). The research objective will be voiced verbally, so the reader could easily understand it. Written permission will be

processed with the organization, in which the researcher will ensure them that their information will be showed anonymously. The researcher is also responsible to show a document of the approved research topic by his organization, in which it would be stated that this person is conducting research on this topic and organization refers him to do data collection in the required region. The audio copy of the interview will also be provided to the interviewee as a document report will be made available to the informants (if the participant allowed to record interview). While reporting the data, interviewee's wish will be considered according to informant's right and interests.

During this research study privacy of the participants is kept anonymous. Their designation or name or any information that specify then is not mentioned. There was no issue between researcher, participants or funding body. However, the language was an issue during data collection. Since data collection was done in Pakistan and Mozambique, so the language barrier was a major issue. In Mozambique, a interpreter was arranged by the management that interpreter was available during all the interviews because most of the participants wanted to communicate in the Portuguese language. So, the interpreter used to translate the questions in the Portuguese language to the participants and listen to their answer and translated the answers in English for the researcher. The interpreter was a highly qualified individual and was aware of the importance of transparency in research. So as per my knowledge, he was also being neutral while dealing and translation the questions and answers. On the other hand, when data was being collected in Pakistan, the language barrier was again an issue and most of the participants preferred to speak the Urdu Language instead of English Language. Since the researcher is from Pakistan, so the interviews were conducted in Urdu which later was translated in English.

Another major issue during the interviews happened that even teachers and management was not aware of the availability of assistive technology in the market that support visually impaired students. So as a result, students were also unaware of it. As a researcher, it was very difficult to understand this situation that in inclusive special and special education institutes management and teachers did not have knowledge about the assistive technology. There is a need for research and development that should focus on everything that could help blind and visually impaired students to learn at the same level as other students without disability.

This research has also been done with the cooperation with NSD, the application is under process and the approval is waiting to be included. The screenshots have been attached in appendix, which shows NSD has researcher's application under process ("NSD Norwegian senter for forskningsdata,").

### **3.6 Limitations**

Gelling (2015) stated that qualitative research approach grants the researcher with an opportunity to examine human experience, the social background of participants and get the detailed perception of factors involved in the experience. During the whole data collection process, some difficulties were faced by researcher. Arrangements of interviews with students and teachers were difficult at the same time. So, the researcher had to visit the institutes multiple times.

In this study, both types of participants students and teachers were aware that their responses are important, and they were willing to answer the exact things which they were asked. As I have already mentioned that in Pakistan Urdu language was also used during data collection and the Portuguese language was used in Mozambique. It was a huge barrier which was eliminated with the help of a translator. However, I am from Pakistan and my mother tongue is Urdu, still, there are chances of making a mistake while interpreting the responses. I have tried my level best to be non-biases throughout the research.

Another limitation is that most teachers and management was not aware of the available assistive technology for blind and visually impaired students. It was a difficult situation because the students were also not aware of it. There were some questions related to assistive technology. So, I would consider it as a limitation for the study.

## Chapter 4 – Results and Analysis

### 4.1 Introduction

Overall the results of interviews showed participant's experiences regarding their visual impairment and assistance of AT in the classroom. Eight participants participated in the qualitative interviews and they shared their challenges, motivation and demotivation stories throughout their educational life level.

Participant shared their experiences as:

"I got admission in school for inclusive education [...], out of forty students, there were approximately eight impaired students. It was a difficult experience for me to study in the inclusive education system because I was not allowed to use screen readers and braille because the device makes a sound in the classroom. Other students used to get disturbed because of me as I needed some extra time to learn and adjust to a new school environment because I was not sighted, student."

In this example, different perspectives of daily life have been discussed from the blink of an unsighted person. This scenario covers the three most common facts of society e.g. acceptance, cooperation and behavioral problem regardless of countries. The participant was a visually impaired student who joined the school, where all the other students without impairment were studying. Other students were not willing to accept the presence of their impaired mates, so they used to get annoyed from them. Lack of cooperation and behavioral problem by mates results in discouragement for visually impaired mates. These barriers can make a dual impact on visually impaired students.

#### 4.1.1 Human Support:

By human support, means the role people played in the betterment of blinds students. These group of people varies from instructors to classmates and the parents of impaired students. These people can make a positive and negative impact on impaired students and following results shows their influence on our target group.

The first participant was an instructor who quoted their experience as,

“I had a counseling session with the student who was in the class right for the last two years. He was not promoting to the next class because he was a shy student and he was not sharing his learning problem. He was not picking up the new learning material because he was afraid of making mistakes in front of other mates and in-home he did not have AT facility to improve his skills”.

The participant who was an instructor shared that all the instructors have assigned duties during counseling session, so they could get familiar with the newcomer’s mind, interest and fear. He also shared that one of his students continuously failed in the same class because he was afraid of expressing his problem in front of others. Just because of the trust issue, he had continuously been in criticism. Every year in summer all the parents and students attend the training session. The purpose of these two facilities together in summer camp is to help the students to improve their skills. This question was asked to students and they shared their experiences which are as under.

Another participant who is blind and now working as an instructor shared their experience and quoted,

“I remember, in my time of the study, I was not allowed to use braille and I had a tough time. I used to record lectures and practice my task on my friend’s braille. In our institute, we provide a friendly environment in the classroom because it is the basic need of a school, we allow them to get familiar with the assisting aids in the institute, so they don’t have to fear about learning without an instructor in future.”.

He shared the experience he gained from his journey. At his time the ratio of impaired learners was below average, and they used to study in an organization where they were not even allowed to use braille because it makes noise and other students get disturbed from impaired mates. So, he was just allowed to record the lecture only and after school, he used to practice braille on friend’s device.

This comparison shows that the role of instructors in both countries is similar. One of them has suffered in his own time of education so he wants to provide all the possible facilities to their students so the discrimination factor coming up from ages could be replaced with equality. On the other hand, the other participant, who was an instructor too, figured out that

the shyness of students resists them to 'speak' and 'ask' in the classroom. Indirectly, the society of school and student themselves both are involved in relation to the study.

Another participant, who was a student described,

"It was a different sort of experience studying in the inclusive education system and it was a difficult and different experience for me to make a grip on and pass out the annual exam with remarkable grade. My teacher played a significant role in the improvement of my skills with new energy and it worked well for me".

The participant was a student and he described the significances of human encouragement on their educational carrier. He believed that a different and new thing is always time demanding, especially, when it is related to impairment. The most fundamental part which impacts the positive and negative energy from surroundings. The participant was happy with the positive energy given by the instructor.

Another participant expressed the pleasure of strong support from his family. He shared,

"I was not the only blind person in my family, but my father was also blind. He did not study but he sends me to school. At home, we have a small number of my old braille translation books and after school, I share my lesson with my father".

The participant was happy to have a strong back of his father and he also shares his lesson with him. These two participants(students), shared their views about strong support by their parents and instructors. Both participants are satisfied with their family and school support.

The positive attitude of participants developed a unique way of seeing the way ahead. These interviews by instructors and students conclude that if a person has a positive persuasion, then negative remarks by the society do not affect them. The summary, of their responses, has been included, many of the students, studied in Schools for visually impaired learners in their early years and then, they started their higher school education in the inclusive education system. All the students who were not studying in inclusive education system wanted to finish their high school with their peers without impairment. Some of the students, who started their higher level have already gained the experience to study in inclusive education. They were a bit aggressive in the beginning when some of the students complained about the noise of braille devices, which they used in class or text to speech software voices

but later they accepted it and became friends. Some of them also shared that their peers without impairment were gracious and polite in class with them. So, they accepted to study in the inclusive education system.

To conclude, a combination of positive and negative human behaviour has been analysed in this section. In some cases, criticism by society made the participants depressed and resulted in low confidence in them. Whereas in some cases the instructors and families were supportive, and they did not let their children feel disheartened. So, the human attitude cannot restrict to territories, it varies from family to family, region to region but the main objective is to be firm on the goal.

#### **4.1.2 Assistive technology:**

Assistive technology means the barriers, support, understanding, and experiences gained by students about learning AT. In this section, all the above themes will be further identified with the participants sharing about braille, screen reader.

Participant shared his experience,

“At the beginning of my high school, I started reading online articles, it was a tough job to concentrate on the screen reader wording. As it requires good language skill, I took a couple of months and finally I started reading online articles for my syllabus. I can say, I have strong command on e-learning and that is because I invested time in it after class”.

Participant here is explaining that in high school he started reading online articles related to his syllabus, it was a self-improvement skill, but it helped the participant to enhance his skill and get familiar with the technology which is designed for their ease.

Another participant included at their time, only the English language, was allowed in a screen reader. He shared,

“I had a tough time while, learning screen reader because I was not good in listening English and I took time to become master in using a system with a screen reader. I think the basic reason behind this issue was to integrate myself with others while asking for help again and again.”.

This participant was not satisfied with adopting a screen reader. It is common in Global South, they prefer to use their national language. In the case of high school, students rarely speak

English, the language barrier put the burden of stress on a user. They have screen readers in their national language but the purpose behind the standard “English” language is to reduce the communication gap among different nationalities especially those who visit countries for research purpose.

Participant shared the advancement of technical facilities they provide their students and consider their institute one of the best institutes.

“We provide braille learning courses for the beginners without age limit. We have the facility of braille transcription of braille dictionary and textbooks. Students can use dictionaries and special games are played like word search, so they could exercise the new words.”.

This participant explained the advanced technology available in the institute. They have their own braille printing press and braille dictionary. Through braille graphics, students become familiar with tactile graphics and shapes of living things. Through different games like word search, students enhance their vocabulary and reading skill. These learning games help them to learn without stress.

Another participant shared,

“We had presentation section once in a month, all the students had to choose a topic and present it in class. It was not a power point presentation, it was like a speech, we all had to make our speech in braille and present it in the class. We were allowed only to write keywords on the paper, through this way we learned to arrange things smartly”.

The language was the major barrier which has been observed for example students used to study in their national language and then suddenly, they are introduced with voiceover in an international language. The reason is not the language barrier but the expectation from the instructors for them, to be fluent in listening and understanding, what the screen reader speaks and response accordingly. Beside study in class, students are also involved in learning games for example word search. Participants feel PowerPoint not interactive, so they are introduced with an alternative way of making their presentation. They were taught to choose a topic and make slides on braille and present their topic with those slides.

Participants were asked in general, about the definition of AT according to them. Different students had different responses, one said; thing which does not become rude if we make



mistake and repeat again and again until we do it correctly. One said, AT is which lessen the human dependency, other said that AT is the beauty of science which is designed to remove the difference between sighted and unsighted people. Here, participants not only defined the definition of AT, but they appreciated the technology which is helping them to learn without being dependent.

In conclusion, both countries have some necessary facilities available but still, there is a gap which needs to be filled out. They have limited technical facilities available but the purpose of exploring their experience, was, to see how smartly they accept the modification and the way they agree with the replacement and adjust with the flow.

#### **4.1.3 Financial affordability**

Finances are a fundamental consideration in education. Here, in this research, economic issues have been discussed by the participants. He shared that,

“I studied in school for impaired learners, from the very first class till the end of high school, we had access to few required necessary AT but we somehow adjusted. In exams, we always had the issue of a smaller number of braille devices available than the number of students”.

A participant pointed out the different dimension of the barrier which occurs in the education system in high school. He also defined the issues students had to experience in exams when they did not have enough assistance. A limited number of devices like braille keyboards, tactile access. Once a device is broken it must be replaced by a new one which is an expensive approach. This barrier becomes a hurdle in the way of impaired students in higher education.

Another participant shared,

“In our school which is a trust, every year some well-known personalities visit on our annual function and donate the big amount to our school. It sounds very weird because we are born in our country, studying in our country and our government is not taking responsibility to start some projects for impaired learners. Though with the funded amount we get able to study with the assistance of AT, it somehow affects strange when the whole crowd is clapping on getting funds”.

Here, the participant shared the emotions about the irresponsibility of government. He shared that every year some well-known personalities visit their school and donate a large

amount of money to their school. It is, somehow, heart-breaking that their schools rely on funds, but the good thing is they do not have to suffer like their friend studying in different cities where they must imagine AT instead of using it in practice.

Both participants shared their experiences which are the result of financial issue. One participant shared that they have a limited number of AT in their school which was always a problem because the number of students was greater than the number of available devices. The actual problem used to raise in exam but some of the fellow students purchased their own braille devices to overcome the trouble. On the other hand, the carelessness of government when the schools must serve on funds. It is disappointing to some extent, but it is much better than students have proper facilities and they do not have to bear the inconveniences.

Participant shared the barrier he faced in purchasing expensive software which leads to helping them make an assignment,

“After learning screen reader, we were assigned our first assignment, we were all supposed to complete it separately. The task for us was to install the suitable software in our systems and we were not explained which software to install. It was a good experience, but we were surprised because almost all the screen reader software was expensive, then we got to know about the free software available with the references of institutes. Through these tasks, we also got familiar with the economic way of utilizing things”.

This participant explained the different aspects of the educational carrier. They clarified the different side of the research. Participants were assigned a task to install a screen reader, but they were not informed about the cost of the software. Here, the point of focus was to enhance the concept of logical thinking among students. This was a short task, which our participant included but the idea of building knowledge upgrading will always make them think about working economically.

Another participant explained the fact of affordability. They said,

“In our school, we have had braille dictionaries which we use to improve our language skills especially for a subject like English. In our summer vacation, I tried my best to find braille dictionaries in libraries, what I found, these books are not frequently available in libraries and if we want to purchase them, these are very costly”.

Here, a participant shared the experience of lack of availability of braille translated books and dictionaries. Although this is the era of technology, every single article and book in soft copy is available on the internet nowadays, but still, these facilities cannot end up the relationship of a book and reader.

Another participant shared,

“I feel so irritated, whenever, I have to take a lecture because every day I spent 8 hours in school and in the end, we do not get wages and this frustration wakes during my lecture. Sometimes, I feel like a sense of irresponsibility, imagine a visually impaired learner is asking for help because his system stopped working and I just reply to them to use another system”.

The purpose of including this section in results, in general, is to present different challenges regarding funding which directly or indirectly makes an impact on visually impaired student's education. The Government does not provide enough funds to schools which ends up in, a smaller number of successful graduates, every year. Low income is another main challenge which directly makes a bad impression on the education system. For example, the teacher is not getting the wage on time or he is not paid the amount he deserves or enough amount, necessary to survive with family, then he will absolutely stop being fair with the job. This negative behaviour will directly make an impact on subjects and automatically the results will come up with a low literacy rate among impaired learner. The learners will start missing the lectures because in schools they feel solitary.

To sum-up, affordability issues were addressed by the participants where they had less technical aids. Some schools get funds to overcome the issues and assure that they provide the required services. Some teachers also shared that they do not get enough wage which results in irresponsibility. If the organizations make smart estimation on their reputation in comparison to other and wages, then many of the problems can be fixed before they raise.

## **4.2 Analysis based on Current data collection**

This study shows that every individual agreed on inclusive education but with extra technical support. This process appeared beneficial because students with impairments can learn together with the cooperation of their peer without impairment. Secondly, learners get the opportunity to work on the same environment which is operating mainly for their sighted peers. There might come differences for impaired students in the beginning but if they record

the lecture and listen to it again at home, they can easily get prepared for tomorrow lecture. With the assistance of AT devices braille, scanner, typewriter, text to speech software and media player, the dependency of impaired learners has been decreased on trainers. In other words, if impaired learners get a strong grip on AT skills then the difference between sighted and impaired students can be removed. Since several students have been taking benefits from AT but still there is a room for improvement for technology. Instructors should introduce improved teaching methodology to make their teaching skill more efficient for naïve learners. AT is a substitute which is proposed to lower the man-force and by promoting this assistance the cloud of the problem can be solved.

## Chapter 5 – Discussion

This chapter starts with the perspective of blind student's experiences while interacting through assistive technology (AT) like screen readers, magnifiers, braille, etc., in education, with the major themes identified throughout the interview results. The research question was "How were the experiences of visually impaired students in their learning with AT in high school education?" This research question narrows down the key area to "Visually impaired students", "their experiences" in "classroom learning" with "Assistive Technology". While, the results show either the participants were not granted enough AT facilities throughout their educational life, but they explored the new ways of learning. They covered the gap of missing facilities smoothly both economically and technically.

The themes identified through the research are spliced into three parts, human support, assistive technology, and financial affordability, which shows the experiences of our participants in the different aspects of education life. This chapter also argues about the level of satisfaction and expressions of participants while facing barriers on every second step of learning like aggression, curiosity, anticipation, and enthusiasm. These expressions will indicate their own learning experience and technical problems they have experienced and connection between the facts with literature.

Firstly, the chapter shows the challenges experienced by participants in Human support. This section was designed to look at the environmental support of a classroom. By environment, here, means human assistance making a positive or negative effect on the learning process of visually impaired students. By human assistance, means environmental entities like instructors, mates, parents and all those who have a high influence on the participant's educational life. Although, this research has a focus on classroom education, basically, parents should not be included in the part, but their participation has also been included because they are strongly responsible for their child's education. These human entities can be fundamental support or basic challenge for an impaired learner. The vibrant role played by these individuals reflect the energetic potential in participants. The parents and instructors did not let the child feel unlucky while adjusting in the new learning system. Although, all the students were not admitted to the best schools, they had strong communication with their instructors, so they were confident to learn without fear. In the beginning, many of the students shared

they were worried about problem-oriented issues e.g. bullying, intimidation and workload but after receiving strong support by institute and parents, they felt more confident.

Secondly, the barriers related to Assistive Technology learning are covered. Participants from both countries shared their learning experiences when they did not have technical devices available. Instead of complaining about the lack of technical assistance, they smartly found alternative ways of required assistance. The smart amendments not only replaced the concept of insufficiency of adequate resources but also built an idea of thoughtful change. It has been analysed in the literature that AT has always been in high demand but the actual availability ratio is low, especially in low income-countries (Tangcharoensathien, 2018).

Instructors build a spirit of technical thinking among the students. For example, it is a difficult task for visually impaired students to make power point presentation, so the instructors replaced power point with speech. In which students were not supposed to make a presentation in the form of slides, instead they were supposed to make their slides on braille and present it in the class. The second case, students were motivated to play games like word search from syllabus books, for reading improvement. Participants were asked if they were satisfied with their current education system. Very few of them responded in “yes” but other, did not respond in yes. According to them government is not providing them proper assistance in case if their braille device stopped working then it’s expensive for them to repair or buy a new device. They requested from their government to provide a free facility of repairing assistance for them.

Participants also shared the problems they must go through with screen reader because, in both countries, people are not encouraged to speak the international language like English. Participants complained that they speak their national language throughout their school life and in the end suddenly society demands them to be perfect in English while using screen reader. Different people had a different opinion, but their responses were a combination of satisfaction and frustration. Some of the participants were very frustrated about learning new technology because the instructors were not teaching them properly. Some of them were angry because they did not get proper command on the instrument and were not able to get good grades. Therefore, the results came up with the higher level of un-satisfaction among the participants, in most of the questions.

Thirdly, the most common issue has been discussed by the participant, financial affordability. It has been analysed through the participant views that due to lack of proper funding schools are not able to provide appropriate facilities to their students. In general, it was a common issue but the way it was resolved was unique. In this section, participants shared a different side of economic thinking. They were assigned a job to install a screen reader, but they were not guided to install the free version or purchase one. Then they were taught to choose the free version, through this way they learned to think smartly before purchasing any software or device. They also shared the frequent unavailability of braille dictionaries; these are the expensive ones which cost extra money. Although, this is the era of technology and online books and dictionaries are available easily, the relationship of book and reader is distracting. The strong bond between reader and the book cannot be changed with electronic media. A national policy framework is required to fulfil the need for enough funding and the main unit responsible for the intersectoral action (Tangcharoensathien, 2018).

All the institutes which are responsible to educate visually impaired students have challenges to accomplish their mission. Their challenges used to effect on their employees and learners. All the organizations have some rules to provide accessible learning education system as their countries have signed the petition. In government organizations, the status of accessible learning is lower than private institutes. "It's easy to make policies but it's a difficult job to apply those policies and fulfil the desire for which these policies were designed", said by one participant. All the organizations have serious challenges related to the budget. They do not get enough budget to achieve their goal. And this issue affects the morale of their employees because they cannot hire more employees and give them training. Which results in burden on old employees. In short, organizational policies are an important theme which leads towards the achievement of goals but if barriers occur in this stage then it becomes a challenging situation to run a healthy business.

This research also confirms the lack of available AT might leads towards the communication gap between the unsighted students and instructors, for example, they are not provided training on reading or writing and if they are not given space to "ask" and problem like low AT assistance occurs then they cannot share their ideas and solution (Alves et al., 2009). The results have also shown that students were not allowed to use AT because behind the 'access not granted' theme, the mindset was, impairment cannot allow a person to interact and learn

(Alves et al., 2009). Literature related to the facts gathered and analysed through this research and confirms that the schools do not have enough facilities and this absence has covered through finding alternatives to learning.

Lack of trust in technology have different consequences which resist a person to take a step forward (Bhatt & Kumari). The major reason behind the trust issue is the high expectation for example sympathetic attitude of society e.g. school-mates, family or surrounding, which interrupt a visually impaired person to make a strong grip on present technology (Bhatt & Kumari). This theme has also been observed in this research, where participants were shy and afraid of not sharing their involvement.

An analytical framework was designed which was followed through the interview section. The main purpose of the analytical framework was to figure out the outcome of experiences of participants (teachers) and then confirm it with others (students) and verify the status of original barriers occurred. Basically, it was needed for assessment to gather more real problems experienced by the students rather than pointing out the common obstacles. Many of our participants also shared that they have enough facilities in the school, but the staff is not willing to cooperate with them.

This chapter also discussed the affordability aspect of the learning process. It has been analysed that both countries were low-income countries and it was a general vision that they might lack in AT services. After conducting the interviews, many interviewees concluded the less available support leads towards more human dependence. Even the instructors shared that just because of insufficient funds the number of instructors is decreasing and the reason behind this issue is that they do not get enough gross income as much as they must invest their energy.

Initially, the main purpose of this research was to make a comparison between the two countries but after analysing the system it was realised that both countries have different educational systems. For example, Pakistan had separate schools for visually impaired learners, but Mozambique had an inclusive education system, though, they also have separate schools for impaired learners, but many of the participants shared that there was inclusive education system in common. So, this research was modified to find out the experiences of participants from both countries and their experiences based on the inclusive



education system and exclusive education system. Basically, the participants from Pakistan studied in exclusive or special education system, they have their separate schools in which they study up to Graduation level but in Global South, the students with impairments must study in the inclusive education system which is very challenging for them. Study in inclusive education is a tough business for people with visual impairment specially, when the required resources are unavailable. However, the results shared in this research, are generated from both perspectives. The researcher found that the participants from both countries strongly agreed on special education system at least until they complete high school.

The target population was asked questions in English but in common there was a language barrier. In Pakistan, there was a time clash, while conducting interviews with teachers because many of them were available on different days and time so the schedule conflict was a constant problem throughout the interview session. Besides that, the instructors preferred to answer the research questions in English, but the students preferred to answer in Urdu (the national language). The researcher has tried the best, to be non-biased while interpreting all the answers from participants in English. Though, the same barrier was experienced in Global South, where an interpreter helped to decode the answers by the participants from Portuguese to English.

Basically, the same sort of barriers was revealed in both countries but in Mozambique, visually impaired learners must struggle harder than in Pakistan. Human support was almost common in both countries, but technical support varied. Pakistan was a step above in providing appropriate AT, not so expensive and best one, but they are trying to balance their level of accessibility with others. In Mozambique, they are lacking in AT services but the major requirement behind making even a small environment accessible is the human resource. If the human resource is working adequately then technology promotion is not difficult but if the human resource is unfamiliar with the concept of equality then even if enough technology is available, it is of no mean.

## Chapter 6 – Conclusion

The results provide precise problems experienced by learners with visual impairment. Multiple factors leave a strong impression on a person's life. Although, some trusts and private level organization are on the higher rank in providing an accessible environment in the classroom, government sector school are lacking in providing a technical and supportive environment to impaired learners. Still some room is available for upcoming research to find out more barriers affecting directly and indirectly which can extend this research.

Learners with visual impairment were not satisfied with the inclusive education system because they were not free to share their complications, in fact, no one was there to listen to them. They had to go through an unpleasant issue which made their life grumbling. Many of them left the school after getting disappointed, then, again they joined the school with courage to show the oppressors that they can secure good grades and they did. Some teachers also concluded that they were not happy with the education system because they must invest double effort in schools, with a low wage. The low human force increases the problems and gap in communication between teacher and students because of this major issue students feel discomfort and rebel, which end up in low literacy rate among impaired learners.

Government has signed the petitions about providing an accessible system to impaired persons, but they are lacking in putting this concept in practice. Some general and uncommon phenomenon has been recognized, these concerns need special attention by the policymakers or the ones responsible for putting the theories into practice. To conclude, the major responsibilities are depending on the higher authorities e.g. government education department, the Deans of School administration and instructor to make school environment as easy as possible, so, learners show their involvement in classroom activities confidently. If the special attention would be given to the school and specifically, classroom environment then developing countries can stand in the list of most accessible developed countries.

This research was carried out in Mozambique and Pakistan and problem was identified that how were the experiences of visually impaired students in their educational life (high school). This research was carried in many other territories, but this specific combination was not

seen, so the researcher decided to choose these territories. Based on some similarities and dissimilarities the territories were chosen and

This research was specifically for visually impaired learners in their high school level, but it can further extend to their university-level study and explore more barriers occurred there. It can also investigate about visually impaired people in the work environment or in their professional life, about what frequent interruption they must experience on daily biases. This research can also apply to hearing impaired learners, what are the huddle that learners with hearing aids must experience in their education system and which AT facilities are offered easily in the school and how are their experiences regarding using that AT. Besides this, the researcher also wants to suggest the policymaker implement some policies, which should be strictly followed, by the institutes, to make rules which never let the visually impaired learners feel unwanted.

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## **APPENDIX**

### **Interview guide for students with visual impairment**

The purpose of interviews is to know about people's view, motivations, beliefs, and experiences individually. Interviews are designed in a semi-structured way to understand the interviewee's response to the research questions. Following research questions are designed to explore the research.

1. Hi, my name is... and I am master student, I need to ask you some question which are related to my master thesis.
2. What kind of AT do you use in your classroom learning?
3. What are the things you want to change related to technical assistance?
4. How was the behaviour of teachers with you from the very first day of school?
5. Share one good experience in the classroom?
6. Shared one bad experience in classroom?
7. Your comments or message for higher authorities about the education system (if you want to divert their attention towards an issue)?
8. How was your experience in education with and without AT?
9. Thank you for your time, if you have any suggestion or comment you can advise us.

### **Interview guide for Instructors, Deans and administration department**

1. What is your objective of teaching blind students, what goal do you want to achieve?
2. How do you differentiate your organization with others?
3. Based on your experience which teaching methods are the most beneficial for the blind students teaching and learning process?
4. What assistive technology do you provide in your school?



## Consent to take part in research

- I..... voluntarily agree to participate in this research study.
- I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.
- I understand that I can withdraw permission to use data from my interview within two weeks after the interview, in which case the material will be deleted.
- I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.
- I understand that I will not benefit directly from participating in this research.
- I agree to my interview being audio-recorded.
- I understand that all information I provide for this study will be treated confidentially.
- I understand that in any report on the results of this research my identity will remain anonymous. This will be done by changing my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about.
- I understand that disguised extracts from my interview may be quoted in Thesis

- I understand that if I inform the researcher that myself or someone else is at risk of harm they may have to report this to the relevant authorities - they will discuss this with me first but may be required to report with or without my permission.
- I understand that signed consent forms and original audio recordings will be retained in private and only be used in Thesis until May 2019.
- I understand that a transcript of my interview in which all identifying information has been removed will be retained for two years from the date of the exam board.
- I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

Names, degrees, affiliations and contact details of researchers (and academic supervisors when relevant).

Signature of research participant

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Signature of participant

Date

Signature of researcher

I believe the participant is giving informed consent to participate in this study

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Signature of researcher

Date

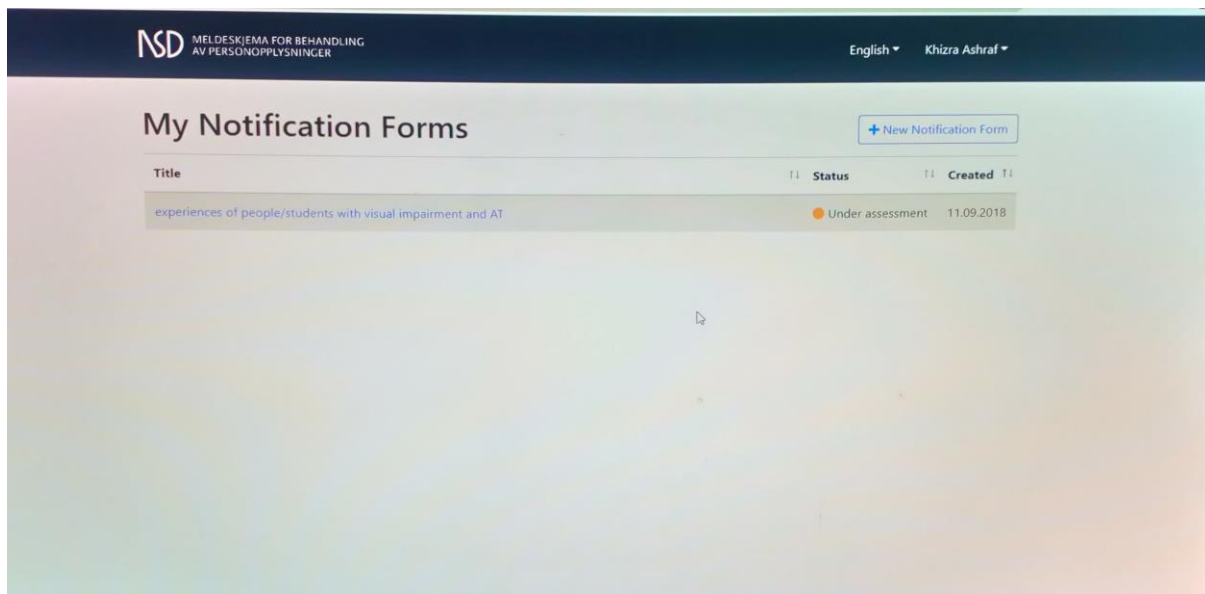
Signature of Supervisor

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Signature of Supervisor

Date

**Screenshot which refer to section 3.5 Ethical Consideration about NSD:**



Reference: ("NSD Norwegian senter for forskningsdata,")