CHAPTER-II

REVIEW OF RELATED LITERATURE

In the previous chapter the theoretical background pertaining to the present study was discussed. This chapter deals with the review of related literature. The review of related literature is essential to all aspects of research work. According to Koul (2009) research can never be undertaken in isolation of work that has already been done on the problems related to a study purposed by researchers. In this chapter the related literatures reviewed are from different sources namely journals, magazines, periodicals, books, websites & educational survey reports. This has helped the researcher to obtain deep insight and clear perspectives of the problem, formulate hypotheses, select tools and statistical techniques for analyzing the data.

A detailed review of both Indian and foreign studies have been presented under the following headings in four sections namely:-

2.1. Studies related to special education of Hearing Impaired.

2.2 Studies related to Educational Facility and Availability and Usage of Technology in Special school.

2.3 Studies related to Academic Achievement of Students with Hearing Impairment.

2.4 Studies related to Teachers’ Awareness of Assistive Technology
2.1: STUDIES RELATED TO SPECIAL EDUCATION OF HEARING IMPAIRED

Sharma (1997) conducted a study to find out the effectiveness of a modified instructional material in science for teaching difficult concepts to hearing impaired children studying in classes II-V in integrated and special schools. The findings revealed that the adaptation of the instructional material enhanced the level of performance of the subjects with hearing impairment. Children from integrated school were found to perform better than those studying in special schools.

Jarvelin M. R Torkko Maki E., Sorri M. J and Rantakallio P. T (1997) conducted a study to examine the effect of hearing impairment on educational outcomes and employment up to the age of twenty five years in Northern Finland. The association between hearing impairment in adolescence and school performance and the outcome of education was studied among twenty five year old subjects followed since pregnancy in the Northern Finland birth cohort. 395 subjects with abnormal hearing and 977 were selected. Random sample technique was adopted to select. A questionnaire on hearing, school achievement and audiometric screening test were used for data collection. Percentage analysis was used to analyse the data. The results indicated that hearing impairment appears to have effects on both the outcome of education and employment status.

Romona Stein and et al., (2000) attempted to find the adolescents’ with normal hearing attitudes toward their hearing impairment peers. The study was carried out in the state of Ohio. 80 adolescents with normal hearing attending a suburban middle school. Forty were male and forty were female students were selected from seventh and eighth grade classrooms as the sample. Questionnaire was used as the tool. Chi-square was used to analyze the data. Chi-square was used to analyze the data. The result shows that 6% of male and female students from the classroom without hearing impaired agreed with the following statement, “I
don’t like to talk to hearing impaired kids because they sound different”. Two male students 6% from the classroom with hearing impaired agreed with the same statement; All 19 females (100%) but only 78% of the males disagreed with the statement, “My friends with a hearing impaired kid”. Further analysis of responses to this questionnaire item yielded a significant difference in attitudes for students in a classroom with and without a student with hearing impairment. None of the thirty seven students in the classroom without hearing impaired agreed that their friends with normal hearing would laugh at them if they were friends with a student with a hearing impairment. However four of the thirty seven students (eleven percentage) from the classroom with a hearing impaired agreed with the following statement “I would want to wear a hearing aid if I were hearing impaired”. Ninety two percentage of the students from the classroom without hearing impaired agreed with the same statement (thirty four/thirty seven), although fewer females than males agreed. Only thirty two percentage of the students surveyed in either classroom agreed with the statement, “I would only wear a hearing aid if nobody could see it” from the classroom without a student with hearing impairment; All forty students from the classroom with hearing impaired agreed with the following statement, “Hearing impaired kids are as smart as kids with normal hearing”, although all but one male students (thirty six/thirty seven) from the classroom with hearing impaired agreed with the following statement, “Hearing impaired kids do as well in school as normal hearing kids”. Nearly all (thirty six/thirty eight) of the students from the classroom without hearing impaired agreed with the same statement.

Kernan J. Deborah and et al, (2000) undertook an investigation in to the efficacy of using teachers as identifiers of hearing problems. 105 pupils having a mean age of 6.75 years and six first grade teachers with a range of four to twenty nine years of teaching experience formed the sample. Screening Instrument for Targeting Educational Risk (SIFTER) questionnaire was used for the study and children were screened using two portable audiometers.
Audiometric screening data were collected on two separate days, one week and apart, three months into the school year. Of the twenty seven children who were referred overall nineteen failed one or more areas in the SIFTER. Eight children had not shows weakness in any of the five areas probed by the SIFTER. Dividing this population into hits and misses, fifteen of those who were referred for hearing problems had none, had poor SIFTER scores and six did not fail any.

Sari Hakan (2005) conducted a study to see the opinion of deaf students in mainstream Turkish vocational schools. Twenty one students from mainstream schools formed the sample. Semi structured interview techniques which included questions on interaction with teachers, participation in school activities, classroom experiences and relationships with other students were adopted. Content analysis technique was undertaken for in-depth analysis and rich verbal descriptions on the issues faced by students. Result showed that 81% students stated that, in any class, there would be a range of abilities and aptitudes and there were other factors which teachers should bear in mind when preparing and presenting materials for pupils with special education needs; 57% students stated that peer tutoring on the buddy system often operated very informally as children developed friendships within which some of their learning needs were met. 43% had enjoyed school and 67% liked the qualities of their teachers.

Marshal Gentry Mary et al., (2005) conducted a study to examine the effectiveness of multimedia reading materials (pictures, sign and print) in transfer of information to deaf children. Repeated-measure design for single subjects within groups was adopted for the study. Twenty eight deaf students, aged nine to eighteen years from Louisiana and Texas, from integrated main–stream school residential, nonintegrated school were selected. ANOVA was used to analyze the data. The results indicated that comprehension was weakest when the stories were presented in a print-only format, and was found to be strongest when presented in print with pictures.
Kongawad N. B (2007) in his study intended to find out the differences in attitude of parents sending their children with speech and hearing impairment to special schools. Attitude scales to fifty parents of hearing impaired children were administered. Evidence suggested that parents sending their children to integrated schools were more satisfied with social development of their children. The study aimed at assessing attitude of parents of hearing impaired children in special schools and to compare the attitude of the parents sending their children to special schools and sending their children to integrated schools. Fifty parents of the hearing impaired constituted the sample. The investigator adopted purposive sampling for the study. Two attitude scales to assess the attitude of parents of the hearing impaired children sending their children to special schools and parents sending their children to integrated schools were developed. The study indicated that 73% of the parents were unhappy over the non availability of the trained teachers and specialized teaching techniques in the integrated schools. About 60% of the parents were found to be satisfied with the academic progress of their children reading in integrated schools.

Bindu C. M (2007) took up a study on self-concept and socio-personal adjustment of hearing impaired and normal secondary school students. In her study attempted to identify whether there is any significant difference in socio-personal adjustment and self-concept between hearing impaired students. Kerala Self-Concept Scale (Nair, 1980) and Kerala Socio-Personal Adjustment Scale (Nair, 1976) were used for data collection. 323 hearing impaired students and 322 normal students of standard VIII, IX and X from seventeen secondary schools of Kerala state were selected to proportionate stratified sampling method. Test of significance of difference between means of large independent samples (Garret, 1979) was used to analyze the data. The results indicated that significant difference in the mean scores of self concept; social adjustment, personal adjustment and socio-personal adjustment between the hearing impaired and normal students were noticed for the total sample and in the
subsamples of boys. Girls and also in the rural – urban samples; in case of the self-concept of hearing impaired and normal rural secondary school students, no significant difference in the mean scores even at 0.05 level was obtained; out of the twenty comparisons employed, nineteen comparisons indicated significant difference in the mean scores self concept, social adjustment, personal adjustment and also in socio-personal adjustment for the total sample and the relevant subsamples and in all comparisons which yielded significant ‘t’ values advantage of normal children over the hearing impaired was noticed since the higher means were associated with normal children.

Ming Ju Jing (2009) investigated the effect of multimedia stories of deaf or hard of hearing celebrities on the reading comprehension and English words learning of Taiwanese hearing impaired students with respect to identification of the main idea, word pronunciation, listening comprehension, recognition, and lip-reading. Eight elementary students with hearing impairment from Taichung city formed the sample. Means, standard deviations and ANOVA were used to analyze the data. The post-test scores was found to be significantly higher than the pre-test scores in main idea identification. Pre-test scores of English word lip-reading was found to be significantly higher than those of English word listening comprehension and English word recognition. Findings indicated that lip-reading was helpful for hearing impaired students. The post-test scores were higher than the pre-test scores in English word recognition. The post-test scores was found to be higher than the pre-test scores in word listening comprehension, and post-test scores was found to be higher than the pre-test scores in lip-reading.

Ghulam Farooq (2011) took up a study on evaluation of curriculum of vocational subjects for hearing impaired children. Survey method was adopted for the study. Hundred vocational teachers, ten subject specialists in the field of vocational education and sixty hearing impaired students were selected through random technique. The investigator found that the curriculum content of both vocational subjects were not only according to the physical and mental
maturity of hearing impaired but was also helpful in making hearing impaired children supportive and self-reliant members of family and society. The theoretical and practical parts of vocational subjects were relevant to each other and taught at the same time. However, the contents of these subjects were not found to be available in printed or book form.

John Luckner (2012) took up a study to find the competencies needed for teaching hearing impaired students. Survey method was adopted for the study. A national sample of teachers of the hearing impaired, to compare elementary and secondary level teachers’ perception for this study was drawn from the mailing list of members of the conference of American instructors of the deaf. Data were analyzed for 285 teachers, 168 working at the elementary level and 117 working at the secondary level. The Mann-Whitney U test was used for data collection. Elementary teachers felt that working with, education and guiding others was the most important domain, whereas teachers at the secondary level opined that this domain was the least important at secondary level. Secondary level teachers ranked interpersonal skills as the most important domain. Competencies related to teaching language, written language, daily living skills, reading, decision making skills and problem solving skills; teaching academic subjects, promoting emotional development, social skills were all rated high whereas, teaching auditory training, leisure skills and speech received lower ratings.

Monika Saroj and Usha Mishra (2013) studied role of parents in the formation of personality needs of hearing-impaired children and its helpfulness in developing the essential, educational and vocational program, proper methodology of teaching and an effective teaching–learning environment for such children. 165 hearing impaired children (100 boys and 65 girls) and 165 normal children studying in class IX of various school of Kanpur, Agra, Varanasi, Allahabad and Lucknow city formed the sample. Tripathi Personal Preference Schedule by R. R. Tripathi (1973) was used to collect the data. Mean, standard deviation, and ‘t’ test were used to analyze the data. The major
finding of the study indicated that, hearing impaired children had a strong personality need for succorance, aggression, autonomy and achievement and less need for interception, dominance, heterosexuality and nurturance. Hearing impaired boys were found to have a stronger need for autonomy, affiliation, succorance, dominance, change, heterosexuality and aggression than hearing-impaired girls. On the other hand hearing impaired girls had a stronger need for deference, order, abasement, nurturance and endurance than their male counterparts. Hearing impaired children and normal children were found to differ in achievement, exhibition, autonomy, affiliation, interception, succorance, dominance, abasement, nurturance, change, endurance and aggression personality needs. However with respect to deference, order and heterosexuality personality needs, both the groups were not found to differ significantly.

Renuka P (2014) took up a study on relationship between teachers’ awareness of hearing, visual, locomotor and intellectual disabilities of disabilities and their attitude towards inclusion of children with disabilities. The study also examined the relationship between the awareness of teachers on disabilities and their attitude towards the inclusion of children with hearing, visual, locomotor and intellectual disabilities in general schools. 720 teachers from government schools of Chittoor district of Andhra Pradesh state were selected through random sampling technique. Awareness Test and Attitude Scales were used. Mean, standard deviation and coefficient of correlation were used for analysis. The total sample demonstrated moderate level of awareness on hearing, loco-motor and intellectual disabilities and low level of awareness on visual disability. The teachers demonstrated more favorable attitude towards inclusion of children with locomotor disability, less favourable attitude towards inclusion of children with hearing and visual disabilities and unfavourable attitude towards inclusion of intellectual disabled children in general school. A positive correlation was found between the awareness of teachers on hearing, visual and loco-motor disabilities and their attitude towards inclusion of
children with hearing, visual and locomotor disabilities in general schools. But there was a negative correlation between the awareness of teachers on intellectual disability and their attitude to inclusion of children with intellectual disability in general schools. Although the result showed that there was no significant relationship between the awareness of teachers on hearing and visual disabilities and their attitude towards inclusion of children with hearing and visual disabilities in general schools, it was found that a significant relationship existed between the awareness of teachers on loco-motor and intellectual disabilities and their attitude towards inclusion of children with loco-motor and intellectual disabilities in general schools.

Gudyanga E, Wadesango N, Hove Eliphanos and Gudyanga A, (2014) conducted a study on challenges faced by hearing impaired students in regular urban schools of Bulawayo. The study revealed that with communication problems, students experienced feelings of anger, frustration and isolation depending on the environment. It also emerged that there was an opportunity for teachers and other stakeholders to reflect on their school and classroom practices with hearing impaired students and adopt effective strategies of managing them in inclusive secondary schools.

Farahani Ali (2014) took up a comparative investigation about impaired hearing students in integrated and atypical schools and their behavioral characteristics, feeling of loneliness and rejection. Hundred hearing impaired high school students from integrated and atypical schools of Shiraz were chosen as the sample. Ratter Behavioural questionnaire, Children Loneliness Index and Peers Rejection questionnaire were used as the tools of the study. Data were analyzed using 't'-test. The findings showed that there was no significant difference between hearing impaired students in integrated and atypical schools in terms of behavioral characteristics and abnormalities. Also students in integrated schools were found to possess higher loneliness and rejection feelings than students in atypical schools.
Wadesango N. Gudyanga E, et. al., (2014) took up a research study on hearing impairment disability salience in students. Descriptive survey was conducted through structured questionnaires. 26 specialist teachers, 80 regular teachers, five school administrators and 56 students with hearing impairment in Bulawayo urban regular secondary schools were selected randomly. The result of the study revealed urban regular secondary schools were not ready to include hearing impaired students.

Girgin Cem M. et al., (2015) attempted to examine the current status of vocational education programs for hearing impaired students and educational environments of the hearing impaired in Kosovo. The participants in this study included the Deputy Head of the Department of Special Education, the Director of Nene Tereze and teachers of vocational skills, language and sign language, the director and counselor of twenty eight vocational high school and authors of the hearing impaired. The data were collected from quantitative and qualitative tools namely as Manager Interview Form, Teacher questionnaire Form, field notes, audio recordings of interviews and photographs. Descriptive and inductive methods were used in the analysis of the qualitative and quantitative data. Interviews within this progress were recorded by an audio recording device and conducted in the Albanian language. The study found that the hearing impaired students received education in the field of mail and communications as they had greater opportunities for employment in these areas. There were four hearing impaired students and Two sign language teachers provided these students with support of sign language during courses and course notes were prepared.

Nazma Unnisa (2016) studied the awareness about hearing impairment in teacher trainees in their descriptive survey. Thirty teacher trainees from science methodology, from social studies and mathematics methodology each were selected through purposive sampling technique. A test was prepared consisting of thirty items to measure awareness about hearing impairment. It was divided into two parts. ‘t’ test was used to analyze the data. The results
showed that the level of awareness in science methodology teacher trainees were found to just average before they were exposed to the orientation program; the level of awareness about hearing impairment was found to increase considerably in all the teacher trainees of all the methodologies after they were exposed to the orientation programme. Significant differences were found in the level of awareness about hearing impairment among all the teacher trainees of all the methodologies and the change in the awareness level was found to be more in the science methodology teacher trainees followed by mathematics and social studies teacher trainees.

2.2: STUDIES RELATED TO AVAILABILITY AND USAGE OF TECHNOLOGY IN SPECIAL SCHOOLS.

Chandramani M. and Kalavani M (1993) studied the survey of educational facilities available for deaf children. The study found that there was scarcity of vocational teachers in many vocational courses like tailoring, painting and type writing which were taught in many schools.

Titus J (1995) investigated the understanding of the mathematical concept of fractional number among deaf and hard of hearing students as measured by their ability to determine the order and equivalence of fractional numbers. Forty seven students in ten to sixteen years of age, twenty three boys and twenty four girls formed the sample of the study. An interpreter skilled in American Sign Language assisted with the explanation of the directions and the administration of the instrument. Students were grouped by hearing status and age group and follow-up pair wise comparisons using Scheffe’s method was adopted for analysis of the study. The study revealed the older hearing students significantly outperformed other students. No differences were found between the two age groups of deaf and hard of hearing students. No differences were found in the performance of younger hearing students and deaf and hard of hearing students.
Boss (1996) assessed the effectiveness of computer programmes as remedial strategies for overcoming specific learning disabilities. It was found that Computer-based learning resulted in enhancement of performance by 5% in math and 7% English. The experimental group was found to have higher gains than the control group.

Russel Neli et al., (1997) took up a study in United States to find the trends and differential use of assistive technology devices. This report attempted to identify the the prevalence of use of assistive technology devices for hearing, vision, mobility and orthopedic impairments. The study also focused on statistics on trends in the prevalence of use of selected mobility assistive technology devices in 1980, 1990 and 1994. Survey method was adopted and interviews were conducted. Estimates in this report were based on a sample of the noninstitutionalized population of all ages. The data from the National Health Interview Survey on Disability (NHIS-D), was used for this report. The result showed that nearly 7.4 million in the US household population used assistive technology devices for mobility impairments, 4.6 million for orthopedic impairments, 4.5 million for hearing impairments and 0.5 million for vision impairments. Use of any mobility device for all ages had the highest prevalence rate at 28.5 per 1,000 persons. Positive correlation existed between an increase in the age group and use of AT. It was found that sixty five years and over, the rate of device usage was more than four times the rate for the total population.

Riemer-Reiss L. Marti (1999) aimed to study the rate of use and abandonment of assistive technology among disabled college students. Survey was conducted through a questionnaire. The sample consisted of ten graduate students, fourteen seniors, eleven juniors, ten sophomores and eight freshmen. The respondents ranged from eighteen to fifty, with a mean age of twenty seven. Frequency counts were used to analyze the data. The results showed that a total of fifty one devices were abandoned across all domains of home, school recreation, leisure, hearing, vision and mobility. School had the highest
rate of use and second highest rate of abandonment. Mobility domain represented the second largest number of devices used and the largest number of devices abandoned. Findings demonstrated that disabled college students were using assistive technology devices for school and mobility.

Maheshwari and Amrita (2004) took up a study on attention deficit disorder of hearing impaired and normal hearing children. They attempted to find the symptoms of attention deficit disorder in hearing impaired and normal hearing children; to compare the attention deficit disorder in hearing impaired and normal hearing children on the basis of various symptoms; to study the differentiating symptoms of attention deficit disorder in hearing impaired and normal hearing children. Data was collected through a survey using a composite questionnaire. Data were analyzed using by ‘t’ test and chi-square. The result of the study showed that ten symptoms of attention deficit disorder were found in hearing impaired and normal hearing children. They were distractibility, impulsivity, over activity, under activity, non-compliance, attention getting behavior, immaturity, poor school achievement, emotional difficulties and poor peer relationship. And also study reveals that the hearing impaired children were not quite different from the normal hearing children in their attention deficit, because their mean difference is not significant at 0.05 level.

Cassia Cristiane de Freitas Alves, Monteriro et. al., (2006) examined the Assistive Technology (AT) adopted in education of visual impaired students. Descriptive survey method was adopted to public schools in three municipalities of SaoPaolo, Brazil. 134 teachers formed the sample. The study found that 94.8% of teachers did not use information technology with visual impaired students. 70.4% quoted the reason of not having included information technology previously in class, 51.8% reported the lack of specific programs for students with visual impairment, 24.1% expressed that the school administration did not make information technology available for teachers and students, 20.4% had a feeling that visually impaired students did not know how
to use the computer and the belief that the disability did not allow them to use the computer.

Johnstone Christopher, Itman Jason, Timmons Joe and Thurlow Martha, (2009) aimed to understand use of assistive technology in instruction and assessment by students with visual impairments. Thirteen students with low vision and five students who were totally blind, two participants with low vision also having hearing loss and four additional students having one other disability were selected as sample and interviewed. Content of each of the summary documents were analysed for themes that emerged across interviewees. These analyses were done in two phases: i) examining data found in summaries and labeling relevant trends and themes that emerged from summaries; ii) analysis of these interpretations for possible errors and for additional perspectives from anecdotes or other information. 17% of the participants were found to be able to read regular print. Two of them also used audio books to read. Large print readers among participants was 61%. 56% read Braille. 72% of the students also used audio books to access print regardless of their primary method of print reading. Zoom text with audio was also used by eight students who used such technology. Two others used the Braille Sense or Braille Sense Plus and one student used a Braille and Speak. For magnification, students were found to use a variety of technology, from simple handheld magnifiers to computer-based products. Technology used frequently were both Zoom texts and closed-circuit televisions. Seven students used both types of technology depending on the reading situation. Two students used Zoom text one and two students used CCTVs only. Students obtained their reading materials from a variety of sources including the Reading for the Blind and Dyslexic catalog (RFB and D), Book share an Braille Text from a state agency. RFB and D which was used by six students were found to be the most frequently used AT. Book share was used by three students and three students also accessed books from a state agency.
Gronlund Ake, Lim Nena and Lasson Hannu (2010) aimed to find the effective use of assistive technology (AT) for inclusive education in developing countries: and identify the issues and challenges from two case studies. Interviews and observation in Bangladesh and Tanzania was conducted. Twenty eight organizations, thirty two Bangladesh and five international organizations were contacted, giving adequate representative strata like the nature and size of Non Government Organizations. The results of this research threw light on the status quo of the use of AT for inclusive education in developing countries and provided useful guidance to parties who are interested in using AT to achieve inclusive education.

Souza Ana, Kelleher Anmarie, et. al., (2010) conducted a study on multiple sclerosis and mobility-related AT. A systematic review of literature published on Mobility Assistive Technology (MAT) used among persons with Multiple Sclerosis (MS) was conducted. After locating fifty articles that met the initial criteria of providing good evidence of the types of MAT devices and their benefits for individuals with MS, they were evaluated. The study found that within fifteen years of onset, half the percentage of individuals with MS required assistive technology.

Ugwuanyi and Obiyo N.O, (2010) examined the values and challenges of assistive technology for students with hearing impairment in optimizing electronic learning in Enugu. The findings of the study showed that all the students with hearing impairment in Enugu agree that assistive technology are valuable to them in both communication and effective participation in e-learning.

Watson H. Anne, Ito max et. al, (2010) took up a research study to investigate the effect of assistive technology in a public school setting. The study attempted to determine the outcome of AT provided by a multidisciplinary team in helping students aged three to twenty one from preschool to eighth grade. Pre test-post test quasi-experimental design was
adopted. Thirteen participants forming a heterogeneous group of students in one school which newly provided AT to address academic and communication goals in one school year formed the sample. ‘t’ test as well as ANOVA were used for analysis. None of the participants were lost at follow-up and all were found to continue to use AT.

De Souza Lindasay (2012) attempted to find whether personal FM system improves speech perception ability for aided and/or unaided pediatric listeners with minimal to mild and/or unilateral hearing loss. The objective of this study is to critically review the existing literature regarding the success of personal FM system use in improving speech perception ability in hearing impaired children. Computerized databases such as Scopes, Pub Med and Google Scholar were searched. The data were collected from two single subjects with alternating treatments design and one single group with repeated measures design. ANOVA was used for analysis of the data. In a classroom environment with hearing aids alone, participants scored 68.8%, 93.3% correct on average. When using a personal FM system in combination with personal hearing aids, participant scores improved to 86.7%-100% correct on average. The FM device with the use of personal hearing aids demonstrated higher speech perception scores for each participant.

Sajan K.S (2012) studied the availability of assistive software for learning disabled persons. Online data survey was carried out with the help of Google search engine to find out the available software for learning disabled. The list of software thus obtained was then analyzed for their use and cost. A huge number of software were listed and found that an exhaustive survey is quite impossible and only some of the important software was presented in this study.

Manduchi Roberto (2012) took up an experimental study and analyzed the mobile vision as assistive technology for the blind. The system proposed carefully designed, pie-shaped color markers, easily detected by a camera
phone with a minimal amount of computation. The researchers considered three environments that were representative of a variety of realistic indoor situations. This contribution provided an experimental analysis of a sign-based way finding system that used a camera cell phone to detect specific color markers. The result of the study showed the need for the design of technology that facilitates exploration without sight.

Yusuf Olalere Mudasiru, Ayodele Fakomogbon Ayodele and Idris Issa Ahmed (2012) in their study on availability of assistive technology in Nigerian educational institutions adopted survey method. 1115 teachers were selected from seventy primary, secondary and tertiary institutions in Nigeria through purposive sampling technique. Inventory of assistive technological devices in special educational institutions was used. Twenty eight items in the tool focused on assistive technological devices for students with visual disability; eleven items on assistive technology for students with hearing disability; and for students with mental and learning disability there were ten items. The result showed that only 6.41% had adjustable tablets and key guards that were available and functioning, and 93.59% of the schools did not have them. 5.13% had wrists rests, mouth and chin sticks available and functioning, and 94.8% didn’t. Three institutions had video of screen magnification and video of refreshable Braille display. Video of screen reader was found in 2.56% of the institutions, while 97.44% did not have them. Other items such as enhance key board, repeat key, mouse key, bounce key, mouse alternatives or mouse code, speech input or output, overlay key boards, programmable key board, oral computer keyboard, querty keyboard, computer companion or writing tool were found in only 1.28% institutions. Non educational institutions had talking computers representing 74.36%. A large number (25.64%) of the institutions did not have any of those items at all. It was deduced from these results that the institutions do not have necessary assistive technology hardware for the use of students with disability. Results showed that 75.64% of the institutions had computers available and functional. Most of these schools with computers were
found to use them only for administrative purposes. 19 institutions (24.36%) had no computers. Signaling device, telecommunication device, electronic hearing aids for the deaf, adapted doorbell, telephone or sign device, tynpanometer, motion film and amplification were found to be available and functional in only 1.28% of the institutions. Items such as electronic hearing aids, telecommunication device for the deaf and tynpanometers were found to be available but not functional in only one institution. Alerting devices were not available in all the seventy eight institutions. Audiometer was available and functional in only three institutions. The results revealed that computers were available in fifty nine schools representing 75.64% of the institutions surveyed. However, most of the available computers were used for administrative purposes and not for instruction. Models and mock-ups and word processing machines were found to be available and functional in 2.56% of the institutions. Between 96.15% and 98.72% of these devices are not available indicating that most of the assistive technology devices for were not available.

Joel Okutoyi, et al., (2013) took up a case study on support services and resources in regular primary schools with hearing impaired learners in Kakamega country of Kenya. The purpose of the study was to establish support services and resources for inclusion of learners with hearing impairment in class in regular primary schools. The study adopted descriptive survey design. 480 hearing learners were selected randomly while stratified sampling was used to select 109 hearing impairment learners, thirty two teachers and sixteen heads of the schools. Questionnaires and interview schedules were used. Frequency counts and Percentages were used to analyze quantitative data. Qualitative data was organized, put into various categories and reported in an ongoing process as themes and subthemes emerged. The findings revealed that the support services and resources used special needs educational (SNE) teachers and in-service teacher training in SNE.

Ibrahim A. El. Zraigat (2013) took up a study to assess special needs of children with hearing impairment in Jordan and its relation to some variables.
The study was carried out in residential and day schools for hearing impaired children in Jordan. 113 males and 118 females were selected as the sample for the study. Survey was conducted using a scale for special needs of students who are deaf and hard of hearing. ‘t’ test, ANOVA and post hoc test were used to analyze the data. The result showed that the hearing impaired students who have 55-69 db hearing loss were more affected by communication needs, audiological rehabilitation needs and learning style needs than hearing students who have 90 dB and beyond hearing loss. The findings also revealed that the grade groups of two to five and six to eight were more affected than the grade groups of two to five and nine to eleven with respect to the dependent variable of learning style needs. Differences between mean scores of students who used sign language and total communication were found to be in favour of students who used sign language and total communication were found to be in favour of students who used total communication on the dimensions of communication needs, audiological rehabilitation needs, behavioural needs and learning style needs.

Bows Alison, Dawson Alison and Greasley Corinne (2013) studied the cost effectiveness of assistive technology in supporting people with dementia through a literature review. The literature review had included both technology offered through formal services and those for personal or private use. The terms were designed to identify a wide range of assistive technology and to identify any discussion of costs and particularly any systematic cost analysis. Eighty two full texts were examined. They were assessed for relevance for the review and if deemed relevant to the study were then assessed using proforma review tool which collected data regarding the content and conclusions of each item. Checklist assessment criteria formed the basis for Review templates. 73% of texts concerned high technology, referring to information communication technology and electronic components. One third of the applications were found to be portable and a further one third were static, such as fixed elements,
did not have a tangible form or were otherwise difficult to categorize, variously controlled by the user, operated remotely or preprogrammed.

Smith W. D and Staey Kelly (2014) took up a study of literature with AT used by students with visual impairment. The synthesis found 397 articles between 1965 and 2013 that focused on AT within the educational framework. Articles were retrieved if they included the search terms specified and none of the excluded terms.

Rekkedal Mette Ann (2015) conducted a study that aimed at locating factors that promote satisfaction about assistive hearing technologies among students with hearing impairment and exploring predictors that could impact students’ attitudes towards the sound quality of hearing aids; the use of hearing aids and cochlear impact; the use of student-worn microphones and the use of teacher–worn microphones. Children with mild and profound hearing loss between ten and sixteen years old were included in the sample. Data were collected from 153 children who filled the questionnaire- 34.4% by internet-based questionnaire, 46.8% by paper questionnaire survey, and 18.8% through face-to-face interviews. Chi-square was used to analyze the data. The result shows that the students with more severe hearing loss appeared to feel more positively towards hearing aids and cochlear impact than the students with mild to moderate hearing loss. Majority of the students with severe hearing loss and the cochlear impact users constantly were found to wear their personal amplifiers in school; consequently, only the students with mild to moderate hearing loss were evaluated with regard to utilization of hearing aids. The mild to moderate hearing loss group using hearing aids comprised of 46 students. 44% of them irregularly or never wore hearing aids during lessons and breaks, whereas 56% almost always or always used them. The main predictor anticipated to impact the utilization of hearing aids was satisfaction with the sound quality of the hearing aids. Independent variables of gender, age, age of onset with hearing aids, self-description, contact with other deaf and hard of hearing children and participation in courses were presumed to have direct
effects. Girls used hearing aids more regularly than boys but this difference was not significant. Other than the students’ satisfaction with hearing aids and their sound quality, “self description” appeared significant in the bivariate regression analyses.

Duarte Ivone, Costa Santos Cristina et al., (2016) attempted to identify the school failure in students who are normal hearing, deaf with or without cochlear implants. The study was a case-control study which included participants aged eight to eighteen years. In the seven schools twenty four implanted and twenty four non-implanted deaf students were identified as well as twenty four normal-hearing students were selected. The data on the number of school years failed were collected based on the students’ school records. Level of family’s participation in the student’s school life was measured using a Likert scale which was administered to the teachers. While asking for parental consent, a semi-structured interview was administered to collect clinical histories and socio-demographic data. The Graffar Scale was used to determine socioeconomic status. The data were collected during the 2010-2011 school year. Kruskal–Wallis test, Mann-Whitney test and Chi square test were used to analyze the data. The result showed that the greatest differences in achievement levels were found between hearing students and those who were deaf without cochlear implants. The study concluded that Cochlear implants provide educational opportunities for hearing impaired students, yet those without cochlear implants remain at a great disadvantage.

2.3: STUDIES RELATED TO ACADEMIC ACHIEVEMENT OF STUDENTS WITH HEARING IMPAIRMENT

Peterson Ellis Miles (1981) attempted to study the effects of mild hearing loss on academic performance among young school age children. The purpose of this study was to measure the academic performance of children with mild hearing loss by comparing them with a normal control group. Twenty four pairs of children in the first through fourth grades were compared.
The achievement scores of the second and fourth grade student pairs were compared for the current academic year and for the previous academic year. A two way ANOVA was used to compare the achievement scores from the Iowa Test of Basic Skills of the two groups. The results indicated statistical significance on some subtests of the first and fourth grade students’ scores. Hearing impaired group was almost always poorer than the normal control group in every grade. The hearing impaired group’s improvement was usually poorer in most of the subtests.

Fisher M. Rebecca, Fitzgerald Dale Mary and Humes Larry (1981) studied individual education programme assessing the performance of hearing impaired students in a variety of settings. This study was designed for the purpose of investigating the performance of integrated hearing impaired children on a test battery derived from assessment protocols most frequently reported in a survey of special education programs. Subjects were twenty seven integrated hearing impaired pupils enrolled in grades three through ten in a large metropolitan public school district. The ages of the subjects ranged from eight years six months to seventeen years one month, with a mean age of twelve years ten months. Seventeen subjects were females and ten were males. A questionnaire was used to collect the data. A five point scale was used to rate the student on each question. Objective assessment battery was used to analyze the data. Results showed that, for hearing impaired students, excellent language skills are critical for achieving success in mainstream placements. The sixth discriminating variable, subtest level, of the Stanford achievement test, indicated that a general overall level of proficiency was required for integration.

Blair et al., (1985) obtained standardized achievement scores in the areas of arithmetic problem solving, math concepts, vocabulary, and reading comprehension on twenty four matched pairs of first through fourth grade hard-of-hearing and hearing students. The result of the study showed that the hard-of-hearing students were found to have received scores consistent with their
grade level. However, they were found to consistently score below their matched hearing peers.

Allen (1986) studied the academic achievement of Deaf and Hard of Hearing (DHH) students and the research indicated that DHH lag far behind what is expected of their hearing peers at similar grade levels or ages.

Holt (1994) in a report of 58,000 DHH students who took the Stanford Achievement Test during 1989–1990 showed that those attending general education classrooms for more than sixteen hours a week in local schools, scored higher than students who studied in self-contained classrooms.

Holt Judith (1994) took up a study on classroom attributes and achievement test scores of reading comprehension and mathematics computation for deaf and hard of hearing students. Gallaudet University’s Center for Assessment and Demographic Studies collected the data during its 1990 standardization of the Eighth Edition Stanford Achievement. Descriptive and Inferential Statistical Methods were used to analyze the relationships among achievement scores, classroom attributes and demographic factors associated with achievement. The results depicted that inclusion with hearing students in regular classrooms is related to a variety of demographic factors. When reading comprehension and mathematics computation scores are adjusted for these factors, they are higher for the deaf and hard of hearing students in regular classrooms.

Akinpelu (1998) under took an investigation into the academic achievement and self-concept of male and female hearing impaired students in Nigeria. The study aimed to examine the academic achievement and self-concept of male and female hearing impaired students in Nigeria. Purposive sampling technique was adopted to select the sample. The sample consisted of 566 (364 males and 204 females) hearing impaired secondary school students The Adolescent Personal Data Inventory was used to measure self-concept while the respondents and Junior Secondary Certificate Examination results
were measures of their academic achievement. The data were analyzed by using the 't'-test statistical procedure. The findings revealed that male hearing impaired students did not achieve better than their female counterparts. It was also found that the self-concept of male hearing impaired students was not significantly different from that of female hearing impaired students.

Fareo D.O (1998) in his research aimed to study the academic achievement and self concept of male and female hearing impaired students in Nigeria. 364 males and 204 females were selected through purposive sample technique. The adolescent Personal Data Inventory was used to measure self-concept while the respondents and Junior Secondary Certificate examination results were measures of their academic achievement. 't'-test was applied. The findings reveal that male hearing impaired students did not achieve better than their female counterparts. Self–concept of male hearing impaired students was the same as that of the female.

Traxler (2000) revealed that by high school, about 50% of a National sample of deaf and hard of that male hearing students were performing at a below-basic proficiency level in math problem solving and reading comprehension.

Jorgensen Shirley et. al., (2005) in an archival study examined the academic performance of college students with and without disabilities. The aimed to determine whether students with disabilities were at risk, by comparing the academic performance and graduation rates of students with and without disabilities. Case study method was adopted. 653 students with disabilities (hearing impaired- oral-35, sign 16) and 41,350 students without disabilities at a large urban junior/community college in Montreal were selected as sample. ANOVA and ANCOVA were adopted for analysis of data. The result showed that there was no significant main effect for program and the interaction was not significant. Post-hoc testing revealed the same patterns as for social science and for comparisons of all the programs.
McCain G. Kathleen and Antia D. Shirin (2005) undertook an investigation into the academic and social status of DHH students participating in a co-enrolled classroom. They examined the communication participation, academic achievement and social behavior of five DHH students, five hard of hearing students with additional disabilities and eighteen nondisabled hearing peers in a co-enrolled, Grade three-four-five combination classroom. Hard of hearing students were not significantly different from their hearing peers in communication participation and social behavior. Differences existed in academic achievement but hard of hearing students made steady academic progress for over three years. Hard of hearing students were significantly different from their hearing peers but not from their hard of hearing student peers in all areas. The finding adds to the data indicating that co-enrollment is a possible model of inclusion for hard of hearing students and also provides initial data about the functioning of hard of hearing students.

Gallaudet Research Institute (2006) took up a study and reported on the academic status and progress, over a five year period of DHH students attending general education in public schools. The result of the study showed that there was comparatively little information on this subgroup. 44% of deaf and hard of hearing students nationally spent more than 16 hours a week in classrooms with hearing students.

Convertino M. Carol (2009) took up a research study on predicting academic success among deaf college students. The study utilizes data from ten previous experiments, to discern significant predictors of readiness for college and classroom learning at the college level. Academic preparation was a clear and consistent predictor in both domains, but the audio-logical and communication variables examined were not. Communication variables that were significant reflected benefits of language flexibility over skills in spoken language and Sign Language.
Daud Md Khairi et al., (2009) conducted a cross sectional study on fifth standard students of Malaysia to determine the prevalence of mild hearing loss and its association with academic performance among primary school children. Simple random sampling was adopted to select the sample of five schools. Chi-square was used to analyze the data. 234 students out of 257 had completed the examinations. 53% of them were boys while 47% were girls and 85 were from class C while 149 of them were from class A. The prevalence of hearing loss in this school was 15% out of which 32 of them were having conductive type of hearing loss. 38.9% were having problems in both ears. The students who had poor academic performance were shown to be significantly associated with mild hearing losses.

Antia D. Shirin (2009) studied the academic status and progress of deaf and hard of hearing students in general education classrooms from 125 elementary and middle schools. Hearing impaired who had an identified bilateral or unilateral hearing loss, did not have additional severe cognitive disabilities, received direct or consultative service from teachers of hearing impaired or had an individual education plan, attended general education classrooms in public schools for two or more hours each day, and were in grades two to eight at the beginning of the study were included. Only thirty schools had more than one hearing impaired student enrolled in the study. Demographic data, teacher’s ratings of students’ communication, students’ self-ratings of classroom participation and preferred communication mode were used for taken as the data. Normative academic status was measured using standardized achievement tests normally administered as part of the state accountability system. Classroom academic status was measured through a teacher rating scale- the academic competence scale of the social skills rating system. Academic progress was examined on both normative and classroom academic data on math, reading and language or writing. All scores were converted to normal curve equivalents. Results on standardized achievement tests indicated that, over the five year period, 63%-79% of students scored in
the average or above range in math, 48%-63% in reading and 55%-76% in language or writing. The standardized test scores for the group were, on average, half a standard deviation below hearing norms. The teacher’s ratings also indicated that 89% of students made average or above-average progress. Students’ expressive and receptive communication, classroom participation, communication mode and parental participation in school were significantly, but moderately, related to academic outcomes.

Patel Ahmed Mushtaq I (2009) undertook an investigated the effectiveness of Computer Assisted Instruction (CAI) and Audio Programme. This experimental study with a group of students had homogeneity based on intelligence score as measured on standard progressive matrices of Raven’s test. The effectiveness of role of Audio and CAI Programme was tested through comparison of scores obtained on pre test and post test. Each group consisted of thirty students and were selected as a sample adopting purposive random sampling technique, giving adequate representation for each strata like the intelligence of students, methods of teaching namely audio and CAI Programme, and academic achievement of students. ‘t’ test was used to analyze the data. The result of the study showed that the group which was taught unit solar energy-I through CAI programme achieved more than that of the group taught by Audio programme.

Atinmo Ibironke Morayo (2010) took up a comparative study of captioned video and face-to-face instruction in library instruction for secondary school students with hearing impairment adopting quasi-experimental pre-test, post-test control group design. It employed two treatment groups comprising captioned video instruction group and face-to-face instruction group as well as a control group. Three out of the four secondary schools in Oyo state that offer integration education to students with hearing impairment were randomly selected using lot casting. 39 students, 21 male and eighteen female formed the sample. Library Use Instruction Test and Library Practical Use Checklist were used to collect the data. The library practical use checklist was developed to
measure practical achievement of participants in library use. ‘t’ test and ANCOVA were used for analyses of the data. The finding in this study indicates a significant difference in the learning outcomes of participants in face-to-face instruction and control groups.

Fareo D.O (2011) undertook an investigation into self perception and academic performance of students with special needs into mainstreamed public secondary schools in Nigeria. The study investigated the academic performance of male and female students with special needs. The examination records were used for data collection. No difference existed in academic performance of male and female students with special needs.

Mishra, Mryuntunjaya, Singh and Anamika (2012) conducted a comparative study on academic performance of students with hearing impairment studying in special V/s inclusive education. Twelve participants – six inclusive st up and six from special school formed the sample. The result of showed that there is a significant relationship between academic performance and educational set ups. This proved that academic performance of special school is better than inclusive school.

Mohd Yasin Mohd Hanafi, Bari Safani and Mat Hassan Ain Nur (2013) investigated cue speech and language achievement of hearing impaired children. Observation and interviews were adopted for data collection. The sample was randomly selected from cue speech population in Pandan village. Six primary school students who have hearing impairment and used cue speech, four guardians either parent, a teacher who taught Malay language and two teachers who teach other subjects like Mathematics and Music were chosen. Two students each were randomly chosen from fourth, fifth and sixth standard to view their achievement as a whole. The students were capable of interacting and socializing with their classmates; socialization of respondents with their peers found that four out of six respondents had friends other than in school. One student had many friends near home because he plays football in
the evening. Teachers of Malay language stated that students communicate using cue speech and they can find their own group. Mathematics Teachers stated that students were afraid to ask him questions. According to him, students who were good in mathematics would teach students who were weak and usually students understand more when their own friends explain. For music teachers, cue speech students are very friendly because they believe they can speak. Achievement in curriculum was also found to be active. Cue students were active in tawkwondo, badminton, table tennis, running and computers. The students at cue centre were found to be encouraged to actively participate in competitions and co-curricular activities.

Ataabadi Setareh, Yusefi Zahra and Moradi Azam (2013) conducted a study to investigate multiple relationships between emotional intelligence, social skills and self-esteem with academic achievement of deaf or hard of hearing high school students in Isfahan. The study adopted survey method. Fifty one boys and fifty five girls formed the sample of the study. Intelligence questionnaire, Social Skills Inventory and Family communications scale were used to collect the data. Pearson’s correlation coefficient and regression analysis were used for analyzing the data. The result showed that there is meaningful and positive relationship between emotional intelligence and academic achievement while there isn’t meaningful relationship between social skills and academic achievement. It was also found that there is positive and meaningful relationship between family communications and academic achievement.

Arshad Rowena and et. al., (2014) took up a research study to assess the achievement and opportunities for deaf students of United Kingdom, Scotland in order to make use of a longitudinal database which had detailed information about every deaf pupil from 2000-2005. The researcher followed the progress of pupils in the database by using questionnaires on deaf young people who had left school and had close collaboration with their teachers. Results showed that the pupils with any degree of deafness had below average academic score
for the general population, particularly in English and the difference in scores between pupils aged sixteen with mild deafness and profound deafness was minimal. Majority of 16 to 28 year-olds preferred to use English speech to communicate, and only 15% preferred to communicate with British sign language. Percentage of nine with English based singing, which was potentially due to the lack of availability of sign language in mainstream schools, where the majority of deaf pupils were educated. Teachers had not always informed the child’s poor literacy skills their parents and neither did they always have high any high expectations for deaf pupils.

Kumari Archana and Bhatt Ankita (2014) designed a study to find the academic and intellectual self concept of hearing impaired children. 100 school going children out of which fifty were boys and fifty girls in each category in the age group of twelve to seventeen years were selected from special school for hearing impaired children using purposive sample technique. Researcher prepared questionnaire consisting of twenty four questions in academic self-concepts and twenty six questions in intellectual self concept was used for data collection. Mean, standard deviation, coefficient of correlation and ‘t’ test were used for analysis of the data. The result showed that the correlation between academic self concept and intellectual self concept was highly significant at 0.05 level. No significant difference was found between academic and intellectual self concept in boys and girls. The effect of loss of hearing was found to equally affect their academic and intellectual self concept irrespective of their gender. There was no significant difference between academic and intellectual self concept with respect to age. The academic and intellectual self concept of twelve to sixteen years old hearing impaired children was similar to the academic and intellectual self concept of seventeen to twenty years age group.

Gulhane Gajanan (2014) took up a study on visually and hearing impaired students and their academic achievement. The purpose of the study were to identify students with disabilities especially the visually and hearing
impaired in the primary schools; to find out the problems faced by the students especially the visually and hearing impaired; to compare the academic achievements of boys and girls especially the visually and hearing impaired in language and elementary mathematics; to know the parental attitude towards academic achievement of the children with disabilities especially the sensory and mobility impaired. Survey method was used for this study. 200 government and aided primary schools, forty each from five districts; 480 boys and girls with disabilities especially the visually and hearing impaired from forty schools and parents were selected by random sample technique. The investigator prepared a check list to inquire about educational facilities available for disabled students in the institution for the collection of the data and a separate achievement test was constructed to measure the scholastic performances of the students with disabilities in language and elementary mathematics. Different inferential statistical techniques and percentage were used for the analysis of the data. The results showed that only 6.25% boys and 7.89% girls with hearing impairment obtained above 81% whereas 48.61% boys and 45.61% girls obtained scores below 41% in language and mathematics. The poor academic performance was attributed to their teachers not playing sufficient attention towards progress of those children and low awareness of parents about lip movement. Teachers were also found to hesitate to teach students with disabilities due to lack of knowledge about such students with disabilities. Significant difference between academic achievement of boys and girls with hearing impairments were not found in Amaravathi division. Significant difference existed between academic achievement of boys and girls with visually impaired and hearing impaired at 0.05 level of significance in Amaravathi division.

Marschark Marc (2015) conducted a study on predicting the academic achievement of DHH students from individual, household, communication and educational factors. Woodcock-Johnson three subtests in passage comprehension, mathematics calculation, science and social studies was
considered for data collection and was obtained from 500 hard of hearing secondary students who had attended regular secondary schools or state-sponsored special schools designed for hard of hearing students. Multilevel linear regression analyses was used for analysis of the data. Across all subject areas, having attended regular secondary schools and having better spoken language were associated with higher test scores. Significant negative predictors of achievement varied by type of subtest but included having an additional diagnosis of a learning disability, having a mild hearing loss and being African American or Hispanic. The result showed that the academic achievement of deaf and hard of hearing students across the curriculum is related to a complex array of factors relating to the students themselves, their family environments and their school experiences.

2.4: STUDIES RELATED TO TEACHERS’ AWARENESS OF EDUCATIONAL TECHNOLOGY

Lesar Sharon (1998) studied the current status and training needs for use of assistive technology with young children with disabilities. The purpose of this study was to provide state-of-the-art descriptive information regarding concerns, preparation needs and perceived barriers to the use of assistive technology for young children with disabilities. Surveys were completed by sixty two early childhood special education professionals in two southeastern states. The findings indicated that respondents had frequent and significant concerns about their knowledge and utilization of assistive technology. Furthermore, training areas were identified that address the concerns and barriers to assistive technology.

Nancy J. Maushak et. al., (2000) examined the current attitudes and knowledge of pre-service teachers towards assistive technology and to develop, implement, and evaluate a mini-workshop on assistive technology to better prepare regular classroom teachers for the inclusive classroom. A pre-post survey design was used to collect the data. 168 students enrolled in a computer
applications course for elementary teachers formed the sample. A mini-workshop on assistive technology was presented by experts in the field. Data was analyzed to determine impact of the mini-workshop on attitude and knowledge and to detect differences based on completion of a diversity course, having a disabled family member and having a disabled friend. Results indicated a continued need to include assistive technology under the broader umbrella of technology in teacher preparation programs.

Anderson L Cindy (2001) studied the impact of technology use in special education field experience on pre service teachers' perceived technology expertise. The study intended to measure changes in the awareness of pre service teachers concerning technology for students with disabilities. A pre test-post test survey collected data on awareness of the types of instructional technology available for students with disabilities; ability to integrate technology into the classroom; knowledge of the operation of computers and peripherals; knowledge of technology available for assessment, and extent of dissemination of new knowledge to colleagues. Results of this study indicated that participation in a technology-rich field experience increased the likelihood that pre-service special educators will perceive an increase in knowledge concerning the appropriate use of technology for students with disabilities to facilitate student learning and the use of technology as a teacher tool.

Michaels A. Craig et. al., (2001) attempted to identify the assistive and instructional technology for college students with disabilities. The purpose of the study was to study the perceptions of post secondary service providers to students with disabilities-referred to as Disabled Student Service (DSS) providers-about assistive and instructional technology accessibility and delivery throughout post secondary institutions in the United States. Results from this study indicated that DSS providers feel that both faculty and DSS providers have achieved a degree of awareness and knowledge of assistive technology (AT). However, the achievements in developing AT expertise are
significantly lower than the importance assigned to possessing this knowledge. Costs of technology and upgrades were perceived as the greatest barriers while the expertise of DSS staff, student awareness/knowledge of AT, and administration's support and funding of AT were perceived as potential factors that might facilitate AT access.

Michaels A. Craig and McDermott (2003) took up a research study on assistive technology integration in special education teacher preparation and program coordinators' perceptions of current attainment and importance. Two questions framed this research. The first focused on how AT knowledge, skills, and dispositions are currently integrated (the Current Attainment Level), and the second focused on how AT should ideally be integrated (the Importance). All paired ‘t’ tests between Current Attainment Level and Importance were statistically significant (p < .01 for factors and p < .001 for individual items) and substantively meaningful (large effect sizes, mostly > .8). Qualitative analysis focused on understanding potential strategies for promoting the integration of AT knowledge, skills, and dispositions; the barriers to AT integration. The findings have important implications for future practices in special education teacher preparation.

Ashton M. Tamarah (2004) took up a survey of assistive technology awareness, use and training among special education staff. Data were collected from 356 special education personnel employed by a large (36,000 students) suburban school district located in Northern California. It was found that specific AT items with which they were familiar, were available to them, were being used by students, and/or were desired as a group speech language pathologist (SLP). SLPs also reported having the largest number of items available to them (18%), while resource specialists reported the fewest (10%). Low tech items dominated the top of the list for items known, available and used by students in the past year. Overall, most well known were pencil grips, calculators, highlighters, slant boards and FM amplifiers. Most available were calculators, highlighters, font size adjustments, objects used for communication
and slant boards. The items most used by students included calculators, grips, slant boards, highlighters, FM amplification and the use of real objects for communication. Staff were quite sparing in the number of items they checked as desired (14%). Desired devices were evenly split between high and low tech items. They reported wanting electronic books, pencil grips, adapted paper, talking word processors, alpha smarts, highlighters, stand alone electronic spell checkers and accessible math software. Several teachers added a comment about needing a computer before software or training.

National Center for Technology Innovation and Center for Implementing Technology in Education (CITE) (2004) undertook an investigation into the assistive technology planner. They surveyed state department of education leaders, district personnel, building administrators, special education teachers, parents, and students. Data was collected through phone interviews, online surveys, case studies of state practices. The work resulted in a "top ten list" of findings and a toolkit for schools, the Assistive Technology Planner: From IEP Consideration to Classroom Implementation. Assistive Technology (AT) policies, guidelines, and technical assistance documents were circulated in the majority of states in the nation. However, teachers reported having little or no knowledge of those state guidelines and 54% of teachers did not have any Individualized Education Programs (IEPs) with AT-specific guidelines. Assistive Technology was most often reported in use for students in grades three to six and most often (20% or more of the students in the category) for students diagnosed with mental retardation, orthopedic impairments, learning disabilities, or speech/language impairments. AT was used most often in the schools for communication and education assistance. A variety of service delivery models were found across the country, from trained AT teams to building or district representatives to regional AT centers. No single service delivery model was found to be most prevalent. Professionals providing AT services most often described their primary responsibilities as assessing and evaluating students on AT and training
students, teachers, and families. AT professionals rarely identified their responsibilities as including evaluating classroom implementation, collaborating with the IEP team, or ordering equipment. In IEP meetings, AT was most often considered as a modification or accommodation. When AT was recommended, in over 70% of the meetings the acquisition of the equipment was assigned to one of the team members and student training on the equipment was recommended. Occupational therapists were seen by other collaborating professionals as having the highest level of AT expertise, second only to AT specialists. Teachers and parents in individual interviews reported that the school or district was supportive in their efforts to get AT for their students and that they had access to the technology that they needed. Teachers and parents also reported that they valued AT expertise being available in the school or district to help with providing information, troubleshooting, training, implementation support, and acquiring equipment. Positive effects and powerful anecdotes of AT use were reported throughout the interviews with teachers, parents, and students. Students most often cited increased independence as a direct function of their work with AT. Teachers continued to request more training on general awareness of AT and help staying current with available technologies. Teachers also reported that they did not use or have AT implementation plans or guidelines to guide and monitor implementation once AT is recommended in an IEP. Taken together, the data from this multi-year research project shows an uneven profile of expertise, training, and monitoring of AT use across the country. Positive effects were associated with AT use, and parents and teachers felt that they had the technology and support they needed. While there is expertise available in schools and districts, teachers and parents continue to feel that they need additional training on basic awareness and options. Left out of this database, however, are the reflections of students, parents, and teachers who are not working with an IEP.

Lynette Bigelow Diane (2008) took up a study on assistive technology for students with learning disabilities in writing: beliefs, knowledge and use of
assistive technology. The instrument modified from a previous instrument created by Parker (2006) was used to measure use of instructional software. The survey was conducted with a random sample of 112 teachers from the population of over 18,000 special education teachers in Ohio. Means and range were used to analyze the data. The results revealed that special education teachers value the use of technology but had limited experience using assistive technology for students with learning disabilities in writing. About half of the respondents listed one or two types of assistive technology they have used including a wide range of assistive technology. As teachers were asked what would encourage further use of assistive technology, the largest percentage suggested they needed more training and increased resource availability. The next largest percentage expressed that they would use assistive technology if student need prompted it. It was also noted that 28.4% of participants said they would use assistive technology if their students needed it. The remaining concerns of teachers noted through this research included: more time, small class sizes, limitations of assistive technology, and seeing the assistive technology as a distraction to students. Nearly 95% of the respondents agreed or strongly agreed that technology brings value to student learning. While few respondents who stated that they had no experience or training using technology, 10.5 percent had no experience using technology to include students with learning disabilities and nearly thirty percent had no experience using AT for writing. A significant number of respondents had no experience with AT in the current instrument. One-fourth to one-third of the respondents had no experience with four of five categories. Only 8.3 percent responded that they had no experience with spell checker/thesaurus/grammar checkers. Almost 95% agreed or strongly agreed that technology is valuable to student learning. However, more than one-fourth of them had no experience with assistive technology. Comparisons were made between year of most recent college courses taken and beliefs and use of technology. A correlation was found between year of most recent college courses and the value teachers believed technology brought to their students. In particular, the more recently a
participant had taken a course, the more likely they were to strongly agree that technology brought value to students. Comparisons were also made between years of teaching experience and beliefs and use of technology. A negative correlation was found between years of teaching experience and the value teachers believed technology brought to their students. Specially the less years of teaching experience the participant had, the more likely they were to strongly agree that technology brought value to students. When comparisons were made between years of teaching experience and belief that organizational/outline programs help students with learning disabilities learn the curriculum more efficiently, a negative correlation was found. This correlation indicated that the less years of experience a participant had, the more likely they were to strongly agree that organizational/outline programs were beneficial. When the remaining data were compared there was no further evidence of correlation between variables.

Atchison and Bradley Tilman (2008) ventured to analyze the attitudes and knowledge of special education professionals towards Assistive Technology as an accommodation on accountability assessments. The methodology consisted of survey to measure the attitudes and knowledge of educators and special service providers on this subject. The survey was conducted through a five point Likert scale compressed of ten items designed to measure attitude and ten items designed to measure knowledge. Ten survey respondents were selected as the sample for the study using in depth interviews. Pentadic analysis, a method of Rhetorical analysis designed by Kenneth Burke (1945) was used to analyze the data. Survey results indicated that the knowledge and attitudes scores between the two groups were similar, however regression analysis identified a significant increase in the attitude scores of employees of the special education cooperative as they gained work experience. Scores of employees of district employees did not increase on either scale as participants gained work experience. Analysis of interview data provided rich description of participants knowledge and attitudes concerning
the use of AT as an accommodation and enabled the researcher to identify
significant similarities and differences between groups of employees and the
state standards to guide their decision making on this subject.

Rafeedali E (2009) studied the computer based technology and its
pedagogical utility. A survey through questionnaire was conducted. 150
teachers of higher secondary schools from Malappuram district of Kerala were
selected through stratified random technique, giving adequate representation to
strata like gender. Percentage analysis was used to analyze the data. The result
of the study showed that most of the higher secondary school teachers had
basic computer knowledge. Among the higher secondary school teachers
female teachers were found to use computers more for educational purposes
than male teachers.

Alkahtani D.F and Keetam (2013) in their study focussed on teachers’
knowledge and use of assistive technology for students with special educational
needs. Objective of the study was to gather information about assistive
knowledge and skills among teachers. Survey method was adopted for the
study. A total 127 participants responded to the online survey from different
geographical region. Data were primarily collected through questionnaire
survey. A two part self reporting questionnaire was distributed utilizing web-
based technology via online survey website. The questionnaire was divided
into two parts. The first part of the questionnaire collected participants’
demographic information and consisted of six items. The second part consisted
of thirteen items designed to assess teachers’ use and knowledge level of
assistive technology. Interviews were also conducted with three participants to
gather data of greater breadth and depth to the analysis of the data gathered
from the survey. Mean scores, standard deviations, frequencies and percentages
were used for the analysis of the data. The findings from this study indicate that
the lack of knowledge and skills of using assistive technology is a critical issue,
with over ninety-three of respondents reporting they were poorly prepared or
not at all prepared to provide assistive technology services for students with
disabilities in their schools. Unfortunately more than half of the participants were found to hold a neutral attitude toward using assistive technology to enable students to access the curriculum. The results of the study also imply that professional development was needed by more than eighty-four teachers, and it was concluded that training might influences their use of assistive technology in classroom.

Joan Robert D.R (2013) examined the relation between web learning awareness and academic achievement of future teachers. The purpose of the study was to study the significant difference between gender, locality, religion on web learning awareness and the correlation between web learning awareness and academic achievement. 140 future teachers from Kanyakumari district formed the sample. Web learning awareness scale and the marks from college record was used to collect the data. ‘t’ test and correlation were used to analyze the data. The study found that male and female students did not differ significantly in web learning awareness. Rural and urban students did not differ significantly in web learning awareness. Hindu, Christian and Muslim students were not found to differ significantly in web learning awareness. The correlation between web learning awareness and academic achievement was not found significant. Verbal interpretation showed that the correlation between web learning awareness and academic achievement was found to be negligible.

Brady Erin, Thies William and Cultrell Edward (2014) examined the use and non use of assistive technologies. Thirty two visual impaired formed the sample of the study. Questions about the appropriate ways for technology use among people with visual impairments were framed. They focused only on the users of assistive technology and how having access to assistive technology has impacted their lives and does not delve into the reasons for non-use or the impact that non-use might have. Findings in this field tend to be limited to faculty development and need assessment focus, technological interventions appeared scattered, vague, incomprehensive and non specific and pre-service teachers comfort level of AT in inclusive classroom were found to be low.
Burgos B. Besty (2015) examined assistive technology competencies of specialist in public schools. The study adopted descriptive method of research. It employed a self-administered online survey and a semi structured phone interview. 39 assistive technology specialists from the five regions representing professionals from rural and urban areas formed the sample. Mean, standard deviation and percentages were used to analyze the data. The results of the perceived knowledge revealed an ‘average’ level of expertise. Participants revealed that their perceived knowledge in assistive technology was high with the majority of responses landing just under ‘above average’ expertise (36.85%) following the ‘expert’ category with 32.74%. Most respondents (54.29%) believed that they were ‘experts’. Respondents reported the lowest levels of knowledge regarding ergonomic principles, with 5.88% reporting ‘below average’ expertise.

An overview of the related studies reviewed with respect to Special Education of Hearing Impairment, Educational Facilities, Availability and Usage of Technology in special schools, Academic Achievement of Students with Hearing Impairment and Teacher’s Awareness of Assistive Technology is presented in table No. 2.5.
Table No.2.1: Table showing an overview of the related studies reviewed with respect to the variables.

<table>
<thead>
<tr>
<th>Section</th>
<th>Variable-wise studies</th>
<th>Studies</th>
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<tbody>
<tr>
<td>2.2</td>
<td>Studies related to Educational Facilities and Availability and Usage of Technology in Special Schools</td>
<td>Chandramani M. and Kalavani M (1993); Titus J (1995); Boss (1996); Russel Neli et al., (1997); Riemer-Reiss L. Marti (1999); Maheshwari and Amrita (2004); Gronlund Ake, Lim Nena and Lasson Hannu (2010); Cassia Cristiane de Freitas Alves, Gelse Beatriz Martins Monteriro et. al., (2006); Johnstone</td>
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<td><strong>2.3</strong> Studies related to Academic Achievement of Students with Hearing Impairment</td>
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<td>Peterson Ellis Miles (1981); Fisher M. Rebecca, Fitzgerald Dale Mary and Humes Larry (1981); Blair et al., (1985); Allen’s (1986); Holt (1994); Holt Judith (1994); Akinpelu (1998); Fareo D.O (1998); Traxler (2000); Jorgensen Shirley et. al., (2005); McCain G. Kathleen and Antia D. Shirin (2005); Gallaudet Research Institute (2006); Convertino M. Carol (2009); Daud M md Khairi et. al., (2009); Antia D.Shirin (2009); Patel Ahmed Mushtaq I (2009);</td>
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<tr>
<td>2.4</td>
<td>Studies related to Teacher’s Awareness of Assistive Technology and Educational Technology.</td>
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- Lesar Sharon (1998)
- Anderson L Cindy (2001)
- Michaels A. Craig et. al., (2001)
- Michaels A. Craig and McDermott (2003)
- National Center for Technology Innovation and Center for Implementing Technology in Education (CITE) (2004)
- Lynette Bigelow Diane (2008)
- Atchison and Bradley Tilman (2008)
- Alkahtani D.F and Keetam (2013)
- Joan Robert D.R (2013)
- Brady Erin, Thies William and Cultrell Edward (2014)
- Burgos B. Besty (2015)
Conclusion:

The review of related literature reveals that researches have been conducted on developing instructional strategy for the impaired and studying its effectiveness. Review of research indicates that AT has had a positive impact on students’ learning (Kober, 1991; Sivin–Kachala and Bialo, 1993). Studies also reveal that it is how teachers adapt and utilize the technology that makes a difference and not the technology itself. The effect of AT on student with disabilities were positive, reaching the potential requires knowledge on the part of the user (Merbler, Azar and Ulman, 1998). As demonstrated in this review, more people use AT to compensate for mobility than any other type of impairment. Other AT in wide use are hearing aids and back braces.

Studies have also been conducted on the Availability and Usage of Technology in schools for special children. The review of the literature indicated paucity of research effort to link these variables with the education of the hearing impaired children in the Indian context. The studies point to special needs but do not specify for classroom practice.

A bulk of studies reviewed in the earlier pages reveals that a few researchers have focused on the field of Assistive Technology as a major area for research. However, many of the studies were focusing on knowing the effectiveness of the newer AT and their application to the field of special education. The review reveals that there were no studies reported on the Academic Achievement of Students in relation to Teacher’s Awareness of Assistive Technology, it’s Availability and Usage in Schools for Hearing Impaired Children. This is true in the case of India and other foreign countries as well. Thus, the present research is a humble attempt to fill the existing research gap.