Use of ICT Software for Visually Impairment Learners

A

Thesis

By

Suman Subedi

In Partial Fulfilment of The Requirements for Master Degree of ICT Education

Submitted

To

Department of ICT Education

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FACULTY OF EDUCATION
CENTRAL DEPT. OF EDUCATION
DEPARTMENT OF ICT EDUCATION

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Letter of Certificate

This is to certify that Mr. Suman Subedi is a student of the academic year 2074/2076 B.S. with campus Roll no.75/074, Exam roll No.7428382 and T.U. Registration No: 9-2-241-432-2014 has completed this thesis under supervision of Mr. Arjun Saud during the period prescribed by the rules and regulations of Tribhuvan University, Kirtipur Kathmandu, Nepal. This thesis entitled "**Use of ICT Software for Visually Impairment Learners**" embodies the result of this investigation conducted from January 2021 to May 2021under the department of ICT Education Central Department of Education, University Campus, Kirtipur Kathmandu. I hereby recommend and forward that this thesis be submitted for the evaluation to award the Degree of Master of Education.

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Thesis By

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Use of ICT Software for Visually Impairment Learners as been approved in partial Fulfillment for the Requirements for Master Degree of Education.

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This is to certify that Mr. Suman Subedi completed his M.Ed. Thesis entitled "Use of ICT Software for Visually Impairment Leaners" under my supervision during the period prescribed the rules and regulations of Tribhuvan University, Kirtipur, Kathmandu, Nepal. I recommended and forward his thesis to the Department of ICT Education to evaluate in the final viva-voce.

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By

Suman Subedi

Dedication

This work is dedicated to my father Mr. Meghnath Subedi and my mother Mrs.Laxmi Subedi, who even in a very difficult situation gave me a great span of their life for what I am now.

Declaration

This thesis contains no materials, which have been accepted for the award of other degrees in any institution. To the best of acknowledgment and belief thesis contains no materials previously published any others except due acknowledgment has been made.

………………….

Suman Subedi

Date: ……………

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………………………….

Suman Subedi

Abstract

The research entitled "Use of ICT for Visually Impairment Learners." The research focused on examining ICT use, analyzing the effectiveness, and finding out accessibility conditions and difficulties of ICT software for vision impairment learners. The study had used survey method research design, and the total sample population of primary data were fifty five visually impaired learners and eight teachers who teach impairment students of four schools of Kathmandu and Lalitpur district visually; names of the school are laboratory H. S. school, Adarsha Saula Yubak secondary school, Namuna Machhindra school, and Shree Prithvi Narayan secondary school. The researcher had used both primary and secondary sources of data for the analysis. The purposive homogeneous sampling procedure was followed for the selection of the sample population. Questionnaire and interview guidelines were taken as the main primary source of data where close-ended for questionnaire and open-ended for interviews were adopted. The obtained data were tabulated, analyzed, and interpreted descriptively by using statistical tools such as mean, percentage, and X2 test at 0.05 level of significance.

The finding of the study showed that the teacher and VI students have a positive opinion in the use of ICT for teaching and learning. Students have believed that ICT software makes learning easy and accessible than before. ICT software encourages students towards learning, and it boosts the learning performance of the student; they can gain information from the internet like sight students with the help of ICT software. While Software and website development must need to follow web content accessibility guidelines provided by W3C, it has considerable influence in enhancing the accessibility of VI users in modern technology.

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List of Abbreviation

ICT= Information Communication Technology

VIL= Visual impairment Learners.

AT= Assistive technology

WCAG= Web Content Accessibility Guidelines

SNE= Special Need Education

T.U. = Tribhuwan University

VI= Visually Impaired

W3C = World Wide Web Consortium

WHO = World Health Organization

NVDA = NonVisual Desktop Access

JAWS = Job Access with Speech

MoE =Ministry of Education

BIOS = Basic Input/Output System

Chapter-I

Introduction

Background of the Study

Visual impairment is an eye problem where we lose part or all of our ability to see. Visual impairment (VI) is a state of reduced visual performance that cannot be cured by refractive correction (spectacles or contact lenses), surgery, or medical approach (Naipal, & Rampersad, 2018). These could be a result of eye harm, the default of the brain to reacquire and read visual wave dispatch by the eyes, etc. It can occur at any point in life. The major reason for vision impairment and blindness are uncorrected refractive errors and cataracts. Sometimes visual impairment may be inherited by parents' genes. According to WHO, globally, at least 1 billion people have a near or distance vision impairment that could have been prevented or has yet to be addressed. There are three types of vision impairment, low visual acuity, blindness, and legal blindness. A learner with visually impaired is one of the types of students with SNE who has a limitation to capture information through their eyesight sense (Ediyanto & Kawai, 2019). Learning should be accessible for all types of learners, including children with visually impaired in mainstream school is the main goal for the world.

ICT stands for Information and Communication Technology. ICT is a tool or technology which provides access to information through telecommunication. ICT is the component that provides modern computing. Personal computers, laptops, tablets, mobile phones, transport systems, televisions, and network technologies are just some examples of ICT tools. ICT was first used in the 1980s; ICT became popular as a term in 1997 when it was used in a report to the UK government by Dennis Stevenson. ICT is a great gift of the 21st century; ICT is used in different areas like business, medical, agriculture, entertainment, education, etc. In education, ICT has become a very effective tool for teaching and learning. Nepal government also published different ICT master plans and policies for effective use of ICT in education. For example, ICT in Education Master Plan (2013), National ICT policy (2015), etc.

The benefits of ICT, along with the assistive devices and their use and role in the teaching and learning activity, present alternative method of communication; ICT constructs accessible educational materials and resource in a more appropriate way and intensify learning motivation. (Lamsal et al., 2019).

ICTs for education mention the enlargement of information and communications technology, particularly for teaching/learning purposes, although the ICTs in education contains the acquisition of common elements of information and communication technologies which help in the teaching-learning process. ICT in education has become an essential tool for teaching-learning, which advances social and collaborative learning (Hernandez, 2017). Specially ICTs have influence on teaching-learning practice in education to date in quite small ways but that the effect will enlarge significantly in years to come and that ICT will become a great tools for change among many educational practices. Concluding recent activities and practices, the frequent utilization and evolution of ICTs within education will have a strong influence on ICT and educational delivery process; standard and accessibility of education; learning, encouragement, learning environment, and ICT usage and academic performance and (Amin, 2013). Teaching, learning, and research have a positive influence on ICTs use and adoption. ICT can impact the delivery of education in new ways. Moreover, it will grow flexibility so that students can access the education regardless of time and geographical obstacles. It can affect the way learners are instruct and how they learn.

ICT generates waves for transformations, and transformation is also seen in education. Use of ICT increase in educational institutions as support to teaching the student (Phutela & Dwivedi, 2019). It would generate a great environment and stimulation for the teaching-learning process, which appears to have a profound mark on the procedure of learning in education by creating new possibilities for learners and teachers (Amin, 2013). These possibilities can have an influence on student results and outcomes. Likewise, the broad availability of best practices and best course contents in education, which can be shared by means of ICT, can promote better teaching and enhance the academic achievement of students.

People's ability and intelligence are not linked with visual impairment; visually impaired people have the same level of intelligence and ability as sighted people (Rony, 2017). However, people with visually impaired needs further support in writing, reading, and idea development; ICT plays a remarkable part in teaching visually impaired learners in the classroom. Learners with the visually impaired have the right to expect similar educational opportunities as sighted students, and, according to this principle, they also have the right to approach mainstream educational tools, including ICT-based ones, which are normally regarded as "Learning Tools." Information and Communication Technology has a vital role in facilitating opportunities to participate fully in education for students with visual impairment (Douglas, 2002). World Health Organization described assistive technology as any product or technology-supported utility which allows the disabled to lead a self-reliant life..

 Information communication and technology have played a crucial role in advancing the education process due to flexibility in computers' operation and supporting tools. ICT empowers disabled students to access the curriculum, supports learning, and creates a stage for disabled trainers to advance their skills (Rony, 2017). For visually impaired students, there are not enough braille books as required in standard school so that they take ICT help for managing their classes.

People with vision loss can do many things, such as sending and receiving emails, browsing the internet, and writing documents. People with no vision can use a computer, mobile phones, and other electronic tools independently with the support of assistive technologies such as screen reading software, Braille devices, and special talking ("How does technology, "2015). Likewise, people with low vision can see pictures, letters, and other display objects without having any problem with the help of screen magnification software and devices. This technology, generally familiar as assistive or adaptive technology, is regularly progressing and has detached many access troubles for people with vision loss.

Characteristics of persons with visual impairment.

There are educational characteristics of persons with visual impairment. These characteristics depend on the extent of an individual learner(Mboshi, 2018). Learners with visual impairments demonstrate the following characteristics.

- Intellectual potentiality is similar to those of sighted peers.
- They are impotent to use sight to help them develop concepts.
- Their ideas development depends on their tactile experience.
- They are unable to utilize visual imagery.
- They may display monotonous, stereotyped movements, such as shaking or scouring the eyes.
- They are removed, subordinate, and are inadequate to use non-verbal cues.
- They have trouble using spatial information and visual imagery and problems with functional implications.
- They have uncommon facial behaviors such as squinting, blinking, or frowning while reading or doing close work.
- They are unable to detect or pick up small objects. Physical indicators may include red eyes, swollen eyelids, watery eyes or discharge eyes that do not appear straight, uneven seized eyes, eyes with drooping eyelids, and crusts on lids between the eyelashes(Mboshi, 2018).
- They may have poor eye-hand coordination.

Statement of the Problem

Everyone has a similar opportunity to get an education; normal people can easily get an education effectively. Above fifty percent of the information, we receive about our world is through vision (Winzer, 1999). Vision impairment students also have an equal chance as normal people to get accessibility in education with required facilities. They also need to facilitate an alternative way to read & write (Winzer, 1999). However, we need to use different tools and strategies to provide education adequately to vision impairment students. ICT is one of the greatest innovations of science and technology. Nowadays, ICT makes human life trouble-free in every sector like business, entertainment, medical, education, etc. ICT is one of the tools

that assist educators in upgrading and optimizing the delivery of information for both kinds of sighted and visually impaired learners.

Various research and policies have been made for ICT used in special needs education. This study focuses on a students who have a problem with vision. This study aimed to explore what type of ICT software is used for visually impaired learners (VIL). ICT is a very effective learning tool of this century. The use of assistive technologies in vision, communication, mobility, and learning significantly help in special needs education. The educational experts declare that learners with disabilities should be provided with opportunities to realize their capability. They should engage in education and training on the same basis as students without disabilities and are not subject to inequity. Due to the revolutions in the IT industry, digital technologies are simply reachable and widespread, which permit using them to provide students with new opportunities.

Accessibility is a major cause for a visually impaired learner. Researchers have previously investigated the difference in learning outcomes. Many studies concern about the adoption of ICT tools in SNE. Some policies are made; however, less effort has been made for practical use of ICT. It states that there is a gap in theory and practice in using ICT for VIL. So in this study researcher investigated the use of ICT for visual impairment student. This study digs out the use of ICT for VIL. The result of the study reflects the role of ICT for VIL & the difficulties which VI students face.

Objectives of the Study

The objectives of the present study were as follows:

1. To examine the use of ICT Software for vision impairment students.
2. To analyze the effectiveness of ICT Software for vision impairment students.
3. To find out the accessibility condition and difficulties while using ICT software for vision impairment students.

Research Question of the Study

The research questions were largely guided by the objectives of the study. They could also assent to a researcher to design appropriate methodology and consequently to

discuss, analyze and interpret the data derive findings and to draw a conclusion of the study. The researcher used the following research questions were as follows.

1. Which type of ICT software is used in vision-impaired student classrooms?
2. What is the impact of ICT software on vision impairment students?
3. How does ICT enhance the accessibility of vision impaired students?
4. What are the difficulties while using ICT software by vision impairment students?

Justification of Study

The role of ICT is very significant in teaching and learning; it has a very positive impact on the learners. ICT help students in different ways like access to various content, collaborative learning, use of multimedia to make engaging content, anytime learning, and distance education. There is different software helpful for a visually impaired learner like Daisy, window eye, jaws and text help system, etc. However, we have problems with using ICT properly, like lack of specialized teachers, funds, and limited availability of assistive tools. In my research, ICT is of crucial importance because ICT offers a range of specialized software and hardware for communicating, assessing, and inputting data/information from web applications. Student students with visual impairment have similar intellectual abilities as slighted students. It considered that the research is potential of considerable importance for several reasons.

- It helps develop policy makers in the ministry of education to design an ICT-friendly approach for visually impaired students.
- It is useful for teachers to know the influence of ICT on visually impaired learners.
- It is applicable to encourage and motivate the visually impaired learner to utilize ICT software in learning.
- It is useful for assistive technology developers to notice difficulties while using assistive software by the visually impaired learner.
- It provides a recommendation to develop assistive technology according to the desire of visually impaired learners.

Delimitation of the Study

Delimitation is those features that limit the scope and define the study's boundaries. This study had the following delimitations as follows:

- This study is delimited to exploring the use of ICT software for visually impaired students.
- This study was limited only to four schools of Kathmandu and the Lalitpur district.
- This study was delimited within 55 visually impaired students and eight teachers who teach visually impaired students.
- This study was limited to the questionnaires and interviews as a tool for data collection.
- This study was limited to quantitative research in survey design.
- This study was limited to NVDA and JAWS software.

Operational Definition of Key terms

The key terms in my research can be enlisted below with their contextual meaning;

ICT

It stands for Information, and Commutation Technology refers to technologies that provide access to Information through telecommunications technologies. It helps learners by sharing Information from one way to another; for example, the students can gain information from the internet and share their ideas by using the internet.

Vision impairment

Vision impairment is a reduced ability to see; it means a problem in eyesight. It limits the function of the eyes. Visual impairment is a term experts use to define any vision loss, whether it's someone who cannot see at all or someone who has partial vision loss.

Assistive technology.

It's a kind of technology specially designed to support people with various learning difficulties. Some kinds of assistive technology arrange physical assistance, while others produce helpful aids for individuals with learning disabilities. It helps to person with a disability to access education.

Accessibility

Accessibility means being easy to enter or being able to reach. It provides equal change to participation in facilities provided by the government for all nation's populations. For instance, free education to all, making special needs education.

Software

Software is a set of instructions or program instructions for a computer to do a specific task. It makes human life easier by facilitating different features. For instance, information processing is very difficult without computer software, but nowadays, software features different data processing features, which makes it much easier.

Chapter II

Review of Related Literature

This chapter illustrates the existing literature and research related to the present study for finding out what has been already studied and how those research works become helpful to the present study. This section consists of the review of the theoretical literature and review of the empirical literature, implications of the review for the study, and conceptual framework.

Review of Theoretical Literature

The review of theoretical literature provides a strong knowledge to find out the area of problem and the need of investigating on it.

A visually impaired person also has an equal level of brainpower as a sighted person. However, peoples with visual impairment frequently encounter a different kinds of learning difficulties for the reason that they are unable to process details by using their vision. The school environment should be inclusive with suitable for a visually impaired students. The school needs to facilitate disability-friendly infrastructure, advanced education materials, and equipment. Successful learning outcomes can be achieved for learners with visual impairment in an inclusive education environment if classroom instructors are adept at utilizing assistive technology in the teaching-learning process. The computer provides particular assistance to visually impaired learners. Effective gadgets and facilities are needed for the visually impaired to inclusion in education, for instance, specific computer programs, slate and stylus, and electronic braille writer (Mboshi, 2018).

Visually-impaired learners can get expertise in different kinds of skills in a computer, such as a word processing, operating system, and the use of the internet. VI students, while doing an operating system-related task, can boot, open named folder, and shut down the computer. However, they have hassles in the different activities of operating systems such as installing software, uninstalling software, printing documents as more copies, and searching a file and folder; in the case of word processing, VI students had no difficulty while changing font color and size. However, they encounter a problem while underlying words, saving the document to a particular disc, and formatting font style. Looking into the internet using activity VI,

students can run instant messenger, can swap home pages in a browser. Nevertheless, VIL experience complication in copying text from a web page as well they take a long time in browsing. They have a major problem with security images while registering websites. The teaching training program and course materials were insufficient to teach visually impaired students with assistive technology. Appropriate ICT curriculum and infrastructure are required to develop for effective teaching and learning. The keyboard used by sighted people is not appropriate for visually impaired learners. VI students believe they can find a job, learn from a computer, and socialize. Furthermore, they recommended that the government design numerous computer and internet-related courses that are convenient to them. Visually impaired difficulties need to be addressed for providing equal opportunity as sighted people so they can be important parts of society (Simsek et al., 2010).

ICT have a significant role in education management and delivery. ICT provides a new way to gain and absorb knowledge; ICT contributes amazing opportunities for countries to strengthen their educational system. Today ICT is being utilized as an instrument for enhancing the standard of life by upgrading capabilities and strengthening effectiveness. Many kinds of ICT instruments help people with disabilities by giving them learning chances, abilities furthermore, raise potential in the many parts of life. ICT makes disabled people access any kind of knowledge with the assist of suitable digital media. In addition, it have become very effective in delivering information to people with disabilities. ICT can lower discrimination and create more scope for people with disabilities in all conditions, including educational areas. ICT enhances accessibilities in learning for people with disabilities; it is an influencing tool for creating an inclusive learning environment. ICT makes it easy to construct learning materials that meet the requirement of people who have a barrier in learning. Assistive technology hardware and software need to develop to enhance participation in education for all kinds of disability learners (Mishra et al., 2010).

Revolutions in technology provide a new way for the visually impaired learner in education. Note-taking devices, optical scanners, optical magnifiers, and systems that make large print braille are different instances of technologies that encourage visually impaired learners to write and edit papers, do research activities, build job expertise, and receive information. Assistive technologies are software and hardware

for visually impaired students that allow learners to access computers and other technologies. Assistive technology enhances accessibility for visual impairment by providing access to unlimited information through the computer system. Students mostly use screen enlargement programs and screen reading software. Fewer teachers use assistive technology available for students with visual impairment. Most teachers believe they are beginner level for educating their students to apply these assistive technologies. A teacher needs training and support to use assistive technology effectively. An assistive technology-related workshop can enhance the teacher's knowledge and skill for teaching visually impaired students (Abner & Lahm, 2002).

The essential facilities involve hardware and software that suit visually impaired learners' needs and preferences to ease their learning, empower them to take part productively in the learning environment. A student with visual impairment can learn a subject like science effectively with assistive technology. A teacher with good knowledge and mastery of assistive technology can enhance students' performance in learning (Ediyanto & Kawai, 2019).

Ismail and Baharin (2008) have mentioned that persons with disabilities regularly use assistive technology products. These technology are designed to contribute a method for performing a particular activity. For the favorable result, visually impaired students learn through virtual learning; a few technologies require to be developed first hand—screen reader software which read all the text that appeared on a computer screen. JAWS is well known and familiar screen reader software for the visually impaired. Voice recognition is a computer program that uses voice as a communication medium. Voice recognition systems have a remarkable role in accessing the web for visually impaired learners, which fulfill all the needs of access to the web. Web technology is an essential learning medium in the virtual learning environment. Virtual learning is a necessary technology that greatly advantages the disabled, particularly the visually impaired. Mobilization is one of the major problems of visually impaired learners. Virtual learning courses are constructed to communicate to students formally anywhere, anyplace, and anytime. Without being physically present in the classroom, learners get services provided by the school. Nevertheless, for the better still needs improvement in virtual learning and voice

recognition technology. A special browser needs to develop for the visually impaired. A lot of research and enormous effort is still needed.

ICTs have been a crucial tool to construct knowledge development in higher education. It assists learners in building knowledge in their social periphery. ICTs are a demanding requirement in college education, especially in building up knowledge. Students' demand for enormous knowledge appears to be essential due to their comprehensive approach to globalization. Consequently, people seem to perceive the requirement of the latest knowledge to encounter their local and global demands (Jha, 2017).

Web Content Accessibility Guidelines (WCAG 2.0) was published by World Wide Web Consortium (W3C), which recommend different principle and guidelines under principle to make web content more accessible for people with disabilities. Perceivable, operable, understandable, and robust are four principles of WCAG 2.0. Under these four principles, it provides 12 guidelines to follow by web authors and content writers for making content more accessible to the user with disabilities. Principle perceivable has four guidelines to develop content that is easily perceivable to users with disabilities. Text alternative, time-based media, adaptable and distinguishable are four guidelines of principle perceivable. Principle operable has four guidelines: keyboard accessible, enough time, seizure, and navigable, which deals with making user interface component and navigation easy to user. The untestable principle provides three guidelines, readable, predictable, and input assistance, to make the user more readable. Principle robust provides guidelines to maximize compatibility with future and current user agents. It's the guidelines that need to implement by the developer while developing the more accessible site and software ("WCAG," 2008).

Some ICT software for visually impaired learners

Window-Eyes is a special software designed by GW micro for visual impairment in Microsoft window. It is influential and organized screen reader software. These tools provide overall control over what you hear and how you hear it. In addition, these tools come up with upgraded braille support. A visually impaired person can be a part of a knowledge base society with the assist of a window eye tool. They can get access to an unlimited source of information. Window eye provides synthesized speech features for the visually impaired; by these features, they can easily control components of the window operating system (Mishra et al., 2010).

JAWS is one popular and overfull screen reading software for visually impaired learners. It uses synthesized speech to read the information on a computer screen. Jaws make it easy to read web pages and edit documents by facilitating convenient commands. Jaws provide an opportunity to the user to customize the Jaws program as per individual needs and requirements. Jaws also came up with braille output along with synthesized speech. One of the significant limitations of the jaws program is it's not free; the user needs to purchase it for its full features (Mishra et al., 2010).

Math Daisy is a computer program aiming to make math more accessible and reachable to the user with learning disabilities. It provides a new way of learning math with a digital talking book where users can save the document. Learners can read classroom subject matter by using a DAISY player, where lots of math-related materials are available (Mishra et al., 2010).

Text Help gives literacy software solutions. This tool is designed to assist slow readers and writers who have literacy awkwardness. It helps those with learning disabilities such as dyslexia, mild visual impairment, and for whom English is a second language (Mishra et al., 2010).

Review of Related Empirical Literature

This section attempts to review the related studies, articles and reports and old thesis. Some research studies have been reviewed here to facilitate this research work. They are as follows:

Haneefa and Syamili (2014), published an article the titled "Use of Information and Communication Technology by Visually-impaired Students: A Study in University of Calicut, Kerala". This research aimed to explore the use of Information and communication technology (ICT) by visually impaired students in Calicut University, Kerala. The size of this study was students in the departments and affiliated colleges of Calicut University, Kerala. A qualitative method design was followed for this research. One hundred students were taken as a sample of this study. Interviews and semi-structured tools were utilized to collect data. The study result that a more significant number of learners are computer literates and use mobile phones repeatedly. A considerable number of students use screen readers on their mobile phones. However, the foreign accent of screen reading programs is an issue for the learners. The support of friends and family members is beneficial for the students to gain ICT skills. Microsoft Office and JAWS screen reader supported by windows operating system are the most well like software among the students. Visually impaired students primarily use internet services is www followed by email; however, student use of the internet is significantly less. It is concluded that a more significant number of the students need training in internet and word processing.

Adam and Tatnall(2008), did research on "Using ICT to Improve the Education of Students with Learning Disabilities". The purpose was to examine how ICT can upgrade the education of students with learning disabilities. The Concord School Transition Centre, Australia, was the population of this research. In this research researcher carried out a case study design for the study. The instruments for data collection were observation, surveys, interviews and discussion. 86 teachers, 270 students and staff were picked as a sample of this study. The result of this research was this is particularly predominant in this arena, where technology can make a remarkable difference in educating visually impaired students, but only if it is used properly.

Likewise, Sánchez and Sáenz (2009), carried out research on "Video Gaming for Blind Learners School Integration in Science Classes". The aim of the study was for visually impaired students to be able to interconnect and grow socially integrated through operative science video gaming and the application of specific science content. The study was done with sixth and seventh-grade blind and sighted children between the ages of 11 and 14 years old. Analysis was applied in seven mainstream public schools in Santiago de Chile during four months, with a population of 326 learners and 15 teachers. Eight legally blind students engaged in this study (2 with partial vision and six totally blind). The mix method design was applied in this study. The conclusion of this study provides proof and initial data that the use of video games such as The Natomy's Journey Game can boost the process for the school integration of students with visual impairment.

Eligi and Mwantimwa (2017), did research on "ICT accessibility and usability to support the learning of visually-impaired students in Tanzania". This study aimed to measure the accessibility and usability of Information and Communication Technology services to facilitate education among visually-impaired learners at the University of Dar es Salaam (UDSM). A mixed-method design was chosen for this study. A total of 36 participants carried out a sample of this study. Participant observations, questionnaires and interviews were the tools for the data collection. This research discovered that ICTs help innovative learning, advance participatory, collaborative learning, and motivate independent learning.

Eguavoe (2016), did a study on "ICT Utilization as Correlates of Academic Performance among Students with Visual Impairment in Lagos State, Nigeria". The research tries to find out ICT tools, level of ICT utilization, and their connection to academic results and outcomes among students with visual impairment. A structured questionnaire was employed to collect information from VIL from two special schools located within Lagos. The study's finding indicated a correspondence relationship between ICT utilization and academic outcomes of learners with visual impairment in Lagos state.

Matshedisho (2007), researched "Access to higher education for disabled students in South Africa: a contradictory conjuncture of benevolence, rights and the social model of disability". The purpose of this study was to figures the level of support provisions for disabled students in South Africa, compare the state of these support provisions with those of the United States of America and the United Kingdom and compares the different methods applied by South Africa and the developed nations in general towards disability rights. A survey method was taken out for this study. The study's finding illustrated that South Africa seems to be progressing along a contradictory path and that it should build an allegiance to prioritize equal access to higher education for disabled students.

Implication of the Review for the Study

Review of theoretical and empirical literature plays a vital role in accomplishing any research study. It helps the researcher from beginning to end. It provides insights into the objectives, research questions, methodological procedure and other important aspects of research. That is to say, it helps researchers to bring clarity and focus on the research problem, reform methodology and contextualize the findings. To accomplish this research study, the researcher also reviewed some research works that were already carried out. These researches helped the researcher find out the topic and the gap between what has already existed and what is still there to be found.

In reviewing theoretical literature, the researcher has gone through different books, articles, and journals. Similarly, the researcher has reviewed much empirical literature, similar to the proposed study. After reviewing the literature, the researcher has found some implications for the completion of this study.

Conceptual Framework

      The conceptual framework is very important for the researchers in the sense that it provides a visual representation of the work. The main purpose of this conceptual framework is to see the relationship among various concepts and variables of the study. On the basis of all reviewed documents, the researcher has developed the following conceptual framework to process this study ahead.
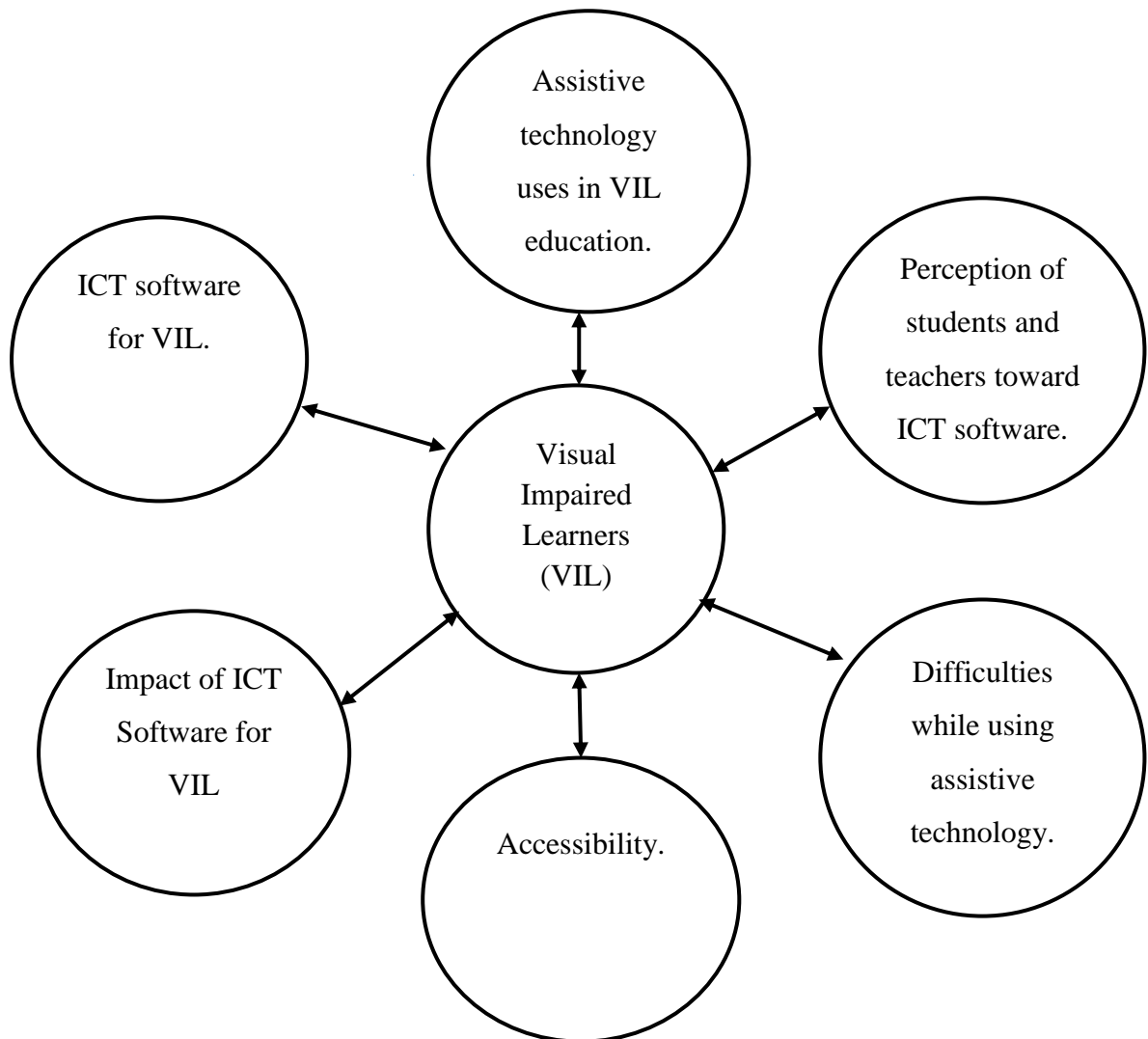
Chapter III

Methods and Procedures

In this chapter, the research design, study area and participants of the study, data collection tools, data collection procedure and data analysis procedure will be discussed.

Design of the Study

The design of this study is survey type. The research question and the research issues correspond to the survey. The overall methodology used corresponds to the survey research. This research study is based on quantitative research design through the survey study and descriptive in nature. It is the most commonly used method of investigation ranging from large-scale investigation to a small scale study or even a small classroom study. Therefore, techniques are applied to analyze the data. The data are collected through primary sources. To conduct this study, all the information from primary sources is analyzed and interpreted in the following procedure.

Population and sample of the Study

The researcher's target population was the visually impaired students and teachers who guide VI students in using ICT software for teaching and learning activities. All the school level visually impaired students from six to ten classes and teachers who teach visually impaired students in laboratory H. S. school Kathmandu, Adarsha Saula yubak Lalitpur secondary school, Namuna Machhindra school Lalitpur and Shree Prithvi Narayan Secondary school Kathmandu, were the population of the study. Among them, 55 students and eight teachers were selected by purposive sampling.

Data Collection Tools

In this study, the researcher used a close-ended questionnaire, and an interview was a research tool. In this study, two sets of questionnaire schedules and one set of interview schedules were designed as the main tools of the study.

Questionnaire

A questionnaire means to a device for securing answers to a series of questions by using a form that the respondents fill themselves (Goode & Hatt, 1952). In order to meet the research objectives of the study, two sets of questions were used to examine the use of ICT software for visually impaired learners in teaching-learning. The answer to the research questions was used to analyze the data. The questionnaires were desinged on the basis of elements given in the conceptual framework of the study, and then questionnaires were administered to all sample students and teachers. Also, questionnaires were developed in Likert scale point techniques. A Likert scale is the sum of opinion to several Likert items; these items are generally displayed with a visual aid for example a series of Strongly Agree, Agree, Neutral, Disagree, and Strong Disagree.

Meaning of Rating	Favorable Statement	Unfavorable Statement
Strongly Agree	5	1
Agree	4	2
Neutral	3	3
Disagree	2	4
Strongly Disagree	1	5

Interview

The interview method of gathering information involves the presentation of oral-verbal stimuli and reply in terms of oral verbal responses. The researcher conducted personal interviews that contained carefully constructed tasks and questions to examine the use of ICT software for visually impaired learners. Interviews allowed the researcher to explore the phenomena from a participant's field of perception and look for the meaning of each participant's experiences. There were 55 students and eight teachers; among them, the researcher had taken personal interviews with five students and two teachers selected by purposive sampling method.

Reliability and Validity of Research Tools

Reliability and Validity of Tools For the reliability of the instruments, a pilot study was conducted to assess the reliability of these tools or instruments. The pilot study was carried out of twenty students not included in the study. The obtained data were calculated using the split-half method; the reliability coefficient was found to be 0.63. To validate the instruments, the researcher consulted with the thesis supervisor. The research tools used in this study were a questionnaire. It is also prepared through consultation with the expert. The statement was fixed for the final research. The idea was related to the use of ICT for visually impaired students. The researcher consulted with the thesis supervisor.

Data Collection Procedure

The researcher followed step-wise procedures to collect the data of the study. First of all, the researcher makes ready two sets of questionnaires, one for teachers and another for students and interviews. Then, the researcher went to the field with a letter given by the Department of ICT Education and got permission from the respected authority with administrator, teachers and students. The researcher builds rapport with the respondents. Then, the researcher clarified the research purpose and asked permission to carry out the research. Later, the researcher distributed the questionnaire to the respondents and requested them to help by responding to the questionnaire. Next, the researcher took interviews with some respondents. Finally, the researcher collected the questionnaire from respondents by providing thanks to teachers, students and administrators for their kind support and help for this research study.

Data Analysis Procedure

Analysis and interpretation of data is essential aspect of any research study. If collected data is not analyzed and interpreted correctly, the study's findings will not be genuine and reliable. The process of data analysis and interpretation is different according to the nature of the research. The systematically collected data were analyses, interrelated and presented descriptively and correlative based on questionnaire and interview as a research tool. The researcher explained the facts data in tables and pie-chart. For the analysis, the researcher descriptively and statistically interprets the data using Mean, frequency, chi-square and percentage.

Ethical considerations

Ethical consideration is an important issue that should be concluded in the research study. Ethical consideration helps research study avoid the possibility of causing harm to participants, to maintain confidentiality, avoid biases, prevent incorrect reporting, avoid inappropriate use of information, prevent the misuse of information and so on. So, to avoid all these things or make this research confidential, biased,, and less effective, the researcher will follow ethical considerations.

At first, the researcher informed the informants about the purpose of the study. The researcher maintains confidentiality regarding the information of respondents. The researcher will not use the data for any other purpose except for this study without the permission of respondents. The researcher will not make manipulation in collected data. The researcher will not ask any questions that are directly or indirectly harmful to informants while collecting data. The researcher did not seek any sensitive information from the respondent.

CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

This chapter was mainly concerned with analyzing and interpreting the data collected from primary sources. The data were analyzed, tabulated and interpreted to examine and find out the use of ICT software, effectiveness of ICT software and ICT accessibility problem for the visually impaired learner of secondary school. Data are also presented in a table and pier chart/bar diagram for the help of data analysis. The researcher presented, analyzed and interpreted the data obtained from primary sources in this chapter. The researcher collected data from four different schools of Kathmandu and Lalitpur Nepal as the respondents utilized questionnaires and interviews to collect the data.

Analysis of Data and Interpretation of Results

After collecting data, these were analysed and interpreted to identify and analyse the use, effectiveness, and accessibility problem of ICT software for vision impairment students. Altogether, 16 questions for teachers and 16 questions for students were asked in the form of closed-ended questions. This section of the research paper presents the result of statistical analysis of collective data, which were collected from the teachers and students of secondary schools of four different special schools for a visually impaired learner of Kathmandu and Lalitpur district, by the method of purposive homogeneous sampling, name of the school are Laboratory H. S. school, Adarsha Saula Yubak secondary school, Namuna Machhindra school and Shree Prithvi Narayan secondary school. A total of 55 students of school level and eight teachers were the sample for this study. This study included 16 statements for the teachers and 16 statements for the students'.The questionnaire was the vital tool for collecting data in this research. The study was used to find out the Use of ICT, effectiveness and accessibility problems for a visually impaired learner. To achieve the objectives, the scale of scoring each item of the questionnaire used the dichotomous questions and Likert five-point scale. This part indicates statistical analysis and interpretation of the data. The mean, percentage, and chi-square tests were used to analyse the data at the 0.05 level of significance. Similarly, if the response were more than 50 per cent, it was provided positive attitudes, and less than 50 per cent considered the negative attitudes. The open-ended questionnaire response was expressed in words, and phrasing was analysed descriptively

. **Student familiar with ICT assistive Technology.**

Information and communication technology plays a crucial role in teaching and learning. It also helps in making a suitable environment for teaching and learning. There are different ICT assistive technology, which provides excellent support to visually impaired students. For taking advantage, the student must be familiar with assistive technology. Table 4.1 and Chart 4.1 illustrate the status of students familiar with ICT assistive technology.

Table 4. 1: Student familiar with assistive technology

Response	Frequency	Percent
Yes	55	100.00 %
No	0	0.00 %
Total	55	100.00 %

Source: Field survey.

Figure 4. 1: Student familiar with assistive technology
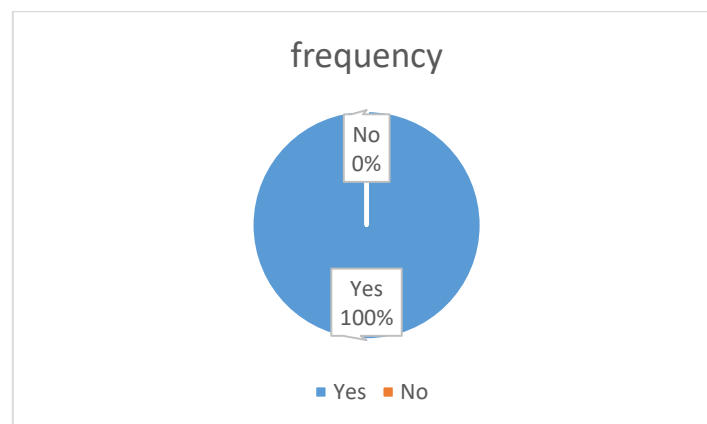
Table 4.1 and figure 4.1 exhibit the status of students familiar with ICT assistive technology. Regarding students' responses, all 100% of students are familiar with assistive technology. This means visually impaired students use ICT in their learning.

ICT support in a regular school student opinion

There is no sufficient braille Book; their learning material was bounded. They had to hang on converting Braille book. Now with the help of ICT, they are being independent learners. ICT facilitate visually impaired learner, especially by supporting them with various tools. So, table 4.2 tried to find out the preference given by the student in ICT support in regular school.

Table 4. 2: ICT support in a regular school

Response	Frequency	Percent
Yes	55	100.00 %
No	0	0.00 %
Total	55	100.00 %

Source: Field survey.

Figure 4. 2: ICT support in a regular school
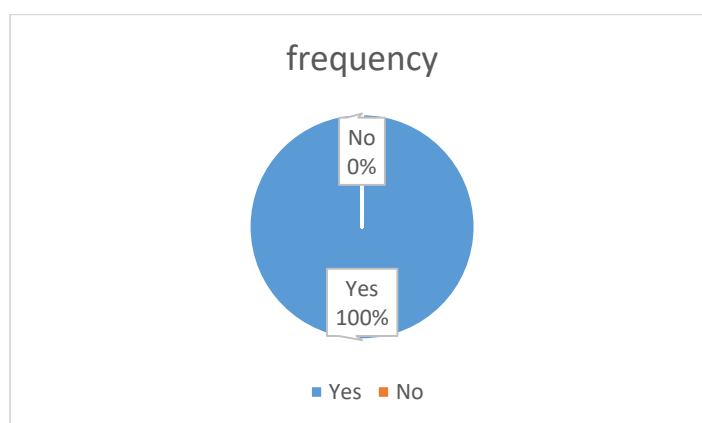
Table 4.2 and figure 4.2 reveal the preference for ICT support in regular schools. According to the response given by the student, ICT provides 100 % support to students in regular school. This gives the sense that ICT support them in regular schooling. ICT motivate them towards learning by making learning more accessible.

Assistive technology you used for learning student response.

Assistive technology is an ICT tool that presents an entirely new learning environment for a visually impaired students. Technology can play a significant role in their learning; ICT help to gain required knowledge experience. The following table and graph demonstrate which assistive technology students mostly use.

Table 4. 3: Assistive technology used for learning.

Response	Frequency	Percent
NVDA	50	90.91
JAWS	5	9.09
Others software	0	0.0
Total	55	100.00

Source: Field survey.

Figure 4. 3: Assistive technology used for learning.
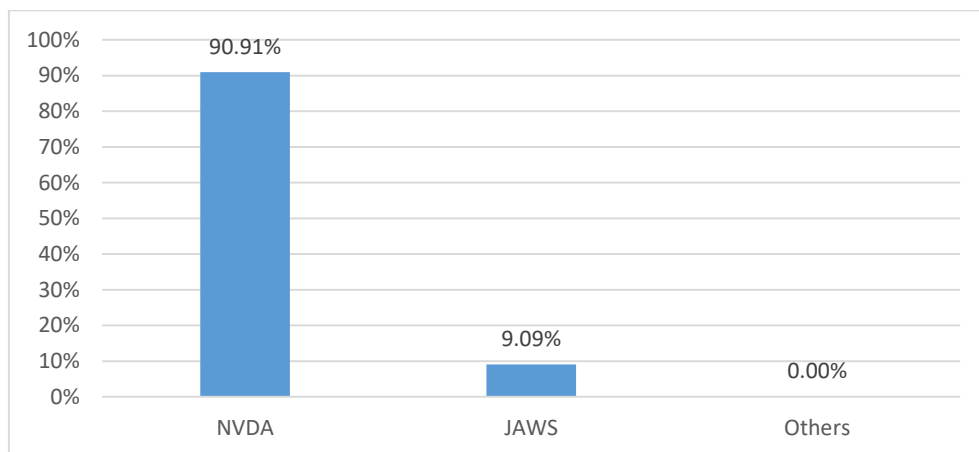
According to table 4.3 and figure 4.3, it is seen that most of the visually impaired students used NVDA assistive technology, which accounted for 90.91%. Similarly, Jaws software is only used by 9.09% of the student. Hence the majority of students use NVDA assistive technology for learning. NVDA software has no time limitation; it provides all its features for free. Some students use JAWS outside the school at their hostel and home; however, all instructors and institutions suggest using NVDA for more flexible learning.

Accessibility problem when using assistive technology student view.

Accessibility is the standard of a system that makes it simple to learn, easy to utilize, easy to remember, error-tolerant, and subjectively pleasing. Learners with the visually impaired should be able to use and access all the information provided for the learning experience. Accessibility problems while using assistive technology can be a presentation as follows.

Table 4. 4: Accessibility problem when using assistive technology

Response	Frequency	Percent
Yes	55	100.00 %
No	0	0.00 %
Total	55	100.00 %

Source: Field survey.

Figure 4. 4: Accessibility problem when using assistive technology
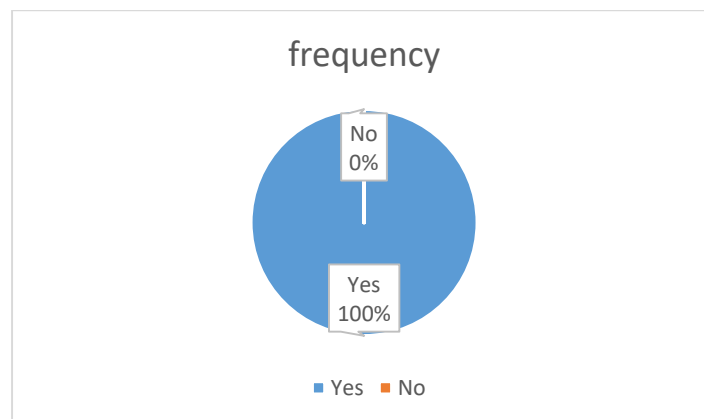
As shown in table 4.4 and figure 4.4, all 100% of visually impaired students have different kinds of accessibility problems like; while learning Nepali and math; they encounter difficulties because assistive technology doesn't read Nepali font properly, and they have trouble in learning math.

Assistive technology support magnification (zoom) features student opinion

Screen magnification software makes text and graphics more extensive on a computer display. It's loaded in the computer's memory and works like a magnifying glass, traveling around a screen, following the cursor, and magnifying the region around it. People with visual impairments can see words and pictures better by enlarging part (or all) of a screen. This type of ICT software is helpful for low vision impaired learners. Table 4.5 presents their system support or not magnification features.

Table 4. 5: Assistive technology support magnification (zoom) features

Response	Frequency	Percent
Yes	21	100.00%
NO	0	0.00 %
Total	21	100.00 %

Source: Field survey.

Figure 4. 5: Assistive technology support magnification (zoom) features
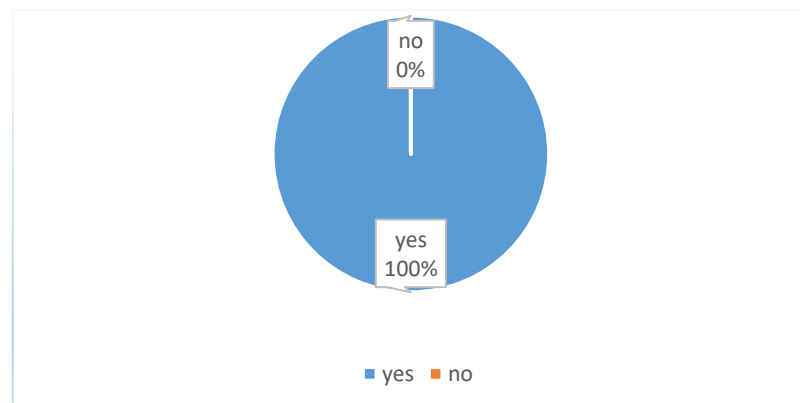
The opinion of this statement is only taken by a student who has a low vision impairment. All 100 % of students give a positive response to this statement. According to student response, their system support magnification features which are helpful to them in the learning process.

Text alternative features provide by VIL software student opinion

The software provides text alternatives features to enhance accessibility for different kinds of disabled users. Content must be present to the user in ways that they can perceive easily. It delivers text alternatives for any non-text content so that it can be reformed into other forms people need, such as large print, braille, speech, symbols, or simpler language.

Table 4. 6: Text alternative features provide by VIL software

Features	Frequency	Percent
Large Print	55	100.00 %
Braille	55	100.00 %
Speech	55	100.00 %
Symbols	0	0.00 %

Source: Field survey.

Figure 4. 6: Text alternative features provide by VIL software
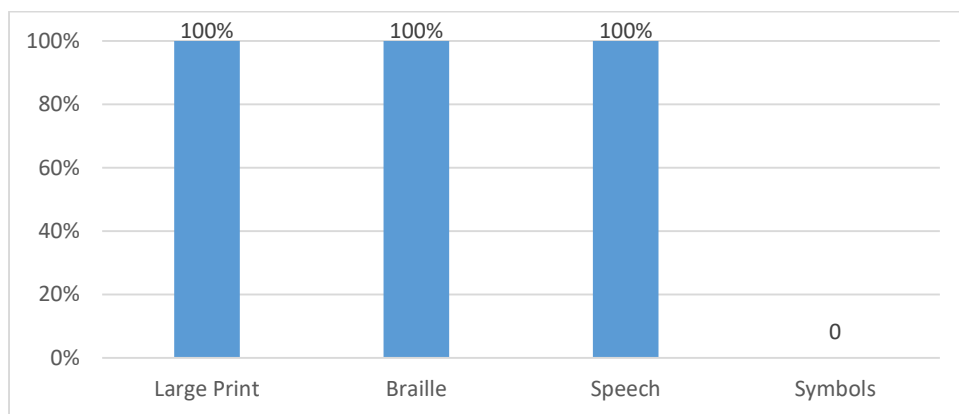
Table 4.6 and Figure 4.6 give an idea about the features provided by their VIL software. A student responds that large print, Braille, and speech are common attributes provided by VIL software; these all features accounted for 100 %. Large print, Braille, and speech are the most useful features for VI learners.

Media features provide for content by VIL software student response.

Media is a form of communication, which provides different ways of communicating in the community. In VIL software, the response of how to access the content provides different criteria. Table 4.7 illustrate which features are provided for content.

Table 4. 7: Media features provide for content by VIL software

Features	Frequency	Percent
Audio only	55	100.00%
Video only	0	0.00%
Audio-video	0	0.00%
Audio video combine with both	0	0.00%

Source: Field survey.

Figure 4. 7: Media features provide for content by VIL software
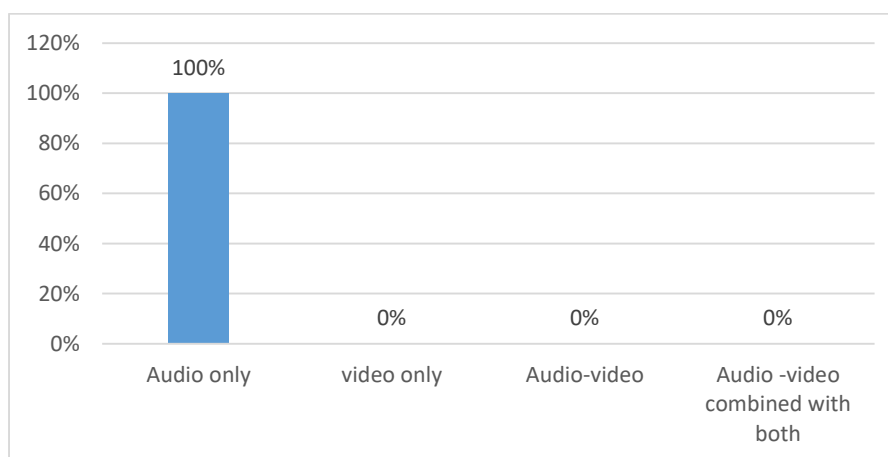
Table 4.7 and figure 4.7 reveal the features provided by VIL software for media. Student response all 100 % in audio-only features, as the opinion of a student their VIL software only provide audio-only media features for access content. Their assistive software provides synchronizes the audio in different voice patterns so they can understand content fetched by software. Synchronized audio is the most useful media feature provided by their software for them; with these features, they can learn anything by hearing.

Table 4. 8: Use of ICT software student perception in content access.

SN	Statements	SA	A	N	D	SD	Total	Mean	X^2
8	Display the content in different sizes & different colors make it easy to access the content.	12	8	4	10	21	145	2.64	15.33
13	VIL software makes text content readable and understandable.	8	12	10	13	12	156	2.84	7.53
14	VIL software makes it easier to hear learning content.	15	18	5	9	8	188	3.42	16.11
15	Assistive technology provides students with enough time to read and use the content.	23	26	6	0	0	237	4.31	8.33

Figure 4. 8: Use of ICT software student perception in content access.
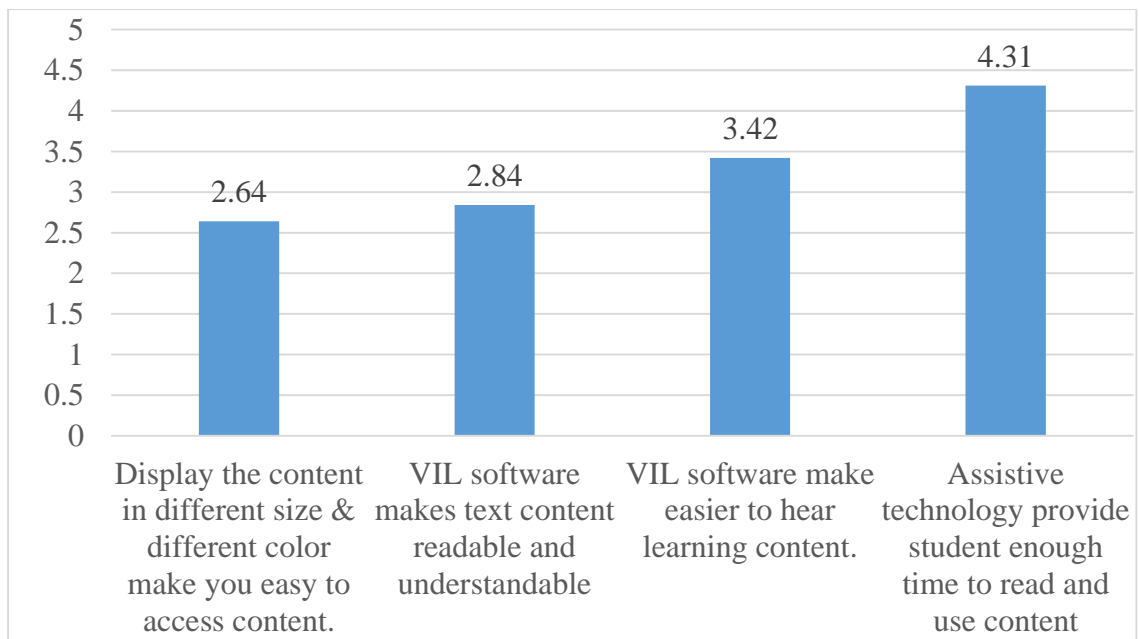
The analysis of data of table 4.8 in the response of the eighth statement is significant with the x2 value 15.33 at0.05 level of significance and 21.8% of sampled students are strongly agreed, 14.5% of students are agreed, 7.3% of students are neutral with this statement, 18.2% students disagree, and 38.2% of students strongly disagree with this statement. Hence the majority of students have opposing views in the statement of displaying the content in different sizes & different colors make it easy to access the content.

The response of thirteen statements is significant with the x2 value 16.11 at 0.05 level of significance, and 14.5% of sampled students are strongly agreed, 21.8% of students are agreed, 18.2% of students are neutral with this statement, 23.6% of students disagree, and 21.8% students strongly disagree with this statement. To summarize, it reveals that the majority of students have negative views in the statement that VIL software makes text content readable and understandable.

The response of fourteen statements is significant with the x2 value 16.11 at 0.05 level of significance, and 27.3% of sampled students are strongly agreed, 32.7% of students are agreed, 9.1% of students are neutral with this statement, 16.4% of students disagree, and 14.5% students strongly disagree with this statement. In conclusion, the majority of students have positive views in the statement that VIL software makes it easier to hear learning content.

The response of fifteen statements is significant with the x2 value 8.33 at 0.05 level of significance, and 41.8% of sampled students are strongly agreed, 47.3% of students are agreed, 10.9% of students are neutral with this statement, 0% of students disagree, and 0% students strongly disagree with this statement. To sum up, this statement tells that most students have positive views in the opinion that Assistive technology provides students enough time to read and use the content.

Table 4. 9: Use of ICT software student attitude in using keyboard.

SN	Statements	SA	A	N	D	SD	Total	Mean	X^2
10	VIL software help in typing with keyboard on computer	30	20	5	0	0	245	4.45	6.93
11	Make all functionality available on keyboard help in flexible accessibility	25	20	10	0	0	235	4.27	4.42

Figure 4. 9: Use of ICT software student attitude in using keyboard.

With the analysis of data of table 4.9, the response of the tenth statement is significant with the x2 value 6.93 at 0.05 level of significance, and 54.5% of sampled students are strongly agreed, 36.4% of students are agreed, 9.1% of students are neutral with this statement, 0% students disagree, and 0% students strongly disagree with this statement. Hence, most students have positive views in the statement ofVIL software help in typing with the keyboard on a computer.

The response of the eleventh statement is signed with the x2 value 4.42 at 0.05 level of significance, and 45.5% of sampled students are strongly agreed, 36.4% of students are agreed, 18.2% of students are neutral with this statement, 0% of students have disagreed and 0% students strongly disagree with this statement. Hence, most students have positive views in the statement that making all functionality available on the keyboard help in flexible accessibility.

Table 4. 10: Use of ICT software student perceptions in ICT support in accessibility.

SN	Statements	SA	A	N	D	SD	Total	Mean	X^2
9	VIL software provides way to help navigate, find content and determine where you are.	35	20				255	4.64	2.68
12	VIL software help you to avoid andcorrect mistake.	27	19	5	4		234	4.25	6.08
16	ICT makes learning easier and accessible than before	50	5				270	4.91	6.60

Figure 4. 10: student perception in ICT support in accessibility.
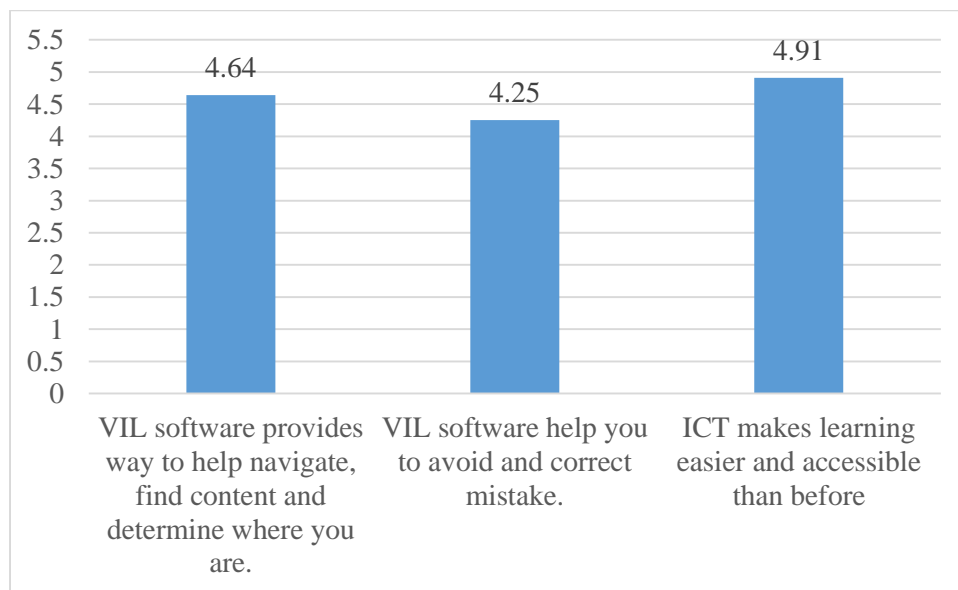
With the analysis of data of table 4.10 in the response of the ninth statement is significant with the x2 value 6.08 at 0.05 level of significance and 49.1% of sampled students are strongly agreed, 34.5% of students are agreed, 9.1% of students are neutral with this statement, 7.3% students disagree, and 0% students strongly disagree with this statement. Hence, most students have positive views in the statement that VIL software help you to avoid and correct mistake.

The response of twelve statements is significant with the x2 value 6.08 at 0.05 level of significance, and 49.1% of sampled students are strongly agreed, 34.5% of students are agreed, 9.1% of students are neutral with this statement, 7.3% of students disagree, and 0% students strongly disagree with this statement. Hence, most students have positive views in the statement that VIL software help you to avoid and correct mistake.
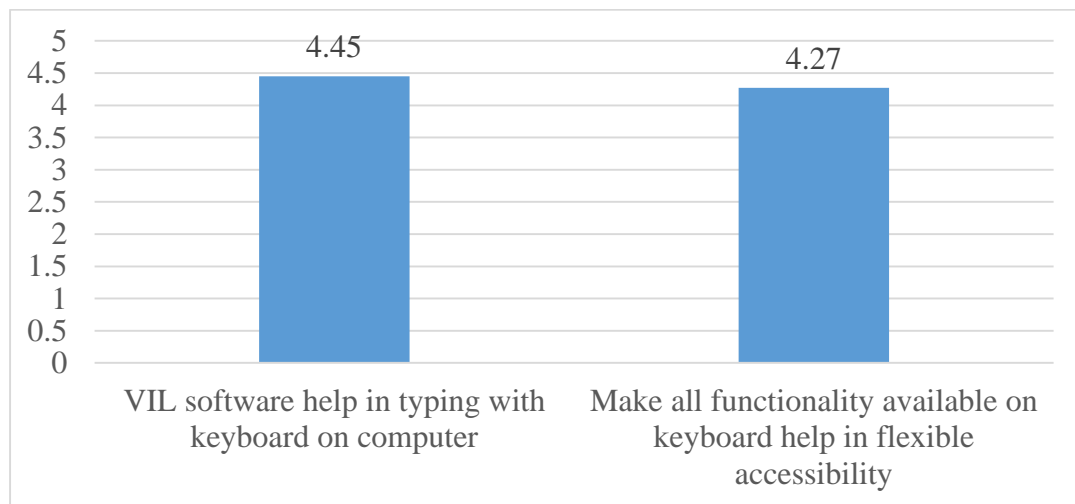
The response of twelve statements is significant with the x2 value 6.60 at 0.05 level of significance, and 50% of sampled students are strongly agreed, 5% of students are agreed, 0% of students are neutral with this statement, 0% of students disagree, and 0% students strongly disagree with this statement. Hence, most students have positive views in the statement that ICT makes learning easier and accessible than before.

Teacher familiar with ICT assistive Technology.

Information and communication technology plays a crucial role in teaching and learning. It also helps in making a suitable environment for teaching and learning. ICT provides a new way of delivering instruction. ICT makes teaching-learning easier than before. Assistive technology is that technology that is specially designed for those people who have a different kinds of learning disabilities. There is other ICT assistive technology, which provides excellent support to visually impaired students. Teachers must be familiar with assistive technology to educate students with visual impairment. Table 4.11 and figure 4.11 illustrate the status of teachers friendly with ICT assistive technology.

Table 4. 11: Teacher familiar with ICT assistive Technology.

Response	Frequency	Percent
Yes	8	100.00 %
No	0	0.00 %
Total	8	100.00 %

Source: field survey

Figure 4. 11: Teacher familiar with assistive technology
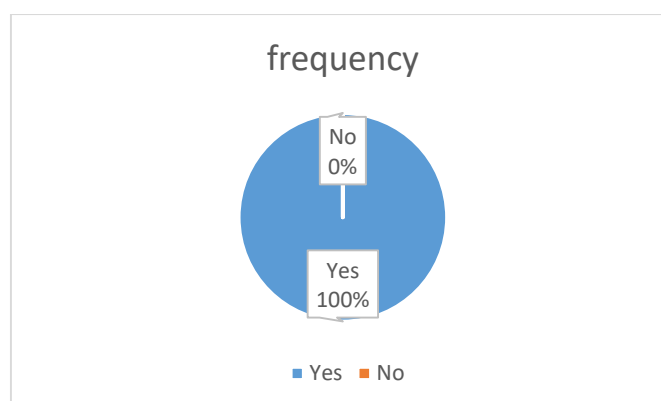
Table 4.11 and figure 4.11 illustrate the status of teachers familiar with ICT assistive technology. Regarding teachers' responses, all 100% of teachers are familiar with assistive technology as the answer provided by teachers use assistive technology to teach a visually impaired student.

Teacher and their ICT skill level.

Skill is the ability to do something which comes from knowledge and practice; it is a capacity to do the task perfectly. Teaching with ICT to visual impairment student teachers also need ICT skills. ICT skills in teaching mean expertise in the use of digital technology in education for learning purposes. The table below demonstrates teacher skills in using ICT.

Table 4. 12: Teacher and their ICT skill level.

Response	Frequency	Percent
Good	3	37.50%
Normal	5	62.50%
Poor	0	0.00%

Source: Field survey

Figure 4. 12: Teacher and their ICT skill level.
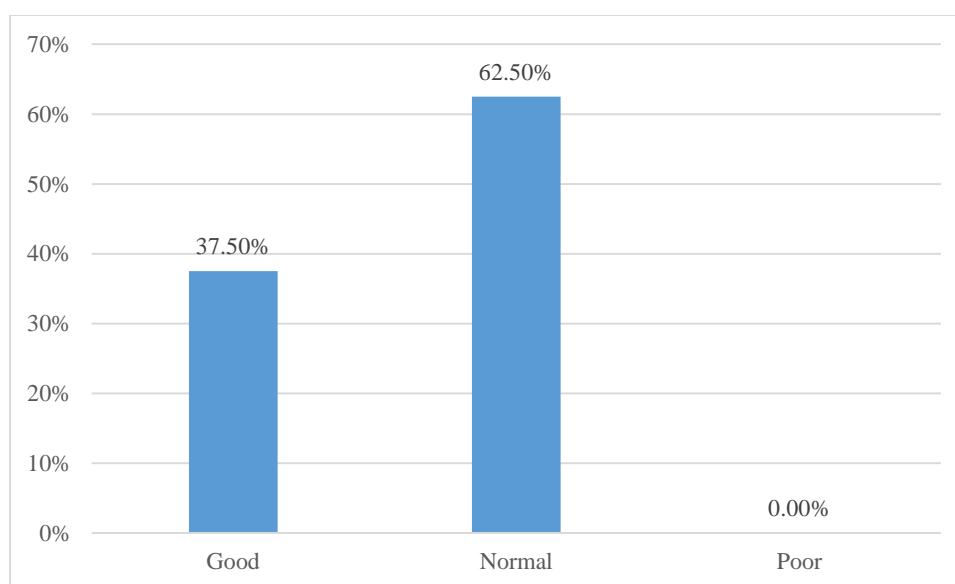
Table 4.12 and figure 4.12 give an idea about teacher skills in using ICT. It is seen in the table and figure that 35.5 % of teachers have good skills in ICT. Similarly, 62.50% of teachers have ordinary skills, and 0% of teachers have poor ability to use ICT. An overall more significant percentage of teachers have normal skills in ICT. Teachers receive regular ICT Skills

Teacher receive regular ICT skills

In the era of the 21st-century, technology has a significant impact on human life; we use ICT in every sector, and education is one of the areas which also have the influence of technology. Advancement in technology results changing in information, so we need to keep updated in the case of teaching with ICT; educational technology upgraded and changed rapidly, so teachers must take regular ICT training to teach students new skills. The government needs to provide training or workshop to make school teacher expert in using education technologies. The trained teacher can enhance student learning performance with new methodologies. Different educational assistive technology has been made for VI learners to use this technology effectively in their teaching-learning workshop, and the teacher needs to provide training. Table 4.13 illustrate teacher receive regular ICT skills or not.

Table 4. 13: Teacher receive regular ICT skills

Response	Frequency	Percent
Yes	5	62.50%
No	3	37.50%
Total	8	100%

Figure 4. 13: Teacher receive regular ICT skills
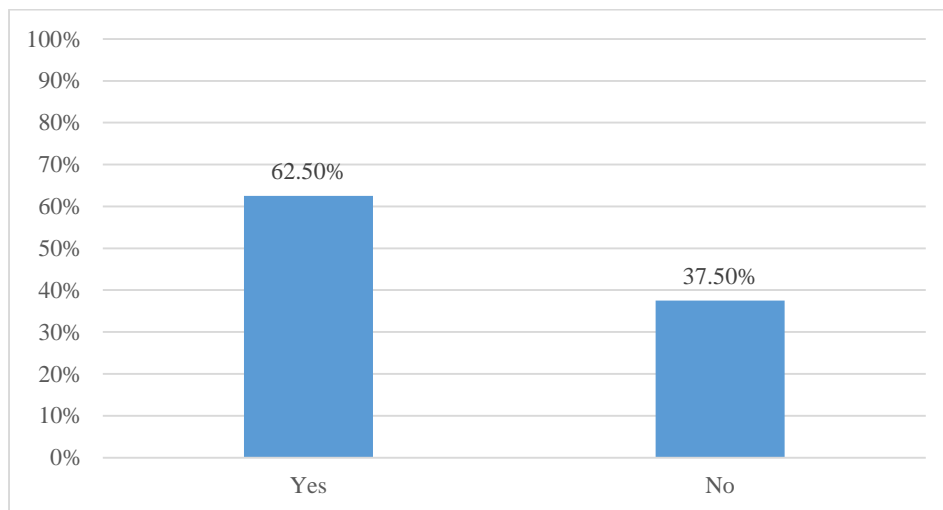
Table 4.13 and figure 4.13 illustrate the number of teachers who acquire regular ICT skills to teach visually impaired students. Astable and figure present, 62.50 % of teachers get regular ICT skills; however, 37.50% of teachers still don't receive regular ICT skills. Hence the majority of teachers receive regular ICT skills. Teacher training and workshop are major factors that affect the visually impaired student learning outcome. The government needs to organize training programs for teachers to teach a student with different disabilities.

Assistive technology is used by school for teaching VIL student

Assistive technology is an ICT tool that is specially designed for helping a student with different kinds of learning disabilities. Many different types of assistive technology support visually impaired learners like window eyes, jaws, TOBIL, daisy, etc. The tables below show assistive technology used by teachers to support the student in schools.

Table 4. 14: Assistive technology is used by school for teaching VIL student

Response	Frequency	Percent
NVDA	8	100.00%
JAWS	0	0.00%
Others Software	0	0.00%
Total	8	100.00%

Figure 4. 14: Assistive technology is used by school for teaching VIL student
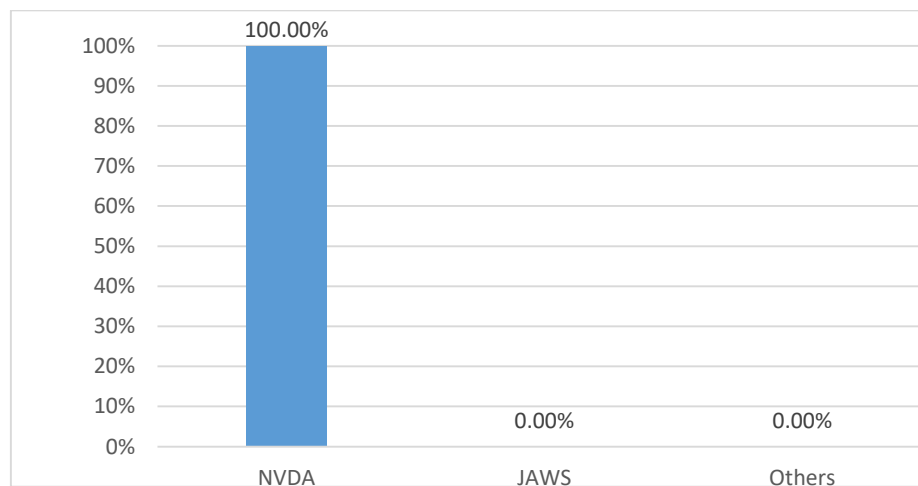
Table 4.14 and figure 4.14 represent the use of assistive technology used for teaching. Table and figure give the idea that all 100 % of schools use NVDA technology for the learner. However, according to the response provided by the student, some students also use JAWS software for learning. NVDA stands for NonVisual Desktop Access, is one of the free and powerful open-source portable screen reader software which enhances the accessibility of students with visual

impairment.Text alternative features area provide by your VIL software for access content

To enhance visually impaired learner accessibility in education, assistive technology provides different services for accessing content. For instance, braille, large print, symbols, etc. The table below shows which assistive technology provides features for access content.

Table 4. 15: Text alternative features provide by VIL software

Features	Frequency	Percent
Large Print	8	100.00%
Braille	8	100.00%
Speech	8	100.00%
Symbols	0	0.00%

Source: Field Survey

Figure 4. 15: Text alternative features provide by VIL software
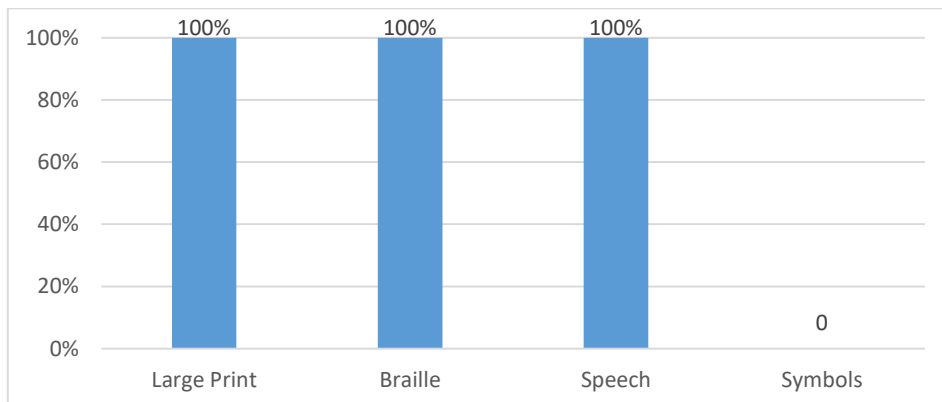
Table 4.15 and Figure 4.15 give an idea about the features provided by their VIL software. Large print, braille, and speech all accounted for 100 % response by the teacher. In a response given by teachers, it is clear that large print, braille, and speech are primary attributes provided by VIL software for making learning more accessible to a student with visual impairment.

Media features provide for content by VIL software teachers response.

Media is a form of communication, which provides different ways of communicating in the community. In VIL software, in response to accessing the content, provide other criteria. The table below illustrates teachers' opinion on which features is provided for content.

Table 4. 16 Media features provide for content by VIL software

Features	Frequency	Percent
Audio only	8	100.00 %
Video only	0	0.00 %
Audio-video	0	0.00 %
Audio video combine with both	0	0.00 %

Source: Field survey

Figure 4. 16: Media features provide for content by VIL software
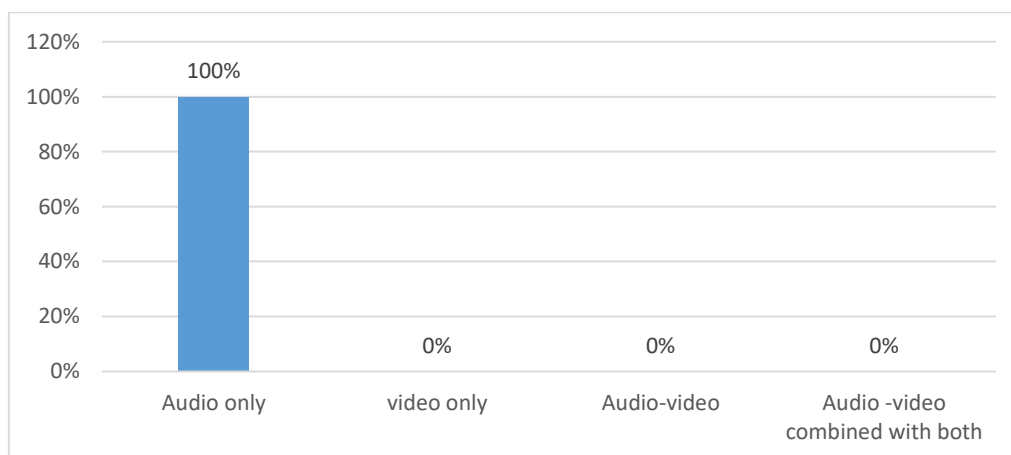
Table 4.7 and figure 4.7 reveal the features provided by VIL software for media. In the opinion of teachers, VIL software only provides audio-only features for accessing content. Audio features are beneficial for visually impaired students among many multimedia features. Software used by students provides synchronized audio for making learning easy.

Table 4. 17: Use of ICT software teacher perception in content access.

SN	Statements	SA	A	N	D	SD	Total	Mean	X^2
7	Display the content in different size & different color make your student easy to access content.	3	2	2	1		30	3.75	8.00
12	VIL software makes text content readable and understandable	2	4	2			30	4.00	4.80
13	VIL software make easier to hear learning content.	3	3	2			33	4.13	5.15
15	Assistive technology provide student enoughtime to read and use content	2	4	2			32	4.00	4.80

Figure 4. 17: Use of ICT software teacher perception in content access.
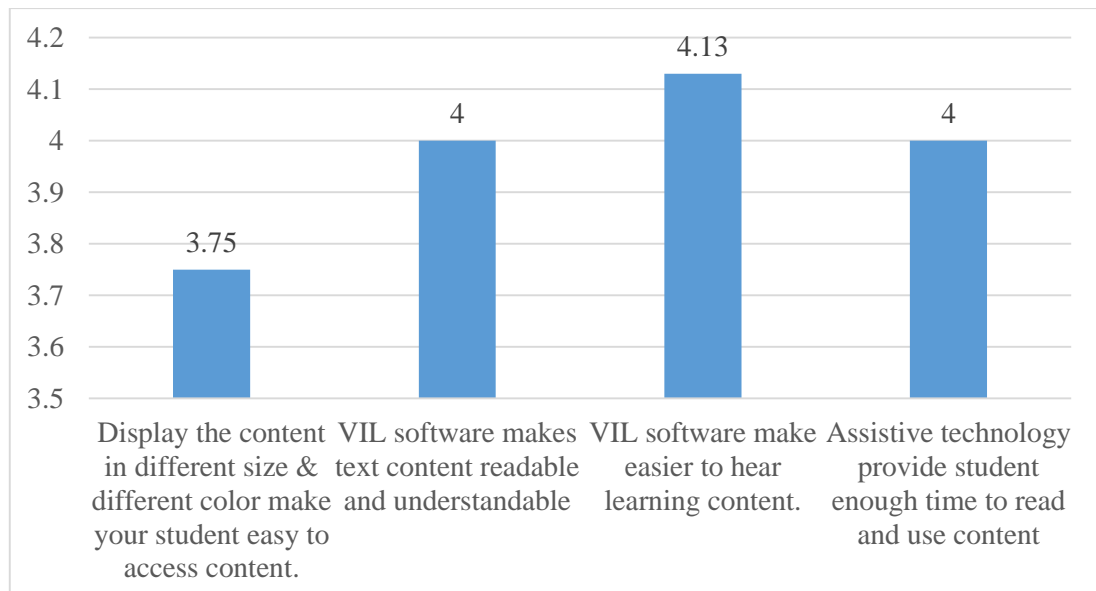
With the analysis of data of table 4.17 in the response of the seventh statement is significant with the X2 value 8.00 at 0.05 level of significance and 37.5 % of sampled teachers are strongly agreed, 25.0% of teachers are agreed, 25.0% of teachers are neutral with this statement, 0% teachers disagree, and 0% teachers strongly disagree with this statement. Hence, most teachers have positive views in the statement of displaying the content in different sizes & different colors, making it easy for students to access the content.

The response of twelve statements is significant with the x2 value 4.8 at 0.05 level of significance, and 62.5% of sampled teachers are strongly agreed, 37.5 % of teachers are agreed, 14.3% of teachers are neutral with this statement, 0% of teachers disagree, and 0% teachers strongly disagree with this statement. To conclude, most teachers have positive views in the statement that VIL software makes text content readable and understandable.

The response of thirteen statements is significant with the x2 value 5.15 at 0.05 level of significance, and 37.5% of sampled teachers are strongly agreed, 37.5 % of teachers are agreed, 25.0% of teachers are neutral with this statement, 0% of teachers disagree, and 0% teachers strongly disagree with this statement. To sum up, it reveals majority of teachers have positive views in the statement that VIL software makes it easier to hear learning content.

The response of fifteen statements is significant with the x2 value 4.8 at 0.05 level of significance, and 25.0% of sampled teachers are strongly agreed, 50.0 % of teachers are agreed, 25.0% of teachers are neutral with this statement, 0% of teachers disagree, and 0% teachers strongly disagree with this statement. To summarizesummarize, it proves that the most teachers havee positive views in the statementthat Assistive technology provides studentsdent enough time to read and use the content.

Table 4. 18: Use of ICT software teachers attitude in using keyboard.

SN	Statements	SA	A	N	D	SD	Total	Mean	X^2
9	VIL software help in typing with keyboard on computer	5	3				37	4.63	8.00
10	Make all functionality available on keyboard help in flexible accessibility	4	2	2			34	4.25	5.87

Figure 4. 18: Use of ICT software teachers attitude in using keyboard.

With the analysis of data of table 4.18 in the response of the ninth statement is significant with the X2 value 8.00 at 0.05 level of significance and 62.5 % of sampled teachers are strongly agreed, 37.5% of teachers are agreed, 0% of teachers are neutral with this statement, 0% teachers disagree and 0% teachers strongly disagree with this statement. Hence, most teachers have positive views in the statement that VIL software help in typing with the keyboard on a computer.

The response of the tenth statement is signed with the x2 value 5.87 at 0.05 level of significance, and 25 % of sampled teachers are strongly agreed, 50 % of teachers are agreed, 25% of teachers are neutral with this statement, 0% of teachers disagree, and 0% teachers strongly disagree with this statement. It has been justified; most teachers have positive views in the statement that Making all functionality available on the keyboard help in flexible accessibility.

Table 4. 19 Teacher perception in ICT support in accessibility.

SN	Statements	SA	A	N	D	SD	Total	Mean	X^2
8	VIL software provides way to help navigate, find content and determine where your student are.	5	3				37	4.63	8.00
11	VIL software help student to avoid and correct mistake.	4	2	2			32	4.00	4.80
14	ICT makes learning easier and accessible than before.	5	3				37	4.63	8.00
16	Assistive technology help you to make your student more understandable than before.	4	4				36	4.50	4.80

Figure 4. 19: Teacher perception in ICT support in accessibility.
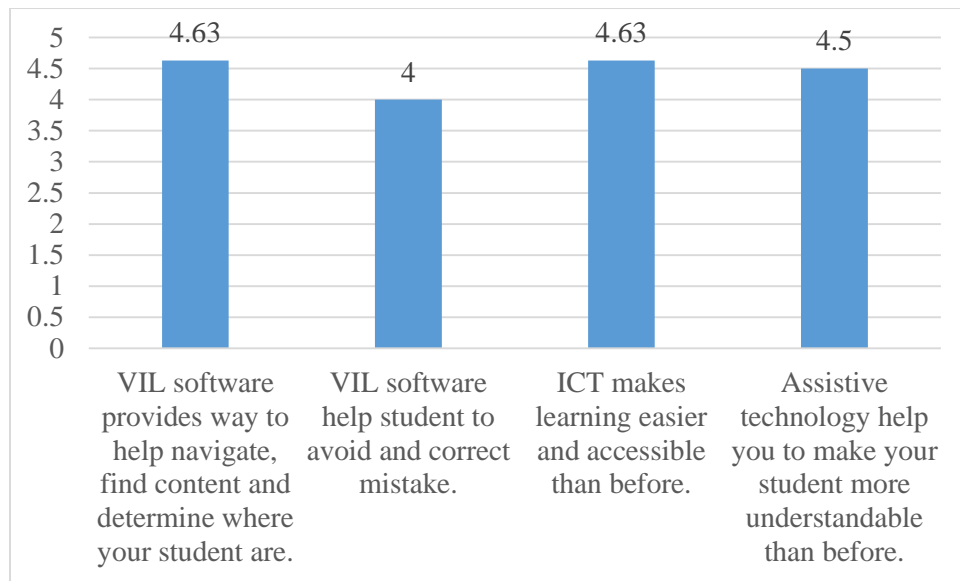
With the analysis of data of table 4.19 in the response of eight statements is significant with the X2 value 8.00 at 0.05 level of significance and 62.5 % of sampled teachers are strongly agreed, 37.5% of teachers are agreed, 0% of

teachers are neutral with this statement, 0% teachers disagree and 0% teachers strongly disagree with this statement. Hence the majority of teachers have positive views in the statement that VIL software provides a way to help navigate, find content, and determine where your student are.

The response of the eleventh statement is signed with the x2 value 4.8 at 0.05 level of significance, and 25 % of sampled teachers are strongly agreed, 50 % of teachers are agreed, 25% of teachers are neutral with this statement, 0% of teachers disagree, and 0% teachers strongly disagree with this statement. It has been justified; the majority of teachers have positive views in the statement that VIL software help student to avoid and correct mistake.
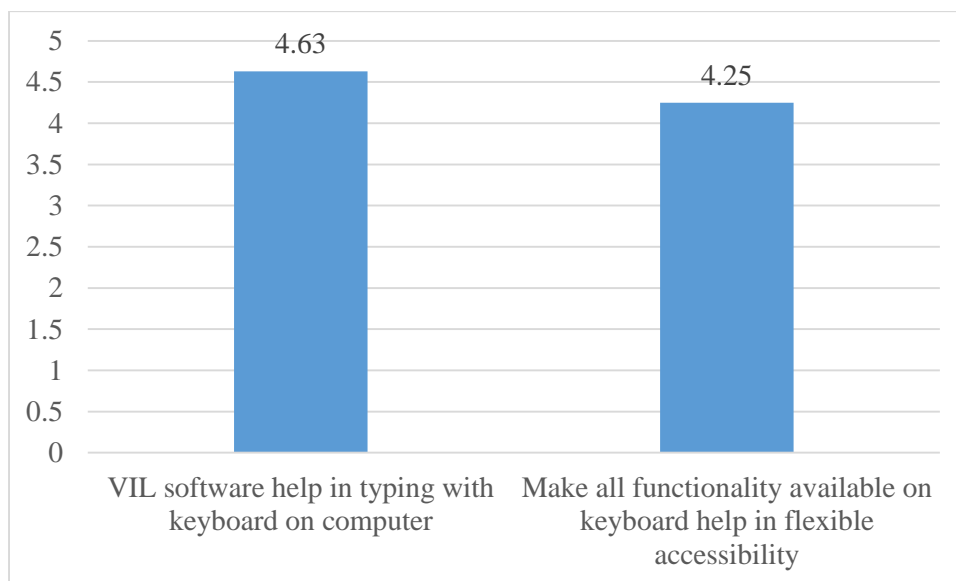
The response of fourteen statements is significant with the x2 value 8.00 at 0.05 level of significance, and 62.5 % of sampled teachers are strongly agreed, 37.5% of teachers are agreed, 0% of teachers are neutral with this statement, 0% of teachers disagree, and 0% teachers strongly disagree with this statement. It has been justified; the majority of teachers have positive views in the statement that VIL software help student to avoid and correct mistake.

The response of sixteen statements is significant with the x2 value 4.8 at 0.05 level of significance, and 50 % of sampled teachers are strongly agreed, 50 % of teachers are agreed, 0% of teachers are neutral with this statement, 0% of teachers disagree, and 0% teachers strongly disagree with this statement. It has been justified; the majority of teachers have positive views in the statement that assistive technology helps you to make your student more understandable than before.

Interview of student and teacher

The interview method of collecting information involves the presentation of oral-verbal stimuli and reply in terms of oral-verbal responses. Cannell and Kahn (1957) have defined the interview as a conversation between two people, which begin with the interviewer collecting data relevant to their research, and focuses on content which is determined an ordinary discussion since it has a specific purpose, it is based on questions asked by the interviewer, and the responses have to be as explicit as possible.

Firstly, I have informed them to notice the nature and the purpose of the interview and then tried to establish an appropriate atmosphere so that they could feel secure to talk freely. As well, I informed them the discussion was going to be recorded. There were 55 students and eight students in my research as a sample; I interviewed with few teachers and students. In the interview, the researcher aims to find out teachers' and students' views of ICT support, most like features, difficulties when using assistive technology, and advice to upgrade ICT for delivering content.

View of students and teachers towards ICT support in learning

ICT has great support in our learning. For instance, in the pandemic situation, due to Covide-19, we are unable to present in a physical classroom; at that time, ICT helps us join the classroom by creating a virtual classroom. We participate in the classroom through the zoom system. We convert a book into an audio file with the help of scanner technology, and we use to listen to this audio file by inserting it into our pen drive. On top of that, it motivates us towards learning; it makes us too easy to access the content. In addition, we also make use of Youtube to learn many things. Besides, we used to search many learning contents in browsers with the help of the internet.

(Student's view)

ICT has considerable support in education, especially in the case of a visually impaired learner; braille is difficult to understand as well learning materials in braille are not sufficiently available. ICT assists students to download books from over the internet as well learn from the internet. They can do their homework with the help of a computer. Students utilize Youtube for their further studies, as well they gain much knowledge from this platform. Overall, the ICT role is remarkable in learning.

(Teacher's view)

Students and teachers likes features in VIL software.

Assistive technology we apply for learning provides many features to support us in learning. Among the verities of features, we prefer those which really make our learning easier. Firstly, we love sound-changing facilities; this system provides three or four types of sound in reading content by software; with these characteristics, we can choose those sounds which make it easy to hear content read by VIL software. Secondly, we use NVDA mostly, and it is freely available. Thirdly, VIL software provides shortcut key attributes; it helps us operate computers faster and effectively.

(Student's view)

Everything in this world has two types of characteristics positive and negative. In regards to positive features, it guides the student with sound to access anything they like. For example, while browsing the book on the internet, their software navigates them where they are. The auto-correction feature is one of the considerable, with this quality student aware when they are typing wrong with their keyboard. A shortcut key feature is also a noticeable feature provided by VIL software. Its great advantage is it increases learning performance of students as well they can perform task fast like other students. On the other hand, ICT makes students lazy to read braille.

(Teacher's view)

Difficulties occurred when using assistive technology.

While using assistive technology for learning, we encounter a variety of problems. For instance, a document written in Nepali font software doesn't read properly. Besides, we also have trouble reading math. Assistive technology has an issue in reading graphs and pie charts. The software doesn't read a document in pdf format effectively, we have to convert it to Word files, and it's tough for us.

(Student's view)

Firstly, transforming VIL students into an ICT environment is one of the major challenges. Because they do not fully know with features provided by their software, students are unable to use the full features provided by their assistive technology. Students with low vision also have difficulties while using magnification software. The pdf file format is not effectively read by VIL software, so it's trouble to convert a pdf to a word file for a visually impaired learner. In regards to reading math, they also have issues.

(Teacher's view)

Chapter-V

Summary, Findings, Conclusion and Recommendation

After the analysis and interpretation of collected data as per the study's design and the research questions, this concluding chapter on attempt has been made to drive a conclusion. This chapter represents the summary of the study with major findings and conclusions. Finally, the last section presents recommendations for future study.

Summary

The study was under taken to examine use of ICT software visually impaired learner. Especially the objective of study were.

1. To examine the use of ICT Software for vision impairment students.
2. To analyze the effectiveness of ICT Software for vision impairment students.
3. To find out the accessibility condition and difficulties while using ICT software for vision impairment students.

The methodological design of the study was descriptive survey type. The population of the study consists of all visually impaired students and teachers who teach VIL of four schools of Kathmandu and Lalitpur district; names of the school are Laboratory H. S. school, Adarsha Saula Yubak Secondary school, Namuna Machhindra school, and Shree Prithvi Narayan secondary school. Fifty-five students and eight teachers were selected for the sample from the above four schools. The purposive homogeneous sampling method is used to achieve the objectives of the study; data and information were collected through questionnaires and interviews. All the information was collected from primary and secondary sources using the dichotomous questions method, Likert method, and interview. There is a five rating scale (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree). The analyses percentage score and test of each statement were determined and interpreted using the conceptual understanding the study developed in literature review with selected theory.

Major Finding of the Study

On the basis of the analysis of data, the following findings are given:

- It found that most visually impaired students and teachers who teach visually impaired students are familiar with ICT assistive technology and ICT support students in regular schooling.

- From the graphical analysis and chi-square test, all statements are significant and maximum students and teachers hold a positive attitude towards using ICT software for visually impaired learners.

- It found that most students and schools use NVDA assistive technology to support visually impaired student learning.

- It found that most VIL uses ICTs for learning from over the internet, such as using YouTube, downloading books, and listing books with the help of ICT software.

- Large print, braille, speech are text alternative features, and audio-only media features are provided by assistive technology to support student learning.

- ICT software motivates, increases their self-confidence, and enhances the learning performance of VIL.

- It founds that ICT makes learning easier and accessible than before.

- Magnification tools and display content in different styles, colors, and sizes enhance the accessibility of low-vision students.

- Auto-correction, all functionality in keyboard, sound while typing, navigating to determine where they are main guidelines which help to enhance the accessibility of VIL towards learning.

- It found that if we use web content accessibility guidelines, 2.0 provided by the world wide web consortium, it supports enhancing visually impaired learners' accessibility in education.

- It found reading Nepali content, learning math, analyzing graphical representation like bar graph and pie chart and pdf reading is common difficulties student experience while using ICT software.

Conclusion

This research study was mainly concerned with investigating the experience of VIL in the use of ICT software for learning. The data have been collected through the questionnaire and interviews from the 55 students and eight teachers.

The finding of this study concluded that the teacher and VI students have a positive opinion in the use of ICT for teaching and learning. Students have believed that ICT software makes learning easy and accessible than before. ICT software encourages students towards learning, and it boosts the learning performance of a student; they can gain information from the internet like sight students with the help of ICT software. While Software and website development must follow web content accessibility guidelines provided by W3C, it have considerable influence in enhancing the accessibility of VI users in modern technology. Besides, there is still some awkwardness while using ICT assistive technology like reading Nepali and math as well hassle in reading pdf documents. If these problems are addressed, VI student achievement will grow. So, the researcher concludes that ICT software for VIL helps the students to become more active in the learning process and reduced lots of educational barriers by providing different features in software. It increases the participation of VI students in the mainstream education system.

Recommendations

From the finding of the present study the researcher suggests the following recommendations.

- A similar study should be done at the regional and national levels to establish the findings.
- Students and teachers should be uplifted to use ICT assistive technology to raise more accessibility in education.
- MOE should need to organize programs by hiring assistive technology experts to make students aware of assistive technology features.
- MOE and NCED should arrange various tanning programs, workshops, and conferences, especially for visually impaired teachers.
- The government recommends Software Company develop software in such a way that it also read the BIOS system of the computer.

- Assistive technology should be developed in such a way that it addresses learning difficulties like math, Nepali, and pdf file reading problem.
- Schools should need to provide ICT friendly environment for visually impaired learners in their classroom as well as in the computer lab.
- MOE should make policies and provisions to enhance the accessibility of visually impaired learners in education.

RecommendationforFurther Studies

Research on a large scale is needed to see if the findings of this investigation can be generated to another such type of schools and colleges so that the following area should be focused on.

- Effectiveness of using ICT software for visually impaired students.
- Use of window eye assistive technology for visually impaired learners.
- Perception of low vision students in magnification ICT software.

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APPENDICES

APPENDIX-1

Dear Students

      I am going to conduct a study on the topic **Use of ICT software for visually Impairment learners** under my respected teacher as well as my thesis supervisor Mr. Arjun Sign Saud Asst. professor of Central Department of CSIT and visiting faculty member of Department of ICT Education TU. Kirtipur, Kathmandhu. This questioner consist of 16 statement related topic. Please study the statement carefully and give your opinion by putting tick on for each statement.

                                 Researher

                                 Suman Subedi

                       Department of ICT Education

                       T.U., Kirtpur, Kathmandhu

1) Are you familiar with ICT assistive technology?

      Yes   ☐   No   ☐

2) Does ICT support you in a regular school?

      Yes   ☐   No   ☐

3) What is your preferred assistive technology?

      ----

4) Do you have any accessibility problem when using assistive technology?

Yes ☐   No ☐

5) Is your assistive technology support magnification (zoom) features?

Yes ☐   No ☐

6) Which text alternative features area provide by your VIL software for access content?   Large Print   ☐

　　Braille   ☐

　　Speech   ☐

　　Symbols   ☐

7) Which media features provide for content by your VIL software?

　　Audio only   ☐

　　Video Only   ☐

　　Audio-video   ☐

　　Audio-video combined with both   ☐

Terms: Strongly Agree (**SA**), Agree (**A**), Neutral (**N**), Disagree (**D**), Strongly Disagree (**SD**)

SN	Statements	SA	A	N	D	SD	Total	Mean	X2
8	Display the content in different size & different color make you easy to access content.								
9	VIL software provides way to help navigate, find content and determine where you are.								
10	VIL software help in typing with keyboard on computer								
11	Make all functionality available on keyboard help in flexible accessibility								
12	VIL software help you to avoid and correct mistake.								
13	VIL software makes text content readable and understandable								
14	VIL software make easier to hear learning content.								
15	Assistive technology provide student enoughtime to read and use content								
16	ICT makes learning easier and accessible than before								

APPENDIX-II

Dear Teachers

I am going to conduct a study on the topic **Use of ICT software for visually Impairment learners** under my respected teacher as well as my thesis supervisor Mr. Arjun Sign Saud Asst. professor of Central Department of CSIT and visiting faculty member of Department of ICT Education TU. Kirtipur, Kathmandhu. This questioner consist of 16 statement related topic. Please study the statement carefully and give your opinion by putting tick on for each statement.

Researcher

Suman Subedi

Department of ICT Education

T.U., Kirtpur, Kathmandhu

1) Are you familiar with ICT assistive technology?

   Yes ☐   No ☐

2) How do you describe your ICT skill?

   Good ☐   Normal ☐   Poor ☐

3) Do you receive regular ICT skills for visual impairment?

   Yes ☐   No ☐

4) Which assistive technology is used by your school for teaching VIL student?

   JAWS   ☐

   NVDA   ☐

   Others   ☐

   Name of others

   ----

5) Which text alternative features area provide by your VIL software for access content?   Large Print   ☐

   Braille   ☐

   Speech   ☐

   Symbols   ☐

6) Which media features provide for content by your VIL software?

   Audio only   ☐

   Video Only   ☐

   Audio-video   ☐

   Audio-video combined with both   ☐

Terms: Strongly Agree (**SA**), Agree (**A**), Neutral (**N**), Disagree (**D**), Strongly Disagree (**SD**)

SN	Statements	SA	A	N	D	SD	Total	Mean	X^2
7	Display the content in different size & different color make your student easy to access content.								
8	VIL software provides way to help navigate, find content and determine where your studentare.								
9	VIL software help in typing with keyboard on computer								
10	Make all functionality available on keyboard help in flexible accessibility								
11	VIL software help studentto avoid and correct mistake.								
12	VIL software makes text content readable and understandable								
13	VIL software make easier to hear learning content.								
14	ICT makes learning easier and accessible than before.								
15	Assistive technology provide student enoughtime to read and use content								
16	Assistive technology help you to make your student more understandable than before.								

APPENDIX-III

Interview Guidelines

1) How does ICT support in your learning?

2) What kind of difficulties occurred when using assistive technology?

3) What kind of features do you like in VIL software?

4) How does ICT support to your student for education?

5) What kind of problem you facing while teaching VIL student using assistive technology?

6) What are the effect of using assistive technology in teaching learning?

APPENDIX-IV

SN	Statements	SA	A	N	D	SD	Total	Mean	X2
8	Display the content in different size & different color make you easy to access content.	12	8	4	10	21	145	2.64	15.33
9	VIL software provides way to help navigate, find content and determine where you are.	35	20				255	4.64	2.68
10	VIL software help in typing with keyboard on computer	30	20	5	0	0	245	4.45	6.93
11	Make all functionality available on keyboard help in flexible accessibility	25	20	10	0	0	235	4.27	4.42
12	VIL software help you to avoid andcorrect mistake.	27	19	5	4		234	4.25	6.08
13	VIL software makes text content readable and understandable	8	12	10	13	12	156	2.84	7.53
14	VIL software make easier to hear learning content.	15	18	5	9	8	188	3.42	16.11
15	Assistive technology provide student enoughtime to read and use content	23	26	6	0	0	237	4.31	8.33
16	ICT makes learning easier and accessible than before	50	5				270	4.91	6.60

APPENDIX-V

SN	Statements	SA	A	N	D	SD	Total	Mean	X^2
7	Display the content in different size & different color make your student easy to access content.	3	2	2	1		30	3.75	8.00
8	VIL software provides way to help navigate, find content and determine where your studentare.	5	3				37	4.63	8.00
9	VIL software help in typing with keyboard on computer	5	3				37	4.63	8.00
10	Make all functionality available on keyboard help in flexible accessibility	4	2	2			34	4.25	5.87
11	VIL software help studentto avoid and correct mistake.	4	2	2			32	4.00	4.80
12	VIL software makes text content readable and understandable	2	4	2			30	4.00	4.80
13	VIL software make easier to hear learning content.	3	3	2			33	4.13	5.15
14	ICT makes learning easier and accessible than before.	5	3				37	4.63	8.00
15	Assistive technology provide student enough time to read and use content	2	4	2			32	4.00	4.80
16	Assistive technology help you to make your student more understandable than before.	4	4				36	4.50	4.80