

## APPLICATION OF ASSISTIVE TECHNOLOGY FOR SELF-RELIANCE OF THE VISUALLY CHALLENGED: A STUDY

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### ABSTRACT

Paper furnishes the use of various assistive technology by the visually challenged students studying various courses in the higher educational institutions in Karnataka. Responses have been sought from the visually impaired students through formal interview schedule as to the extent of the use of the Learning Resource Centers and the extent of familiarity with the assistive technology. The study also focuses on the need for orientation programmes or the training programmes for effectively handling hardware and software products made available to the visually challenged user communities. The extent of training requirement is also depicted

**KEYWORDS** :Visually Challenged, Assistive Technology; Library Facilities, Blind Students; Learning Resource Centre, Visually Challenged.

#### **INTRODUCTION**

'Assistive Technology' means, any product, that is used to increase or monitor functional capacities of individuals with disabilities. Assistive Technology consists of hardware, software and services that help people with disabilities to achieve greater independence and to enhance the quality of their lives. Visual Impairment is no more an impediment to pursue the subject of their choice. Presently the technology solutions have opened up a new world of exploration, experimentation and effective implementation of skills, knowledge, in the fields of their choice. It could be, arts, science and commerce. The opportunities that were blocked from ages are gradually turning into source of information, as well as self reliance



and e-resources come handy while studying, research, practice and also helpful for innovations at times. The assistive technology plays a major role in providing inclusive Library and Information Services to students with special needs and embracing the same in educational institutions would contribute in making the concept a great success. Inclusive Library Services is now propagated by the Government and is now mandatory for educational institutions to set facilities for students with all disabilities as outlined by National Mission on libraries so that the students can easily support their learning process and compete with the non-disabled peers.

The objectives of the study are to ascertain the extent of the use of various hardware and software products by the visually challenged students studying various courses in higher educational institutions in the state of Karnataka and the training requirement for the efficient use of the technology.

As regards the methodology of the study, the investigator has personally visited the higher educational institutions and libraries that are extending library and information services to the visually challenged students and research scholars. Responses were obtained from the 801 visually challenged students for the closed end interview schedule. The data thus obtained have been tabulated, analyzed and interpreted to arrive at the valid findings.

## USE OF ASSISTIVE TECHNOLOGY FOR READING BOOKS AND JOURNALS:

P		Visual Im	pairment	Gender	Gender		l	<b>T</b> 1
Respon	Responses		Total	Male	Female	UG	PG	Total
No Frequency Percentage		126	240	154	212	346	20	366
		42.7%	47.4%	51.0%	42.5%	45.2%	55.6%	45.7%
Frequency		169	266	148	287	419	16	435
res	Percentage	57.3%	52.6%	49.0%	57.5%	54.8%	44.4%	54.3%
Total	Frequency	295	506	302	499	765	36	801
Percentage		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test sta	Test statistics		•	CV= .083		CV= .043	•	$X^2 = 5.944$
Test statistics		P=.196		P=.019		P=.224		P=.015

## Table 1. Use of book readers for reading books and journals

Table 1 shows responses of on the use of book readers for reading books and journals. The responses reveal that 435 visually challenged students representing 54.3% use book readers such as SARA, ANGEL and so forth for reading books. Among the respondents, 366 representing 45.7% have offered negative response regarding the use of book readers. Both low vision and fully blind students rely upon book readers and the number and percentage is 169(57.3%) and 266 (52.6%) respectively. Thus, a large percentage of students use book readers to refer and read text-books and journals.

	Turk			iced cent			ading	
D		Visual Im	pairment	Gender	Gender		l	m ( 1
Respon	ises	Partial	Total	Male	Female	UG	PG	I otal
No	Frequency	228	416	246	398	622	22	644
No Percentage		77.3%	82.2%	81.5%	79.8%	81.3%	61.1%	80.4%
Vac	Frequency	67	90	56	101	143	14	157
res	Percentage	22.7%	17.8%	18.5%	20.2%	18.7%	38.9%	19.6%
	Frequency	295	506	302	499	765	36	801
Total Percentage		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test statistics		CV=.060 P=.090	£	CV= .021 P= .558	*	CV=.105 P=.003	*	$X^2 = 296.09$ P=.000

### Table 2.Converting printed text in to soft copy for reading

Table 2 shows responses regarding habit of converting text in to soft copy for reading. Among the respondents, 157 representing 19.6% do convert printed text in to softcopy for reading. However, a large majority of the visually challenged students are not in the habit of converting printed text in to soft copy for reading. The segment of respondents who have given negative response amounts to 644

	Table 3. Getting braille printout of printed text for reading											
D		Visual Im	pairment	Gender		Education		T ( 1				
Respon	ISES	Partial	Total	Male	Female	UG	PG	lotal				
Frequency		262	449	282	429	679	32	711				
Percentage		88.8%	88.7%	93.4%	86.0%	88.8%	88.9%	88.8%				
Frequency		33	57	20	70	86	4	90				
168	Percentage	11.2%	11.3%	6.6%	14.0%	11.2%	11.1%	11.2%				
Total	Frequency	295	506	302	499	765	36	801				
Percentage		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%				
Tost sta	Test statistics		CV=.001		CV=.114			X <sup>2</sup> =481.44				
	Test statistics			P=.001		P=.981		P=.000				

students. It may also be due to lack of scanning facility at the centers and the library.

Table 3 depicts the responses regarding braille print out of the texts for reading. Among the respondents, 90 representing 11.2% take print out for reading and future reference. A large majority do not rely upon braille print out and this segment of students account for 88.8% represented by 711 students. Gender-wise responses shows that more of girl students, 70 (14%) take print out of Braille text than boys 20 (6.6%).

D		Visual Im	pairment	Gender		Education	l	m / 1
Respon	ISES	Partial	Total	Male	Female	UG	PG	lotal
No	Frequency	279	494	288	485	739	34	773
INU	Percentage	94.6%	97.6%	95.4%	97.2%	96.6%	94.4%	96.5%
Vas	Frequency	16	12	14	14	26	2	28
105	Percentage	5.4%	2.4%	4.6%	2.8%	3.4%	5.6%	3.5%
Total	Frequency	295	506	302	499	765	36	801
	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test statistics		CV=.080	•	CV=.048		CV=.024	•	$X^2 = 692.91$
Test statistics		P=.023		P=.172		P=.491		P=.000

## Table 4. Converting printed text in to braille script for reading

Table 4 reveals response regarding converting printed text and e-version of the text in to braille for reading. The data reveals that only 28 respondents representing 3.5% is in the habit of converting print/ electronic text in to braille for reading as well as preservation of matter for future reference. Due to intervention of assistive technology, since the recent past, visually challenged students become accustomed to the technology and drop the processes of learning to use Braille script and Braille text. A large number of respondents in the study is not in the habit of converting print / electronic text in to Braille. This segment of respondents account for 96.5% represented by 773 students. The negative response is also due to lack of facilities in the centres to get the text converted in to Braille script.

<b>EXTENT OF FAMILIARITY IN USING A</b>	SSISTIVE TECHNOLOGY: HARDWAR

D		Visual Im	pairment	Gender		Education	l	m ( 1
Responses		Partial	Total	Male	Female	UG	PG	lotal
Not at all	Frequency	267	474	266	475	711	30	741
Not at all	Percentage	90.5%	93.7%	88.1%	95.2%	92.9%	83.3%	92.5%
Clicktly	Frequency	18	18	24	12	32	4	36
Slightly	Percentage	6.1%	3.6%	7.9%	2.4%	4.2%	11.1%	4.5%
Madarata	Frequency	6	6	8	4	11	1	12
Moderate	Percentage	2.0%	1.2%	2.6%	0.8%	1.4%	2.8%	1.5%
ILinh	Frequency	4	8	4	8	11	1	12
HIgh	Percentage	1.4%	1.6%	1.3%	1.6%	1.4%	2.8%	1.5%
Total	Frequency	295	506	302	499	765	36	801
	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test statistics		CV= .069 P=.279		CV= .151 P= .000		CV=.078 P=.184		X <sup>2</sup> =1948.888 P=.000

Table 5. Extent of familiarity in using Prisma Magnifier

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Table 5 Presents extent of respondents familiarity is using prisma magnifier. Among the respondents,60 (7.5 %) are familiar with the use of prisma magnifier. A large majority of the respondents are unfamiliar. This segment of respondents is represented by 741 (92.5%) students. However, the data in the table vindicates that among the students who are familiar with use of prisma, higher percentage of P G students are familiar when compared to the U G students. Among the students who have offered positive response 7.1 % are U G students and 16.7 % are of P G students. Many of the respondents who have offered positive response are familiar to a little extent only.

		Visual Im	pairment	Gender	Gender			Total	
Responses		Partial	Total	Male	Female	UG	PG	Total	
Not at all	Frequency	273	474	270	477	716	31	747	
Not at all	Percentage	92.5%	93.7%	89.4%	95.6%	93.6%	86.1%	93.3%	
Slightly	Frequency	4	14	12	6	15	3	18	
Singinuy	Percentage	1.4%	2.8%	4.0%	1.2%	2.0%	8.3%	2.2%	
Madamata	Frequency	13	11	16	8	22	2	24	
Moderate	Percentage	4.4%	2.2%	5.3%	1.6%	2.9%	5.6%	3.0%	
Iliah	Frequency	5	7	4	8	12	0	12	
nign	Percentage	1.7%	1.4%	1.3%	1.6%	1.6%	0.0%	1.5%	
Total	Frequency	295	506	302	499	765	36	801	
	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	
Test statistics		CV=.078 P=.179		CV=.141 P=.001		CV=.099 P=.050		$X^2 = 1990.775$ P=.000	

## Table 6. Extent of familiarity in using zoomex

Table 6 Furnishes the extent of familiarity with use of zoomex equipment which can render both visual and audio interface. Among the respondents, 54 representing 6.7% have expressed that they are familiar with the use of zoomex. A large majority of them are not familiar with zoomex equipment which helps in capturing video with audio and further editing process. Again among the students comparatively more of P G students are familiar when compared to U G students. Among the P G

Responses		Visual Im	pairment	Gender		Education	1	
Responses		Partial	Total	Male	Female	UG	PG	Total
Not at all	Frequency	274	469	268	475	713	30	743
NOT at all	Percentage	92.9%	92.7%	88.7%	95.2%	93.2%	83.3%	92.8%
Clichtler	Frequency	4	14	12	6	15	3	18
Singhtiy	Percentage	1.4%	2.8%	4.0%	1.2%	2.0%	8.3%	2.2%
Madanata	Frequency	7	11	12	6	17	1	18
Moderate	Percentage	2.4%	2.2%	4.0%	1.2%	2.2%	2.8%	2.2%
High	Frequency	0	0	0	0	0	0	0
High	Percentage	0%	0%	0%	0%	0%	0%	0%
Varyhiah	Frequency	10	12	10	12	20	2	22
very nign	Percentage	3.4%	2.4%	3.3%	2.4%	2.6%	5.6%	2.7%
Total	Frequency	295	506	302	499	765	36	801
	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test statistics		CV=.055 P=.496		CV= .133 P= .003		CV= .098 P=.053		$X^2 = 1961.452$ P=.000

students, 8.3%(3) are slightly familiar and 5.6%(2) are moderately familiar.

Table 7. Extent of familiarity in using bonita mouse

Table 7 shows that extent of familiarity with the use of bonita mouse with audio and video interface. A large majority is not familiar with the use. However, 58 respondents representing 7.2% are familiar with the use. As regards the extent of use, 18(2.2%) are slightly familiar, another 18(2.2%) respondents have expressed that they are moderately familiar and 22(2.7%) are familiar to an higher extent. Considering the level of education of the respondents, higher percentage of P G students are familiar with use of Bonita mouse than the Under Graduate Students.

D		Visual Im	pairment	Gender		Education	1	
Responses		Partial	Total	Male	Female	UG	PG	lotal
Not at all	Frequency	20	31	16	35	48	3	51
Not at all	Percentage	6.8%	6.1%	5.3%	7.0%	6.3%	8.3%	6.4%
Slightly	Frequency	24	24	24	24	46	2	48
Singhuy	Percentage	8.1%	4.7%	7.9%	4.8%	6.0%	5.6%	6.0%
Madamata	Frequency	163	282	176	269	431	14	445
Moderate	Percentage	55.3%	55.7%	58.3%	53.9%	56.3%	38.9%	55.6%
TT: - 1-	Frequency	87	158	78	167	230	15	245
High	Percentage	29.5%	31.2%	25.8%	33.5%	30.1%	41.7%	30.6%
Vory High	Frequency	1	11	8	4	10	2	12
very nigh	Percentage	0.3%	2.2%	2.6%	0.8%	1.3%	5.6%	1.5%
Total	Frequency	295	506	302	499	765	36	801
	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test statistics		CV=.100 P=.089	•	CV=.125 P=.014	•	CV=.099 P=.100	•	X <sup>2</sup> =841.316 P=.000

## Table 8. Extent of familiarity in using SARA book reader

Table 8 presents responses regarding to extent of the use of SARA Book Reader. Among the visually challenged respondents, a large majority comprising of 750 members representing 93.6% have expressed that they are familiar with the use of SARA Book Reader. A small segment comprising of 51

students are not familiar with the use which account for 6.4% in the entire population of respondents. Regarding the extent of familiarity, 257 respondents representing 32.1% are familiar with the use of SARA Book Reader in the higher range. Another segment of 445(55.6%) respondents are familiar with its use to a moderate extent. Further, 48(6.0%) respondents have expressed that they are familiar to little extent. From this data, it is inferred that a large percentage of visually challenged students is familiar with SARA Book Reader which account for 93.6% in the entire population of respondents in the study. Again considering the level of education, higher percentage of Post Graduate students are familiar with the use of SARA Book Reader than Under Graduate Students.

D		Visual Im	pairment	Gender		Education		T ( 1
Responses		Partial	Totally	Male	Female	UG	PG	Iotal
Not	Frequency	44	104	42	106	142	6	148
at all	Percentage	14.9%	20.6%	13.9%	21.2%	18.6%	16.7%	18.5%
01: - 1-41	Frequency	4	2	4	2	6	0	6
Slightly	Percentage	1.4%	0.4%	1.3%	0.4%	0.8%	0.0%	0.7%
Madausta	Frequency	178	321	202	297	477	22	499
Moderate	Percentage	60.3%	63.4%	66.9%	59.5%	62.4%	61.1%	62.3%
TT:-1	Frequency	61	75	50	86	129	7	136
High	Percentage	20.7%	14.8%	16.6%	17.2%	16.9%	19.4%	17.0%
VoruLiah	Frequency	8	4	4	8	11	1	12
very High	Percentage	2.7%	0.8%	1.3%	1.6%	1.4%	2.8%	1.5%
Total	Frequency	295	506	302	499	765	36	801
	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test		CV=.133		CV=.108		CV=.034		X <sup>2</sup> =1006.622
statistics		P=.007		P=.052		P=.924		P=.000

Table 9. Extent of familiarity in using cell phones with internet connectivity

Table 9 furnishes the extent of familiarity with the use of phones with internet connectivity by the visually challenged students. It is encouraging to note that a large majority of the visually challenged respondents are familiar with the use of cell phones with internet connectivity. Among the respondents, 753 representing 91.5% are familiar with the use of cell phones with internet connectivity. Only 148 respondents representing 18.5% are not familiar with the use of cell phones with internet connectivity. As regards the extent of familiarity, 499(62.3%) respondents have expressed that they are familiar with the use to a moderate extent for reading and further, 148(18.5%) respondents are familiar with the use in the higher range. Thus it is inferred that a large majority of the visually challenged students are familiar with the use of SARA Book Reader. Among the respondents who are good in handling SARA Book Reader, higher percentage of students are studying Post Graduate Courses.

D		Visual Im	pairment	Gender		Education	1	
Responses		Partial	Total	Male	Female	UG	PG	Total
Not at all	Frequency	263	478	274	467	710	31	741
Not at all	Percentage	89.2%	94.5%	90.7%	93.6%	92.8%	86.1%	92.5%
Slightly	Frequency	0	0	0	0	0	0	0
Singinuy	Percentage	0%	0%	0%	0%	0%	0%	0%
Madamata	Frequency	4	8	4	8	11	1	12
Moderate	Percentage	1.4%	1.6%	1.3%	1.6%	1.4%	2.8%	1.5%
High	Frequency	8	10	8	10	16	2	18
підп	Percentage	2.7%	2.0%	2.6%	2.0%	2.1%	5.6%	2.2%
Vour II ab	Frequency	20	10	16	14	28	2	30
very High	Percentage	6.8%	2.0%	5.3%	2.8%	3.7%	5.6%	3.7%
Total	Frequency	295	506	302	499	765	36	801
	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test statistics		CV=.125 P=.006		CV=.068 P=.292		CV=.059 P=.433		$X^2 = 1947.809$ P=.000

Table 10. Extent of familiarity in using plex talk daisy recorder

Table 10 depicts the extent of familiarity with the use of plex talk daisy reader. Among the visually challenged student respondents a large majority has expressed unfamiliarity with the use of plex talk. Among the respondents, 741(92.5%) have stated that they are unfamiliar with the use of plex talk daisy reader. However, 48 respondents have opined that they are familiar with the use of plex talk to the higher extent which account for 5.9% in the entire population of respondents. Considering the level of education, higher percentage of respondents who are studying P G courses are familiar with the use than the students studying U G Courses.

Pesnonses		Visual Im	pairment	Gender		Education		Total
Responses		Partial	Total	Male	Female	UG	PG	
Not at all	Frequency	259	429	272	416	658	30	688
Not at all	Percentage	87.8%	84.8%	90.1%	83.4%	86.0%	83.3%	85.9%
Slightly	Frequency	0	6	4	2	4	2	6
Singinuy	Percentage	0.0%	1.2%	1.3%	0.4%	0.5%	5.6%	0.7%
Moderate	Frequency	0	9	6	3	9	0	9
wiouerate	Percentage	0.0%	1.8%	2.0%	0.6%	1.2%	0.0%	1.1%
High	Frequency	25	39	12	52	62	2	64
nigli	Percentage	8.5%	7.7%	4.0%	10.4%	8.1%	5.6%	8.0%
Very	Frequency	11	23	8	26	32	2	34
High	Percentage	3.7%	4.5%	2.6%	5.2%	4.2%	5.6%	4.2%
Total	Frequency	295	506	302	499	765	36	801
	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test statistic	28	CV=.108		CV= .154		CV= .125		$X^2 = 2187.221$
		P=.052		P=.001		P=.014		P=.000

## Table 11. Extent of familiarity in using tactile touch pad

Table 11 shows extent of familiarity with tactile touch pad. Among the respondents, 113 of them representing 14.1% are familiar with the use of tactile touch pad. A large segment of respondents are unfamiliar with its use. As regards the extent of use, 97 respondents representing 12.2% are familiar to the higher extent and 6(0.7%) of the respondents are familiar to a little extent. Only 9(1.1%) of the respondents have stated their familiarity to a moderate extent.

Daamamaaa		Visual Im	pairment	Gender		Education		Total
Responses		Partial	Total	Male	Female	UG	PG	
NT- 4 - 4 - 11	Frequency	260	458	266	452	688	30	718
INOT at all	Percentage	88.1%	90.5%	88.1%	90.6%	89.9%	83.3%	89.6%
Clichtler	Frequency	15	9	16	8	20	4	24
Slightly	Percentage	5.1%	1.8%	5.3%	1.6%	2.6%	11.1%	3.0%
	Frequency	2	31	12	21	31	2	33
Moderate	Percentage	0.7%	6.1%	4.0%	4.2%	4.1%	5.6%	4.1%
TT' 1	Frequency	14	6	8	12	20	0	20
nıgıi	Percentage	4.7%	1.2%	2.6%	2.4%	2.6%	0.0%	2.5%
Voru High	Frequency	4	2	0	6	6	0	6
very High	Percentage	1.4%	0.4%	0.0%	1.2%	0.8%	0.0%	0.7%
Total	Frequency	295	506	302	499	765	36	801
	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test statistics		CV=.200 P=.000		CV=.124 P=.015		CV=.111 P=.043		$X^2 = 2430.117$ P=.000

Table 12.Extent of familiarity in using refreshable braille display board

Table shows On the whole we find that a large majority of 89.6% of the respondents did not have the familiarity in using refreshable braille display board, followed by 4.1% of them had moderate extent of familiarity, 3.0% of them had slight familiarity, 2.5% of them with high familiarity, and remaining 0.7% of them had very high familiarity. Chi-square test revealed a significant difference between these groups of frequencies (X2=2430.117; P=.000), having not at all responses maximum.

Visual impairment status had significant association with the responses, where we find that partially blind respondents had higher familiarity than totally blind respondents (CV=.200; p=.000). Gender-wise comparison revealed that male respondents were more familiar than female respondents (CV=.124; p=.015) and lastly, education wise comparison indicated that those with PG background had higher familiarity than those with Under Graduate background.

## EXTENT OF FAMILIARITY IN USING ASSISTIVE TECHNOLOGY: SOFTWARE

Responses		Visual Impairment		Gender		Education		Total
		Partial	Total	Male	Female	UG	PG	
Not	Frequency	28	54	14	68	77	5	82
at all	Percentage	9.5%	10.7%	4.6%	13.6%	10.1%	13.9%	10.2%
Slightly	Frequency	21	15	10	26	36	0	36
	Percentage	7.1%	3.0%	3.3%	5.2%	4.7%	0.0%	4.5%
Moderate	Frequency	127	231	160	198	346	12	358
	Percentage	43.1%	45.7%	53.0%	39.7%	45.2%	33.3%	44.7%
ILiah	Frequency	96	124	82	138	205	15	220
нıgn	Percentage	32.5%	24.5%	27.2%	27.7%	26.8%	41.7%	27.5%
Very	Frequency	23	82	36	69	101	4	105
high	Percentage	7.8%	16.2%	11.9%	13.8%	13.2%	11.1%	13.1%
Total	Frequency	295	506	302	499	765	36	801
	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test statistics		CV= .		CV=.174		CV=.088		$X^2 = 420.030$
		P=.		P = .000		P=.188		P=.000

### Table 13. Extent of familiarity in using Kurzewell OCR reading software

Table 13 projects the extent of familiarity with the use of kurzwell OCR reading software. Among

the respondents, an overwhelming majority of respondents opine that they are familiar with the use of kurzwell OCR scanning software. 721 respondents representing 89.8% are familiar and just 82(10.2%) of the respondents have offered negative response. Further, 325(40.6%) respondents are familiar to the higher extent, 358 representing 44.7% are familiar to a moderate extent and just 36(4.5%) of them are familiar to a little extent. Higher percentage of P G students are familiar with the use of kurzwell software than Under Graduate students in the higher range. 15(41.7%) of the Post Graduate students are familiar to an higher extent.

Responses		Visual Im	pairment	Gender		Education		Toto 1
		Partial	Total	Male	Female	UG	PG	10(41
Not at all	Frequency	0	0	0	0	0	0	0
Notatali	Percentage	0%	0%	0%	0%	0%	0%	0%
Slightly	Frequency	6	6	6	6	10	2	12
	Percentage	2.0%	1.2%	2.0%	1.2%	1.3%	5.6%	1.5%
	Frequency	42	66	16	92	102	6	108
Widdelate	Percentage	14.2%	13.0%	5.3%	18.4%	13.3%	16.7%	13.5%
TT: 1	Frequency	57	129	60	126	180	6	186
High	Percentage	19.3%	25.5%	19.9%	25.3%	23.5%	16.7%	23.2%
Voryhigh	Frequency	190	305	220	275	473	22	495
very nign	Percentage	64.4%	60.3%	72.8%	55.1%	61.8%	61.1%	61.8%
Total	Frequency	295	506	302	499	765	36	801
	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test statistics		CV=.076		CV= .214		CV= .080		X <sup>2</sup> =654.326
		P=.198		P=000		P=.163		P=.000

Table 14. Extent of familiarity in using JAWS Talking software

Table 14 shows the extent of familiarity with the use of JAWS Talking Software. It is important to note that all the visually challenged student respondents in the study are familiar with use of JAWS software. None of the students among 801 respondents has offered negative response. To be specific, 495 respondents representing 61.8% are familiar to the full extent and 186(23.2%) are familiar to the higher extent. Further, 108(13.5%) have opined that they are familiar to a moderate extent and only 12(1.5%) of the respondents that they are familiar to a little extent. All the categories of visually challenged students are good in using JAWS pro talking software which is said to be most important and popular among the screen reading software all over the world.

		Visual Impairment		Gender		Education		Total
Responses		Partial	Total	Male	Female	UG	PG	
Not at all	Frequency	28	84	4	108	108	4	112
Not at all	Percentage	9.5%	16.6%	1.3%	21.6%	14.1%	11.1%	14.0%
Clichtly	Frequency	12	6	12	6	16	2	18
Slightly	Percentage	4.1%	1.2%	4.0%	1.2%	2.1%	5.6%	2.2%
Madamata	Frequency	27	73	38	62	96	4	100
Widderate	Percentage	9.2%	14.4%	12.6%	12.4%	12.5%	11.1%	12.5%
Iliah	Frequency	198	301	218	281	477	22	499
nıgn	Percentage	67.1%	59.5%	72.2%	56.3%	62.4%	61.1%	62.3%
Vouvhich	Frequency	30	42	30	42	68	4	72
very nign	Percentage	10.2%	8.3%	9.9%	8.4%	8.9%	11.1%	9.0%
Total	Frequency	295	506	302	499	765	36	801
	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test statistics	•	CV= .159	)	CV= .296		CV= .054		$X^2 = 928.419$
i est statistics		P=.000		P= .000		P=.678		P=.000

 Table 15. Extent of familiarity in using Non visual disc access (NVDA)

Table 15 depicts the extent of Non-visual disc access (NVDA) software. It is interesting to note that a large majority of the respondents are familiar with the use of NVDA software. Among the respondents, 689(86%) have expressed that they are familiar with use. Only 114 (14%) of the respondents have offered negative response regarding familiarity with NVDA software. Further, it is also important to note that 571respondents representing 71.3% are familiar with the use to the higher extent and another segment comprising of 100 (12.5%) respondents are familiar to moderate extent. Hence, it is inferred that a large majority of the visually challenged students are familiar with the use of NVDA software.

Responses		Visual Impairment		Gender		Education		T ( 1
		Partial	Total	Male	Female	UG	PG	10141
Not	Frequency	274	462	274	462	707	29	736
at all	Percentage	92.9%	91.3%	90.7%	92.6%	92.4%	80.6%	91.9%
Clichtler	Frequency	10	14	16	8	19	5	24
Slightly	Percentage	3.4%	2.8%	5.3%	1.6%	2.5%	13.9%	3.0%
Moderate	Frequency	7	22	8	21	27	2	29
	Percentage	2.4%	4.3%	2.6%	4.2%	3.5%	5.6%	3.6%
TT' 1	Frequency	4	2	0	6	6	0	6
High	Percentage	1.4%	0.4%	0.0%	1.2%	0.8%	0.0%	0.7%
Varyhiah	Frequency	0	6	4	2	6	0	6
very nign	Percentage	0.0%	1.2%	1.3%	0.4%	0.8%	0.0%	0.7%
Total	Frequency	295	506	302	499	765	36	801
	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test statistics		CV=.101 P=.088		CV=.140 P=.003		CV=.143 P=.003		$X^2 = 2589.668$ P=.000

Table 16. Extent of familiarity in using windows eye software

Table 16 shows the extant of the use of windows eye software. Among the respondents, 65 respondents representing 8.1% are familiar with the use of windows eye software. It is evident that 12 (1.4%) of them are familiar to higher extant, 29 (3.6%) them are familiar to a moderate extant and 24 (3.0%) are familiar to little extent. The data reveal that a large percentage of visually challenged students are unfamiliar with the use of windows eye software.

Responses		Visual Impairment		Gender		Education		Total
		Partial	Total	Male	Female	UG	PG	
Not	Frequency	277	468	274	471	712	33	745
at all	Percentage	93.9%	92.5%	90.7%	94.4%	93.1%	91.7%	93.0%
Slightly	Frequency	4	8	8	4	12	0	12
Slightly	Percentage	1.4%	1.6%	2.6%	0.8%	1.6%	0.0%	1.5%
Modera te	Frequency	14	24	20	18	35	3	38
	Percentage	4.7%	4.7%	6.6%	3.6%	4.6%	8.3%	4.7%
High	Frequency	0	0	0	0	0	0	0
підіі	Percentage	0%	0%	0%	0%	0%	0%	0%
Very	Frequency	0	6	0	6	6	0	6
high	Percentage	0.0%	1.2%	0.0%	1.2%	0.8%	0.0%	0.7%
Total	Frequency	295	506	302	499	765	36	801
1 otal	Percentage	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Test statistics		CV= .067 P=.308		CV= .121 P= .008		CV= .048 P=.598		$X^{2}=1978.77$ 0 P=.000

Table 17. Extent of familiarity in using Duxbury Braille Translation Software

Table 17 depicts the extent of use of Duxbury braille translation software. Among the respondents 56 representing 7% have expressed that they are familiar with use of Duxbury software. A large majority are not familiar with the use of software. Further,6 (0.7%) are familiar to the highest extant, 38 (4.7%) are familiar to a moderate extant, and 12 (1.5%) are familiar to al little extant. The software must be made available at all centers and institutions so that the English and some of the major Indian languages may be converted in to Braille script for easy reading and preservation and future reference purpose.

### FINDINGS AND RECOMMENDATIONS:

Since the recent past the visually challenged students rely much upon the assistive technology for reading mainly to meet the needs of academic pursuits. In the present study, it is encouraging to note that a majority of visually challenged students representing 54.3%. Use book readers such as SARA, ANGEL and so forth for reading books and journals. Further, even the low vision students also rely upon reading equipment to get their text-books, periodical articles and monographs read for academic programmes. The percentage of low vision or partially blind students who rely upon reading equipment account for 57.3%.

Some of the students, especially the post-graduate students possess the habit of converting printed text into electronic format/soft copy for reading through the e-book readers. Among the respondents, 19.6% do convert printed text into electronic form for reading. However, due to lack of scanning equipment in the institutions quite a number of students are deprived of accessing useful information sources.

It is the usual procedure to take Braille print out for reading. In the present study, just 11.2% of the respondents have stated that they take out Braille print out for reading. A large percentage of respondents representing 88.8% do not resort to taking Braille print out of materials for reading. The low usage is on account of lack of Braille printers and many students have not familiar with Braille script. Continuous use of audio facility, reading equipment and screen reading software make the visually challenged students to get more accustomed to reading facility rather than reading the Braille script.

As regards conversion of electronic version of books and journal articles into Braille text using Duxbury Braille translation software, among the respondents just 3.5% are getting text converted into Braille format from English and regional languages. Quite a large percentage of students are not in the habit of converting electronic text from English and major Indian languages into Braille. Those who do not convert text into Braille form account for 96.5%. Still many students are not getting the text converted into Braille due to the lack of Braille translation software and related infrastructure facilities.

Of late, visually challenged students avail whatever facilities extended to them by the Government and voluntary sector. In this direction, now the students have started using various hardware products made available for reading. Regarding familiarity and use of prisma magnifier, 7.5% of the visually challenged respondents have stated that they are familiar with prisma magnifier and use to a little extent whenever needed. The percentage of post-graduate students is more than undergraduates in respect of the use of prisma magnifiers for reading.

The zoomex equipment is also used by the low vision students. Among the respondents, 6.7% are familiar and use the zoomex. It is only 2.7% of users of users use to a moderate extent. However, the use of zoomex reader is by a small percentage of low vision students (Table 28). The familiarity and use of bonita mouse is again by a small percentage of respondents, 7.2% of respondents use the bonita mouse and further, just 2.7% use to a higher extent and another 2.2% of respondents use to a moderate extent.

The use and familiarity with the Ruby hand-held video, is 11.5% among the visually challenged students. However, 5.1% of them avail the facility and the extent of use and familiarity is high.

The familiarity and use of magnifiers such as zoomex, ruby, prisma, bonita mouse and topaz is low and further many of the libraries, learning resource centres do not possess all of them and hence the students are not familiar with regard to the use of these magnifiers used mainly by the low vision students.

It is really encouraging to note that a large majority of the visually challenged respondents in the present study have expressed that they are familiar and use Sara Book Readers. Among the respondents, 93.6% are familiar with the use of Sara Book Readers. Further, 32.1% of the respondents are familiar with the use to an higher extent and 55.6% are familiar and use to a moderate. Therefore, it is inferred that a large majority comprising of 93.6% of visually challenged respondents in the study are familiar with the use of Sara Book Readers.

The present study revealed that majority of the visually challenged students rely upon assistive technology for reading and communicating information. It is understood from the survey that the students frequently use SARA Book Readers, Angel Book Readers, Screen Reading Software, OCR Scanners, Braille Printers, Plex Talk and Magnifiers such as Zoomex. These basic hardware and software packages must be made available at all the hostels established for the visually challenged and also at the college libraries for the benefit of students who get admission to a various courses. Better the infrastructure facilities with assistive technology, the visually challenged students get admission in these institutions. Good LRC facilities is a sort of encouragement to the visually challenged for taking admission to various under-graduate as well as post graduate courses.

The OCR scanning machines, Braille Translation software and Braille Printers are needed in some of the hostels and institutions offering facilities of assistive technology. These basic needs have to be extended to meet the felt needs of the visually challenged students so that whenever there is need, they can use these hardware and software to read and acquire knowledge for academic purposes. In many institutions and hostels, equipment such as Prisma, Zoomer, Topaz, Bonita Mouse, Ruby Magnifier, Braille display board and Braille translation software is not made available. These may

be acquired and installed on priority so that visually challenged students will be much benefited by the infrastructure facilities.

Orientation / Training programmes be organized by NGOs as well as government institutions be conducted from time to time in order to make the visually challenged students familiar with the assistive technology, on one hand and bring to their attention the latest hardware and software brought out by the companies in order to support academic studies by the visually challenged on the other. In some of the institutions the facilities are underutilized on account of lack of knowledge to handle the technology. The State Government may form an expert committee which conducts survey of the needs of students and organize extension programmes and training programmes so that the students will become quite familiar with assistive technology. By this study, the facilitators will also come to know what is lacking in the institutions extending educational and hostel facilities.

Training is also needed by the staff in-charge of the Learning Resource Centres equipped with various assistive technology. The present study also revealed that the staff is not competent enough to handle the technology and further lack skill in training the visually challenged students. Therefore, long term and intensive training on the assistive technology is also an essential part of the programme. The committee may also consider the training needs of the staff working in the libraries, hostels and academic institutions.

## **CONCLUSIONS:**

Now-a-days, effective intervention of assistive technology for the self-reliance of the visually challenged students is a necessity. There is really felt-need for the establishment of full-fledged library facilities comprising of print resources as well as Braille resources in academic institutions where the students seek admission for studying various courses leading to the award of degrees, including research programmes. Here, the libraries have to establish Learning Resources Centres especially for the visually challenged equipped with all hardware and software useful for the visually challenged for reading and writing purposes. The libraries are treated as the right places as the visually challenged students will get the opportunity of accessing huge holdings of books, journals, theses and report literature developed by the libraries.

Assistive Technology is really a boon for the visually challenged because they can use information sources for reading on their own and also fact that, on line information sources can be accessed anytime and from anywhere by these students without reliance on others. Academic colleges and residential institutions which offer admission to the visually challenged have to establish appropriate infrastructure facilities encompassing assistive technology, more comprehensively so that the higher learning will be made easy for those who are served. However, budget is not a constraint because both central and state governments provide the required grants to implement the projects and proposals projected by the institutions serving the educational needs of the visually challenged students.

Training is an essential part of the programme for the empowerment of the visually challenged. Unless the students are made skillful and competent enough to use the assistive technology, the facilities will remain underutilized. Moreover, the staff in-charge of the library facilities for the visually challenged are made knowledgeable and competent enough to handle the assistive technology, the facilities will remain underutilized and the user communities unfamiliar with the technology. Adequate training and orientation for the staff of Learning Resource Centres is a necessity and priority be given for this essential task. More the orientation and training in handling assistive technology, better will be the development of infrastructure facilities with assistive technology. Thus, the American Disability Rights Activist and Former Assistant Secretary to US Department of Education, Judy Heumann rightly says, "for most of us, technology makes things easier. For a person with a disability, it makes things possible".

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