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Awareness on Assistive Technology among Pre-Service Teachers to Promote Inclusive Education

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Abstract

This research investigates the awareness of Assistive Technology among preservice teachers in the context of promoting inclusive education. A quantitative survey method was employed using a Guttman scale, validated by experts. The sample consisted of 222 preservice teachers from five B.Ed. colleges in Kasargod District, Kerala. The survey questionnaire, comprising 35 items, assessed awareness of different domains of Assistive Technology. Preliminary results demonstrated good internal consistency of the used instrument. The analysis of the collected data involved descriptive statistics, percentage analysis, and t-tests using SPSS 15.0 and MS Excel. The study found that the awareness of Assistive Technology among preservice teachers was at a moderate level, with no significant variations based on gender, pedagogy subject, or locality. The study also explored factors affecting awareness, finding that while preservice teachers were aware of these tools, their implementation in classrooms remained limited. This research contributes to the understanding of preservice teachers' awareness of Assistive Technology in an Indian context. It underscores the need for comprehensive training to bridge the gap between knowledge and effective utilization of Assistive Technology to support inclusive education. Future efforts should focus on enhancing the practical implementation of Assistive Technology in educational settings.

Keywords: Assistive technology, Inclusive education (IE), Pre-service teachers, Awareness

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Introduction

Inclusive Education is only achievable in a flexible education system that recognizes and responds to the demands of various learners. Inclusion is a value, not an experiment to be tested (Anjali & Vanitha, 2020a). Though the word Inclusion is predominantly resonating in the institutesduring the time of the admissions and later which is disappearing slowly. This would create a gap between the students (Foundation Open Society, 2019) and sometimes, there will be a chance of creating an exclusion within the class. To avoid this kind of ambiguity in the teaching-learning process, teachers' roles in the inclusive classroom must be clear. In a classroom, teacher beliefs guide action. Thus, the vital success of inclusive education depends on teachers' attitudes**.** As a result, addressing teachers' beliefs has to be done in the initial stages of their training (Ritter et al., 2019). So, these requisites have to be conceived by the Pre-Service teachers effectively. Only then they can manage any ambiguous situation they encounter in a classroom (Beth et al., 2020). As the experience grows, there would be apparent change, but the base must be formed with minimal requirements such as Assistive Technologies (Jude & Simms, 2009).

Assistive Technology refers to any tool which fosters the independence of a differently-abled person. Assistive Technology can refer to anything, from something extremely basic and inexpensive, like pencil grips or text highlighters, to something more complex, like a computer station with a speech-to-text tool (Edyburn, 2004, 2017). Assistive Technology is one thing that could help teachers to make the classroom inclusive, and the findings of the study published by (WHO, 2023) mentioned the Preservice teachers must have fundamental technology abilities, as well as ways to facilitate inclusive educational practises. Inclusion of assistive and instructional technology in preservice teacher preparation programmes will improve academic, social, and employment prospects for people with disabilities (WHO, 2023). In a study (Anjali & Vanitha, 2021) found out that Visual assistive instructional technology is very useful for teaching daily living skills like personal hygiene to students with intellectual disability. So, tailor teaching strategies for the diverse learners will help for their equity in the classroom and thus reduces the functional barriers and improves the learning outcomes of diverse learners as expected (Ahmad, 2014; Anjali & Vanitha, 2020a; Gundewar, 2020). However, a study (Anjali & Vanitha, 2020b) says that very few of the teachers in buds school in Kasargod are employing Assistive Technology, and most of them rely on traditional teaching-learning methods for students with special needs. It is also mentioned that low/No use of AT adversely affects the learning outcomes of Intellectually disabled students.

In this context, knowing the foundation, which is awareness on Assistive Technology, is much needed. Assistive Technology has a vital role in promoting inclusive education (Minimol, 2019; Venkatesha, 2017). It can help students with special needs to engage in classroom discussions along with their peers. By providing diverse suitable tools for each learner, Assistive Technology gives good room for the teacher to make an effective inclusive classroom environment (Castelo, 2020). For instance, Screen readers help visually impaired students, audio aids help the hearing impaired, and other devices like computers, prostheses, etc., helps for physically challenged students in coping up with the other learners in the class. Prospective Teachers who are familiar with Assistive Technology have better knowledge to fulfill the needs of all their students, establish more inclusive classrooms, and promote equity (American University, 2020; Lee & Templeton, 2008; Policy, 2020).

However, research that examined Pre-Service teachers' knowledge of Assistive Technology—which would support inclusive education—revealed that Pre-Service teachers had a modest degree of knowledge about the technology (Ahmed, 2016; Shakunthala, 2017). There should be additional possibilities in teacher preparation programs for preservice teachers to gain subject-matter expertise, student-matter expertise, and differentiated instruction abilities (Sandholtz, 2011). An illustration of how Assistive Technology can be applied in inclusive classrooms is provided here: screen reading and content reading software can be utilized by a dyslexic student to hear the words in a book or on a computer screen read aloud. This will enable students to comprehend the material more clearly and keep up with their peers (Ahmed, 2016) and (Shakunthala, 2017) a researcher discovered a substantial positive link between instructor understanding of Assistive Technology and student academic progress. In this context it is important to examine how much is the awareness level among the Pre-Service teachers on Assistive Technology in Kasargod district.

The Aim of the Study

The purpose of this study is to comprehensively investigate the level of awareness among pre-service teachers in Kasaragod district regarding Assistive Technology, with a specific focus on its role in promoting inclusive education (IE). Inclusive education is a critical aspect of modern educational systems, aiming to ensure access to quality education. A study revealed that the Pre-service teachers' awareness is not to the mark as they are expected at this Assistive Technology (Bhatia, n.d.). This study seeks to evaluate the extent to which pre-service teachers in this district are knowledgeable about Assistive Technology and its potential for fostering inclusive education. Furthermore, the study aims to discern variations in awareness levels among pre-service teachers concerning Assistive Technology, considering different background variables such as age, gender, educational background, and teaching experience (Shawwa & Mohammad, 2023). This approach allows for a more nuanced understanding of the factors that may influence a teacher's familiarity with Assistive Technology in the context of inclusive education.

Ultimately, the study seeks to uncover any significant differences in mean awareness scores among pre-service teachers based on their background variables. By doing so, it aims to provide insights that can inform educational institutions, policymakers, and teacher training programs on the need for targeted interventions and training to enhance pre-service teachers' awareness of Assistive Technology, thereby contributing to the advancement of inclusive education in Kasaragod district and potentially beyond.

Hypothesis

Null Hypothesis (H0): There are no significant differences in mean awareness scores regarding Assistive Technology among pre-service teachers based on their background variables, including age, gender, educational background, and teaching experience.

Alternative Hypothesis (H1): Significant differences exist in mean awareness scores regarding Assistive Technology among pre-service teachers based on their background variables, including age, gender, educational background, and teaching experience.

This study aims to test whether background variables have an impact on the awareness levels of pre-service teachers concerning Assistive Technology and its role in promoting inclusive education. The null hypothesis suggests that there are no such differences, while the alternative hypothesis posits that variations do exist.

Method

Research Model

Since the investigator wanted to examine the awareness of Assistive Technology among preservice teachers, a Quantitative survey method has been adopted for the present study. The sample chosen is unidimensional and the questions used in the scale are reproducible questions which are arranged in an ordinal manner (Bhat, n.d.). The investigator had adopted Guttman scale (EngelhardJr, 2005) a survey method for the present study and was validated by the experts. A pilot study had been conducted to assure the internal validity.

Sample

The population of the present study consists of preservice teachers in Kasargod District of Kerala. The investigator selected sample in two stages. Since, the study was basically concentrating on the Kasargod district. The first stage 5 B.Ed. Colleges were selected which are in the farthest vicinity with each other by using convenient sampling technique. Since, the investigator used the Google form to collect the data, the data were collected from all those 498 preservice teachers from the above-mentioned colleges. In the second stage investigator used simple random sampling. Randomization had done by assigning a sequential number to the data, then by using a random number generator convert the sample from 498 to 222 Pre-Service teachers. All the sample collected are of approximately 23-26b year age. The sample distribution among the different background variables are shown Table 1.

Table 1. Table Showing the Number of Sample Based on Different Background Variables

Sl.No.	Background Variables	Categories	No.
1.	Gender	Male	19
		Female	203
2.	Pedagogy subject	Arts	104
		Science	118
3.	Locality	Urban	88
		Rural	135

Measuring Tools

Since, the basic aim of this study is to know whether the preservice teachers are aware of Assistive Technological tools are not. Investigator used a survey questionnaire which consists of Dichotomous responses Yes or No (Guttman scale). The internal consistency was measured by Cronbach's alpha which was found to be 0.884. The

noted responses were analyzed by using the technique of visual binning to find the Percentage analysis, t-test was used to compare the means of different variables. After a pilot study the Investigator had deleted 15 items out of 50 to make the tool consistent. Finally, the Awareness on Assistive Technology Tool consists of 35 items, which measures the different domains of preservice teachers awareness.

Data Analysis

The data were analysed in five different steps which include The analysis consists of the Distribution of samples by finding their mean, median, and mode. Finding the solutions for the research questions. First, the data were screened to identify missing values and outliers and to ensure that the data is suitable for further analysis. Second, the reliability statistics for all used instruments were calculated. Third, descriptive statistics were calculated by different independent variables. Fourth, the percentage analysis was done for each of the variables, using the visual binning in SPSS. The fifth t-test was used to compare the mean scores of different variables. SPSS15.0, and MS Excel sheet for the full statistical analyses. The reliability of the used instrument was examined by calculating Cronbach's alpha whose value was found to be 0.884 which reflects the good internal consistency of the used instruments (George & Mallery, 2003).

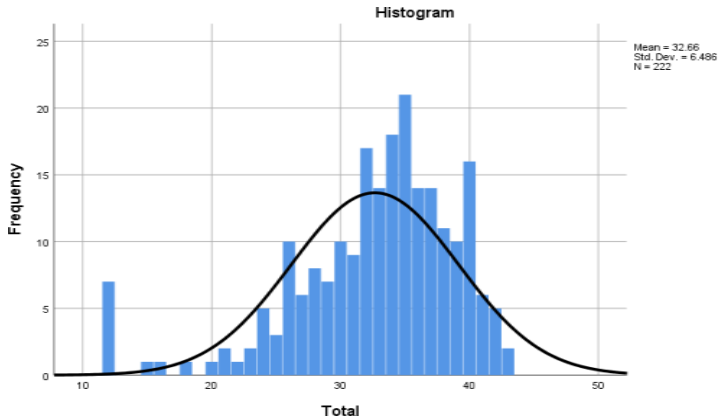

Figure 1. Sample Distribution Paretochart. Note: This chart shows the transparent distribution of the sample based on their mean scores. The curve above shows the normal distribution of samples collected.

Substantiating the above chart (Figure 1), the Table 2 provides data for a clear understanding of the chart. The Mean, Median, and Mode of the collected samples were found and noted in the Table 2.

Table 2. Table Denoting the Mean, Median and Mode along with Skewness, Kurtosis and Standard Deviation of the Sample

Sl. No.	Variable	M	Md	Mode	Sd	Skewness	Kurtosis
1	Awareness on Assistive Technology	32.66	34.0	35	6.488	-1.189	1.763

To know the nature of distribution, the important statistical constants of selection for the total sample were analyzed. For the awareness scale, the results obtained for Mean, Median, and Mode are 32.66, 34.0, and 35 respectively. The value of the mean, median, and mode indicates the distribution of scores of the sample is nearly equal to normal. Though the Mean < Median < Mode, as the sample taken is large enough the ±1 Standard deviation was considered and standard error of skewness value was found to be 0.163. The kurtosis value is 1.763 which is less than 3 platykurtica.

Table 3. Table Denoting the Homogeneity of Variance of the Data

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
total	Based on Mean	3.320	1	219	.070
	Based on Median	2.746	1	219	.099
	Based on Median and with adjusted df	2.746	1	169.414	.099
	Based on trimmed mean	2.800	1	219	.096

From the Table 3 it is clearly seen that the p-value at any point is greater than 0.05 so the data is distributed holds the homogeneity.

Results

First Research Question is “What is the level of awareness on Assistive Technology among Pre-Service teachers to promote inclusive education?” To achieve this objective and to explore the solution for research question, Percentage analysis was done using the binning technique from SPSS and found the percentage at different levels as shown Table 4. After the analysis of data, the evident results were obtained and given as follows.

Table 4. The Percentage of Awareness on Assistive Technology among Pre-Service teachers at Different Levels

Sl.No.	Awareness level on Assistive Technology	Frequency	Percentage
1.	Low	23	10.4
2.	Moderate	180	81.0
3.	High	19	8.6
4.	Total	222	100

Table 4 shows the percentage at different levels namely Low, Moderate, and High of awareness on Assistive Technology among preservice teachers to promote inclusive education. To achieve objective 2 and

research question 2 percentage analysis for each background variable was done and the results for the same were noted down in the Table 5.

Table 5. Table Showing the Level of the Awareness on Assistive Technology Based on the Background Variables

Sl.No.	Background Variables	Categories	No.	Low		Moderate		High	
				N	%	N	%	N	%
1.	Gender	Male	19	2	10.5	14	73.7	3	15.8
		Female	203	16	7.9	165	81.3	22	10.8
2.	Pedagogy subject	Arts	104	19	18.3	67	64.4	18	17.3
		Science	118	16	13.6	86	72.9	16	13.6
3.	Locality	Urban	88	16	18.2	55	62.5	17	19.3
		Rural	135	16	11.9	100	74.6	18	13.4

The above Table 5 shows the different percentages of awareness among the Pre-Service teacher samples based on the background variables. It shows that the awareness level among preservice teachers on the Assistive Technology for the promotion of inclusive education is Moderate irrespective of background variables namely Gender, Pedagogy subject chosen, and Locality of the institute in the district of Kasaragod, Kerala.

Along with that, the researcher also intended to find out a few more things based on the review of the literature. The other hypothesis of the research is that there is an insignificance in the mean score between the mean scores of awareness on Assistive Technology among Pre-Service teachers to promote inclusive education concerning gender. To analyze the significant difference in terms of understanding between males and females for the total sample, the researcher used a t-test. The results are shown in the following Table 6.

Table 6. Table Shows the Mean Comparison between Male and Female

Gender	N	Mean	Std. Deviation	t-value	Sig. (P-value)	Result
Female	203	24.41	6.855	0.630	0.533	Not Rejected
Male	19	23.37	7.625			

Table 6 showed that the t-value = 0.630 (P=0.533>0.05) which showed that the p-value and t-value were greater than the significant value. So, null hypothesis with reference to the Gender is Not Rejected. Therefore, there is

insignificance in the mean score between male and female Pre-Service teachers regarding Awareness on Assistive Technology for total sample.

The other hypothesis of the research is that there is insignificance in the mean score between the mean scores of awareness on Assistive Technology among Pre-Service teachers to promote inclusive education with reference to locale. To analyze the significance difference in terms of awareness between urban and Rural for the total sample, the researcher used a t-test. Table 7 which is given below illustrates the results.

Table 7. Table Showing Mean Comparisonbetween Rural and Urban Samples

Locality	N	Mean	Std. Deviation	t-value	Sig. (P-value)	Result
Rural	134	23.86	7.421	1.241	0.411	Not Rejected
Urban	88	25.03	6.028			

The table 7 showed that the t-value = 1.241 (P=0.411>0.05) which showed that the p-value and t-value were greater than the significant value. So, null hypothesis (H_{02}) stated that there is insignificance in the mean score between Pre-Service teachers' awareness of Assistive Technology for inclusive education with reference to the Locality is Not Rejected. Therefore, there is insignificance in the mean score between Urban and Rural Pre-Service teachers in terms of Awareness on Assistive Technology for the total sample.

The other hypothesis of the research is that there is insignificance in the mean score between the mean scores of awareness on Assistive Technology among Pre-Service teachers to promote inclusive education with reference to locale. To analyze thesignificant difference in terms ofawareness between Arts and Science forthe total sample, the researcher used a t-test.The Table 8 shows the results.

Table 8. Table Showing the Mean Comparison between Arts and Science Streams Sample

Pedagogy Subject	N	Mean	Std. Deviation	t-value	Sig. (P-value)	Result
Arts	118	32.47	7.299	0.458	0.132	Not Rejected
Science	104	32.88	5.445			

The table 8 showed that the t-value = 0.458 (P=0.132>0.05) which showed that the p-value and t-value were greater than the significant value. So, the null with reference to the Stream they chose is Not Rejected. Therefore, there is insignificance in the mean score between Arts and Science Pre-Service teachers regarding Awareness on Assistive Technology for the total sample.

Discussion

The Existing literature on Awareness on Assistive Technology among pre-service teachers were not much focused on their preliminary understanding and more over the literature did not focus into the Indian context as there were only very few. So, this study focused on this context. This study worked on the factors which may affect the awareness of the sample, like gender, locale as Ramakrishna (2020) could see the significant effect on the results by the impact of these variables. Similar to that investigator had tried to see those effects on the variables of this study but contrary to that investigator found no significant impact on these variables on the Awareness level of the preservice teachers. In support to the claims made by Shakunthala (2017) in a study undertaken to investigate the Academic Achievement of students based on the awareness level stated that majority of the assistive technological devices are available with the NGO's and as one of the domain of tool focused on the awareness on availability of devices clearly showed that here in this region also the preservice teachers are awareness of availability of the devices. One study focused on the roles of teachers(Jaiswal, 2021), competency of the teacher in the use of the assistive technology in the classroom (Onivehu Adams et al., 2017). So, considering all these factors a tool was made and the suitable citated results were discussed in relevance to the items.

Contrary to the statement given by Chukwuemeka & Samaila (2020) that teacher don't even know the different tech aids available as a assistive technology these study found a good percentage of evidence to say that more than 50 percent of the preservice teachers are aware of these things and there was a huge amount of acceptance of these Assistive tools as mentioned by Matia Prema & Jeyasudha (2020; Ramakrishna (2020).

However, results showing 67.5% of the sample are aware about the basics of Assistive technology, but the use of these tools are not to the satisfactory level as mentioned in Minimol (2019) & Chukwuemeka & Samaila, (2020) study. These tools are not contributing to the achievements of the children especially speaking about the special children as there was lack of implementation as emphasized by Rajeevan (2020) & Shakunthala (2017). As the study go through the responses for the item, similar results were seen in the study as well but studying a few items of this study it is seen that many of them were not completely confident about the tools, so they know the tools but not their importance in classroom situation. Preservice teachers & teachers were not familiar (only 39.6% were familiar) with the tools Onivehu Adams et al. (2017) as there was no availability of the these tools in many parts of Karnataka (Shakunthala, 2017) Kerala was also analogous to it says Minimol (2019). The reasons for preservice teachers awareness being at moderate level is evident through the results, that the concepts of Assistive technology were not clearly delivered neither practiced in their curriculum. However, this must be studied further in deep with the light on curriculum transaction.

The awareness of preservice teachers remain restricted to the domain of knowledge & understanding only, as the sample awareness on the implementation of the assistive aids and tools at evaluation phase of teaching is considerably very less (20.2%). The agreement to the role of experts as minimum shows the role confusions were also exists for preservice teachers as Jaiswal (2021) mentioned few roles of teachers for inclusive classroom. These issues were not dealt in any other studies prior. However, training them in a proper way would increase these percentage levels as suggested by Venkatesha (2017).

Conclusion

The study's findings have substantial implications for increasing the quality and efficacy of Pre-Service teacher education programmes in preparing them to utilise AT in inclusive classrooms. The study suggests that teacher education programs should integrate AT into their curricula and pedagogy, provide more opportunities for Pre-Service teachers to learn about variety of AT and utilise them effectively, and expose Pre-Service teachers to various resources and networks that can support them in accessing and using AT in their future practice. The study also recommends that teacher educators should model and mentor preservice teachers on how to use AT in their own teaching and provide feedback and guidance.

The study also contributes to the existing literature on AT and teacher education by providing summary into the current state of Pre-Service teachers' knowledge and attitudes on AT in a specific context. However, the study has some limitations that should be acknowledged, such as the small and limited sample size, the reliance on self-reported data, and the lack of objective measures of Pre-Service teachers' skills and performance on AT. Therefore, future research is needed to address these limitations and to explore further aspects of AT and teacher education, such as the impact of AT on students' learning outcomes, engagement, motivation, well-being, and psychosocial development in inclusive classrooms. Future research could also compare different models and methods of integrating AT into teacher education programs and evaluate their effectiveness and sustainability. By conducting more research and evaluation on AT and teacher education, we can enhance our understanding of how to prepare preservice teachers to use AT effectively and confidently in inclusive classrooms. Not focusing on the in particular roles of the teachers, and the implication of the knowledge into the practical situation were not dealt in this study which considered to be a limitation of this study.

Recommendations

In aligning with the study it is seen that educational institutions, policymakers, and teacher training programs on the need for targeted interventions and training to enhance pre-service teachers' awareness of Assistive Technology

- The study's findings highlight the importance of Assistive Technology (AT) for promoting inclusive education (IE) and satisfying the diverse needs of learners with disabilities.
- The study suggests that Pre-Service teachers need to improve their awareness and skills of adopting a suitable AT for the classroom and learn how to use it effectively in their teaching practice.
- The findings of the study suggest that training programs for teachers should give more scope for Pre-Service teachers to learn about different types of AT, their benefits, and challenges, and how to use them in the classroom.
- The study also implies that teacher educators should model the use of AT in their teaching and provide feedback and guidance to Pre-Service teachers.
- Through the study's findings, it is suggested that including the topics such as Universal Design for Learning (UDL), individualized education plans, and collaboration with other professionals and parents

(Van Laarhoven et al., 2012) in the curriculum would increase the awareness level among the preservice teachers.

- The findings of the study suggests that preservice teachers should be exposed to various resources and networks like AT Catalogue (*Assistive Technology Products for Information Access*, n.d.), AT Training Programs, AT user groups and organisations, AT websites and blogs that can support them in accessing and using AT in their future practice.

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