Special Education Teachers' Knowledge and Attitudes toward the Use of Assistive Technology for Disabled Children Management: Impact of an Educational Intervention

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Abstract

The study aimed to investigate the effectiveness of an educational intervention on improving teachers' knowledge and attitudes toward the use of assistive technology devices. **Methods:** A quasi-experimental research design was applied with 68 purposive samples of teachers selected conveniently from four settings located at Jeddah, Saudi Arabia. Three tools were used including participants' demographic and personal data, knowledge scale and attitudes questionnaire. **Results**: A highly significant difference was reported between pre and post-test among studied teachers according to their total knowledge in pre-assessment (66.1 ± 11.4) compared with (72.9 ± 12.0) in post-test and attitude in pre (77.9 ± 11.2) compared with post total score (86.4 ± 11.2) at p-value < .05. **Conclusion**: The program is effective in developing the knowledge and attitudes of the participants with a highly statistically significant difference between the pre and post interventions. Therefore, a well-planned and structured educational program should be undertaken to improve the level of awareness of special education teachers.

Keywords

Teachers, Disability, Children, Technology, Educational Intervention, Knowledge, Attitude

1. Introduction

Learning is the acquisition of new knowledge and skills. During the early years of development, children start learning to read, write and do arithmetic accord-

ing to their age and intellectual capacity. However, it seems that, despite having the normal intellectual capacity and normal vision, hearing, or physical abilities, some children are specifically unable to acquire language and arithmetic skills, even when adequate learning opportunities are provided these problems get more difficult with children with special needs or having a specific disability (Tony, 2019). The prevalence of disability varies between countries ranging from less than 1% to up to 30% in some countries, thus, the estimated global disability prevalence is about 15% (Bindawas & Vennu, 2018). Data on disability status were extracted from the national demographic survey conducted in 2016 as reported by the General Authority for Statistics, Saudi Arabia (N = 20,064,970). Prevalence rates per population of 100,000 of any disability, type of disability, and its severity were calculated at the national level and in all 13 regions. Out of 20,064,970 Saudi citizens surveyed, 667,280 citizens reported disabilities, accounting for a prevalence rate of 3326 per population of 100,000 (3.3%). Individuals aged 60 years and above (11,014) and males (3818) had a higher prevalence rate of disability compared with females (2813). The Tabuk region has the highest rate of reported disability, at 4.3%. The prevalence rates of extreme disabilities in mobility and sight were higher in Madinah (57,343) and Northern border (41,236) regions, respectively. In Saudi Arabia, more than half a million Saudi citizens (1 out of every 30 individuals) reported the presence of disability during the year 2016. Targeted efforts are required at the national and regional levels to expand and improve rehabilitation and social services for all people with disabilities.

Saudi Arabia is one of the leading Arab countries in the protection of the rights of persons with special needs. The Kingdom has taken several measures aimed at promoting and protecting the rights of persons with disabilities. For instance, the establishment of 38 centers for comprehensive rehabilitation and supporting them with specialized cadres, distributed throughout the Kingdom. In addition to the adoption of home health care programs, and the establishment of "Saudi Sports Federation for Special Needs", 15 training centers were established in the Kingdom of Saudi Arabia in which all sports activities are practiced (Maat for Peace, Development and Human Rights, 2019). Therefore, effective ways should be considered to fulfill this need (Ledger, 1999). This goal may be achieved in a variety of ways, like further training to the caretaker or teacher, use of technology or assistive devices, to provide targeted support and help to students on an individual basis, teachers' collaboration with related service professionals, etc. It is also too essential for teachers to collaborate with language professionals, occupational therapists, and language pathologists to bring out the best in disabled children and to help identify their needs and help in resolving their issues (Alkahtani, 2013). The backbone of this relies on the preparation, training, and knowledge of classroom teachers to deal with such kinds of students. Assistive technology (AT) can be defined as "any item, piece of equipment, or product system, whether acquire commercially of the shelf, modified, or customized, that is used to increase, maintain or improve functional capabilities of a child with a disability" (Chambers, 2011). AT can also be classified as

Low-tech or High-tech tools (sometimes Middle tech). As the name describes, Low technology is tools with less complexity, comparatively simple, and easily constructed ones. On the other hand, high-tech devices are complex and technologically sounder, and more effective. Some of the examples of such devices include specially designed eating utensils, pencil grips, voice output devices, screen magnifiers, etc. (Takala, 2007). Since numerous challenges are faced by disabled children across the globe. These challenges can be overcome or minimized using assistive technology (AT). These include the systems, services, and devices that are helpful for the disabled in their daily life, not only let them perform their activities easier as well as to help them in safer movement (Solone et al., 2020; Chambers, 2011). The learning capabilities of disabled children can be facilitated by AT as an adaptive, assistive, and rehabilitation response (Hersh, 2010). Special cases are the children with Autism, as they are facing a hard time in developing relationships through verbal communication as well as other basic concepts. As mentioned earlier, these problems can also, be overcome by the usage of AT. The social interaction and natural development of autistic children are negatively affected by their communication disorder. This can be overcome by communication skills improvement and allow the children to express themselves better via signals, pictures, signs, or gestures (Elmannai & Elleithy, 2017).

These technologies are applied by educators for facilitating the learning outcome of autistic children for the last twenty years or even before. The use of AT also improves the assessment, management, training, teaching, and qualifying teachers. It is known to be helpful in people with special needs (Fteiha, 2017). Many previous studies have discussed the use and effectiveness of AT for children suffering from various disorders. The AT usage positive outcomes were also been reported by various investigators (Al-Khatib, 2005; Millar, Light, & Schlosser, 2006; Mirenda, 2001; Schepis et al., 1998). Although several studies have been conducted in the western world for the use of AT, there is a need for awareness as well as training in Arab countries for the proper usage of technology and implementation of these devices to all over disabled centers to overcome the rapidly growing problems in disabled children. Many recent studies suggested that how AT can successfully be integrated and how knowledge of the use of AT can significantly create an impact on the performance of teachers or caregivers (Smith & Tyler, 2010; Michaels & McDermott, 2003). However, the preparedness of classroom teachers is an essential factor accordingly. Special educators' and teacher's training is crucial and significant differences can be observed by implementing new strategies and programs for the trainer to help them be more prepared for effective use of AT and devices.

1.1. Significance of Study

WHO estimates that over one billion people need one or more assistive devices and products. The majority of these people are children with intellectual and physical disabilities. As children are growing, their function declines in multiple areas and their need for assistive products increases. Accordingly, as the global

population progressively ages and the prevalence of non-communicable diseases rises, the number of people needing assistive products is projected to increase to beyond two billion by 2050. Assistive products enable people to live healthy, productive, independent, and dignified lives; to participate in education, the labor market, and civic life. Assistive products can also help to reduce the need for formal health and support services, long-term care, and the work of caregivers. Without assistive products, people may suffer exclusion, are at risk of isolation and poverty and may become a burden to their family and on society. The positive impact of assistive products goes far beyond improving the health and well-being of individual users and their families. There are also socio-economic benefits to be gained, by reduced direct health and welfare costs (such as recurrent hospital admissions or state benefits), and by enabling a more productive labor force, indirectly stimulating economic growth. It is noteworthy that there were few references to teacher education and training as a source of information (Wynne et al., 2016). In this regard, the current study was looking at investigating the effectiveness of training programs on improving teachers' knowledge and attitudes toward the use of assistive technology for disabled children.

1.2. Aim of the Study

The main purpose of this study is to investigate the effectiveness of training programs on improving teachers' knowledge and attitudes toward the use of assistive technology for disabled children in their working settings.

1.3. Research Questions

1) How much information about assistive technology does the teacher know and how is her/his attitude toward using it?

2) How often do teachers request or consider assistive technology evaluations for their students?

3) What are the types of assistive technology available at target settings (schools and centers)?

4) Would teachers be interested in professional development workshops or in-service courses on assistive technology and what are their preferred delivery methods (e.g., one-on-one instruction, hands-on instruction in a group setting, attending workshops or conference sessions, formalized courses)?

1.4. Hypotheses

The current study will try to agree or disagree with the following hypotheses:

H1. The total score of Knowledge and attitudes of teachers will be higher than their total score in pre-assessment after conducting the interventional program.

H2. There will be a significant difference between pre and post educational programs as regard to scores of teachers' knowledge and attitudes

H3 Teachers' demographic background will have a significant correlation with their knowledge, and attitudes toward the use of assistive technology with disabled children's educational plans.

2. Materials and Methods

2.1. Study Area/Setting

A convenient sampling technique was used to recruit a purposeful sample of 68 teachers working in the Badghish Rehabilitation and Healthcare center. The center has been established in 1995 as the first specialized physiotherapy and rehabilitation center in the western region of the Kingdom of Saudi Arabia (KSA) licensed by the ministry of health, the Disabled children's association institution which was established in 2011, and the Jeddah rehabilitation center, it was established in 2005. These three settings are non-governmental located in different districts in Jeddah city Saudi Arabia. These centers are receiving children from their parents in the morning until 1.00 PM having the same school environment. A convenient sampling technique was used because of the smaller number of teachers working since all of them are Saudi who are smaller in their numbers as well their education and training are still challenging. On the other hand, these settings were used to include study participants based on the convenience for the investigators of the current study and easy access to participants due to proximity by visiting the designated centers.

2.2. Study Design

A mixed quasi-experimental research design was used to achieve the current study objectives. This design is considered appropriate as it helps in exploring participant reactions and responses to research questions and how the participants make sense of these responses. Accordingly, Bergman (2010) suggested that mixed methods research aids in enriching the overall findings of the research and that it can assist in "designing better questions [and] may also guide analysis and interpretation" (p. 172).

2.3. Tools of the Study

The tools have consisted of 3 parts as follows:

1) Demographic and personal characteristics that enquire teachers about age, gender, marital status level of education, years of experience (general and specific with disabled children) and did them attend any training workshop or certificate in assistive technology, job title and type of disabilities they handled. Other questions were adapted from (Alkahtani, 2013) used to assess the teachers' use and experiences of teachers of assistive technology.

2) Knowledge and Attitudes Questionnaires: this part was adapted from (Alkahtani (2013) and Ledger (1999) consisted of 4 parts as the following: A self-administered questionnaire developed by Ledger (1999) and adapted to collect data for this study. The questionnaire was made up of several components. The questionnaires consist of 25 questions about teacher attitudes and knowledge towards assistive technology usage. The questions were on a Likert-type scale, with four possible answers that the teachers could choose, ranging from strongly agree (4), agree (3), disagree (2), strongly disagree (1). The questionnaires were

divided into 4 main scales as follows:

a) Teachers Knowledge of Assistive Technology was covered in Questions 5, 7, 18, 19, 21, and 24 assessed the level of knowledge among teachers toward the usage of assistive technology with disabled children.

b) Teachers attitudes toward utilization of assistive technology consisted of 12 statements, nine statements were adapted from Ledger (1999) which include Questions 1, 6, 11, 13, 14, 15, 25, 8, and 2 while the other 3 questions were adapted from Alkahtani (2013) which are the last 3 questions on his knowledge scale (Q, 11, 12, and 13) in the new scale it was referred to no. 26, 27, 28. The higher the score the more the positive attitudes towards using AT.

c) Teacher Responsibility about Assistive Technology scale was covered by Questions No. 9, 10, and 20) which will deal with teacher responsibility. And the rest of the questionnaires will assess whether the teachers receive Support with Assistive Technology from the occupational, physiotherapist, and other professionals. This part was covered by Questions 4, 17, 22, and 23.

3) The 3rd part of the questionnaire is developed by the researchers based on reviewed literature and the contents of the educational program. This part consisted of 4 questions on a scale of either correct (1) or incorrect (0). These questions enquire the participants about the definition of assistive technology, its advantages, and disadvantages. The last question is examples about types of Low, medium, and high-Tech Assistive Technology with its functional areas that could support the students with special needs education and management. In addition, two open-ended questions were adapted from Ledger (1999) for teachers to provide additional comments regarding barriers and difficulties and the main issues surrounding assistive technology usage in their classroom. (e.g., why do you use assistive technology, do not use assistive technology, time constraints, etc.)

2.4. Validity and Reliability

The instruments were translated into Arabic and back-translated into English, verifying whether the translation covers all aspects of the original English version of the questionnaire or not. To ensure the face validity of the final translated Arabic version of the questionnaires, the tools were evaluated by experts who were selected based on their qualifications and experience in nursing research and education. The reliability of the questionnaires was calculated and Cronbach Alpha for knowledge items was .922 and .675 for attitudes which is acceptable due to the small number (10 Questions) of questions related to attitudes.

2.5. Pilot Study

The tools were piloted and tested by 10 participants to identify ambiguities, the time required, and any difficulties that might be encountered by the participants in reading or understanding. Those 10 participants were included or not depending on the response rate from the participants of the current study since

they have been recruited by a convenient sampling technique.

2.6. Data Collection Procedure

PHASE NO. 1; INVOLVES THE FOLLOWING:

1) Pre-test administration: An approval to conduct the study was obtained from the KAIMRC and IRB, a letter was submitted to the manager of the Badghish rehabilitation center, Disabled children's association institution, and Jeddah rehabilitation center for permission to start data collection:

2) Program preparation: This phase was concerned with searching literature, books, and researches to prepare the theoretical part of the program which aimed at:

• Develop teachers' knowledge about assistive technology, advantages, disadvantages, and types of disability among children.

• Assist teachers to recognize the benefits of assistive technology, in integrating disabled children with their curriculum.

• Motivate teachers to apply the different types of assistive technologies devices with different disabilities and inform teachers of low, medium, and high technology for different functional impairments.

PHASE NO. 2; PROGRAM IMPLEMENTATION:

Once the proposed study was approved by KAIMRC and IRB, a letter was submitted to the manager of targeted settings. The Data were collected during the academic year Fall 2019-2020, the participants (the Quasi-experimental group) were asked to sign the informed consent form before starting the program, and to fill the questionnaires before, and after the educational training program.

A letter with all details of the educational program was shown for the people working in the center to motivate all teachers attending the educational program and to participate in this study.

Limitations and delay because of Covid19 Pandemic:

Center name	Time	Type of contact
a. Badegish Center, b. Disabled children's association institution.	November 2019	• On-site data collection pre and post • The program was implemented with the presence of all participants. • A hard copy of the pretest tools was distributed to the participants and they were asked to fill it before starting the program. • **Methods of instructions:** The sessions were presented to the teachers using PowerPoint, videos, and discussion. In addition to, booklets, brochures, and audio-visual materials. Role-play, modeling, and demonstration were used to teach the practical application for each device and related functional impairments. **POST-PROGRAM EVALUATION:** After finishing the learning session, the last hour was divided into 2 equal parts, half an hour was for discussion, questions, and feedback of the teachers about the training program, and the other was for fulfilling questionnaires after implementing the program.

Continued

c. Jeddah rehabilitation center	Fall 2020	• Tools of the study were transferred into google form as pre and posttest link was sent to the manager of the center who contacts the participants and motivates them to fill the pretest, • The researcher met with the participants through the Microsoft team link which was sent to all participants who agree to participate in the program. • Same PowerPoint and videos, as well as discussion, posters, and audio-visual materials, were used as instructional methods during the sessions. • Posttest link was sent to the participants after the end of the program to fill it and submitted back.

• CONTENT OF THE PROGRAM:

The educational training program was conducted for all participants within one day; 5 sessions each session was 45 minutes to an hour. The program covered the definition of assistive technology, types of disabilities, advantages, and disadvantages, and types of assistive technology and its uses with different functional impairments among disabled children

2.7. Ethical Considerations

The study was submitted for official approval from the research unit at the COMJ, College of Nursing, Jeddah, KAIMRC, and IRB. Then the approval letter was submitted to the director of Badghish rehabilitation center, Disabled children's association institution, and Jeddah rehabilitation center for permission and data collection. After that, study subjects were approached for explaining the purposes and the procedure for the study. Subjects were informed that their participation in the study is voluntary, and they can withdraw without any penalty at any time. They were assured that their answers were kept anonymous during the study and that their data was kept confidential. Participants' privacy and confidentiality were assured, no identifiers were collected and all data both hard and soft copies were stored within MNGHA premises and can be accessed by the research team only.

2.8. Data Analysis and Statistical Management

The data were coded and analyzed using IBM SPSS version 25. Data were presented using descriptive statistics for discrete variables in the form of frequencies and percentages, and for interval and ratio variables in the form of means and standard deviations. A paired t-test was used to analyze the total scores of the participants' responses on the pre-test and the post-test (i.e., before and after the educational training program). Participants' socio-demographic and knowledge, and attitudes differences were analyzed using the Pearson correlation test the significance level was adjusted and tested at $p < .05$.

3. Results

Table 1 showed the distribution of the studied teachers according to their demographic characteristics. All teachers (100%) were female, (69.1%) less than 30 years old, 42.6% were married and the majority (91.2%) have bachelor's degrees. As regards the job position, more than two-thirds (63.2%) are working in special teacher education and the location of the school which they are working are in

the urban area. Concerning years of working experience, one-third of studied teachers had 3 - 5 years compared with only 10.3% who had 11 years and more working experience. On the other hand, more than half of the studied teachers had 2 - 5 years working as an education assistant.

Table 1. Distribution of the studied teachers according to their sociodemographic data (N = 68).

Sociodemographic data	No. (68)	%
Age (Years)		
Less than 30	47	69.1
30- to less than 40	17	25.0
40 and more	4	5.9
Gender		
Male	68	100.0
Marital status		
Married	29	42.6
Divorced	27	39.7
Single	12	17.6
Level of education		
Bachelor's degree	62	91.2
Diploma-Master	6	8.8
Job position		
Special education teacher	43	63.2
Nurse/intern	11	16.1
Psychologist	5	7.4
Speech specialist	5	7.4
Other (supervisor, statistician, PT, Art)	4	5.9
Location of the school		
Rural	2	2.9
Suburban	1	1.5
Urban	65	95.6
Years of experience		
Less than one year	17	25.0
1 - 2 years	16	23.5
3 - 5 years	21	30.9
6 - 10 years	7	10.3
11 years and more	7	10.3
Number of years as an Education Assistant		
0 - 1	21	30.9
2 - 5	35	51.5
6 - 10	6	8.8
11 and more	6	8.8

Table 2 presented the distribution of the studied teachers according to their usage and experience regarding assistive technology. Regarding the types of disability among the students in the studied schools; The table revealed that nearly half (47.1%) of the students were autistic child followed by around three quarters (35.3%) who have intellectual disability, whereas around one-fifth of them have multiple disabilities and learning difficulty disability (22.1% and 19.1% respectively) and the minorities of them have physical disabilities, communication disability, vision and hearing disabilities, and Down syndrome (10.3%, 7.4%, 2.9%, and 2.9% respectively). Only 14.7% of the teachers received formal AT training, 60% among them received AT workshops, followed by 30% who received Bab-noor platform to grow (an Arabic Tablet App) training and only 10% of them received 40 hrs occupational therapy training.

Table 2. Distribution of the studied teachers according to their usage and experience regarding assistive technology (AT) (N = 68).

Teachers' use and experiences regarding assistive technology (AT)	No. 68	%
Types of disabilities among the students #		
Autism	32	47.1
Intellectual disability	24	35.3
Multiple disabilities	15	22.1
Learning difficulty disability	13	19.1
Physical disability	7	10.3
Communication disability	5	7.4
Vision and hearing disability	2	2.9
Down syndrome	2	2.9
Received formal AT training		
No	58	85.3
Yes	10	14.7
Types of training	**n. 10**	
40 hrs. occupational therapy	1	10.0
Bab-noor a platform to grow (an Arabic Tablet App)	3	30.0
AT workshop	6	60.0
The process of teacher's engagement of AT training		
Enforced by a principal to attend the training (organization improvement desire)	56	84.8
They search to attend the training (self-improvement desire)	12	17.6
Ongoing commitment to continuing training	**n.68**	
No	39	57.4
Yes	29	42.6
Type of commitment	**n.29**	
On-Job training	9	31.0
Attend workshops or seminars	9	31.0
Attend a specialized course	11	37.9

Continued

Types of AT available at teacher's school	n.68	
Nothing	12	17.6
Low-tech devices (light pen to enhance writing area, pencil grips, adaptive desks).	41	60.3
Mid-tech devices (Sticky keys, Iris pen, Neo 2 portable keyboard)	8	11.8
High-tech devices (hearing aid and/or assistive listening device, word prediction programs, keyboard alternatives).	7	10.3
Are the AT needs to be considered at the schools		
No	26	38.2
Yes	42	61.8
The students access to the AT		
No	34	50.0
Yes	34	50.0
Use/planned to use AT in student's evaluation		
No	46	67.6
Yes	22	32.4
Teacher readiness—preparedness to AT services		
Not at all.	10	14.7
Poorly prepared.	15	22.1
Somewhat prepared.	24	35.3
Adequately prepared.	16	23.5
Extremely well prepared.	3	4.4
Estimated level of AT knowledge (teacher's self-evaluation)		
No knowledge	12	17.6
Little knowledge	20	29.4
Some knowledge.	24	35.3
Good knowledge	10	14.7
Extensive knowledge	2	2.9
Teacher AT training satisfaction		
Yes	53	77.9
No	15	22.1
The preferred method for learning about AT		
Hands-on instruction in a group setting	23	33.8
Mixed	15	22.1
One-on-one individualized instruction.	13	19.1
Attending workshops or conference sessions	13	19.1
Formalized courses (i.e., for university credit)	4	5.9

Multiple responses.

The process of teacher's engagement of AT training revealed that the majority (84.8%) of the teachers forced to attend the training as a form of organizational improvement desire compared to only 17.6% who have a self-improvement desire toward AT.

One of the remarkable findings revealed that only 42.6% of the studied participant committed to continuing AT training, among them nearly two-fifth (37.9%) willing to attend a specialized course and less than one-third of them willing to attend on-job training and workshop or seminars (31% for both).

Regarding the types of assistive technology available at the studied schools, less than one fifth (17.6%) of the schools have no AT, whereas more than sixty percent of the schools provided low-tech devices (light pen to enhance writing area, pencil grips, adaptive desks), followed by around one-tenth who provide Mid-tech devices (Sticky keys, Iris pen, Neo 2 portable keyboard) and high-tech devices (hearing aid and/or assistive listening device, word prediction programs, keyboard alternatives) (11.8% and 10.3% respectively).

Around two-thirds (61.8%) of the studied respondents reported that assistive technology needs are considered at the schools. Just half of the studied teachers confirmed that the students have access to assistive technology at the school. Only one-third (32.4%) of the studied teachers use /planned to use AT in student evaluation.

Regarding teacher readiness—preparedness to assistive technology services, the table revealed that 14.7% of the teachers were not ready at all, where slightly more than one-third (35.3%) were somewhat prepared compared to only 4.4% who were extremely ready.

Estimated level of AT knowledge (teacher's self-evaluation) less than one fifth (17.6%) reported that they don't have any knowledge compared to 35.3 who expect that they may have somewhat knowledge. Slightly less than eight percent (77.9%) of the studied teachers were satisfied by the received training. Finally, regarding the preferred method of received training, hands-on instruction was documented by 33.8 %of the teachers followed by mixed methods, one-on-one individualized instruction, attending workshops or conferences sessions, and formalized courses (University credit) (22.1%, 19.1%, 19.1%, and 5.9% respectively).

Figure 1 showed different types of assistive technology user difficulties. Around one-third (31%) indicated the unavailability because of high cost followed by 22% indicted the child-related disabilities and 19% were in lack of trained teachers. While 28% indicated that they didn't have any difficulties using assistive technology in their work.

Figure 2 exhibited the Assistive technology use challenges from the studied subject's perspective, 31% of studied teachers indicated they don't know followed by 22% equally indicated poor knowledge and high cost compared with 18% equally divided their response on family's poor acceptance, and a large number of children, while only 7% indicated that poor time management was their challenge to use assistive technology.
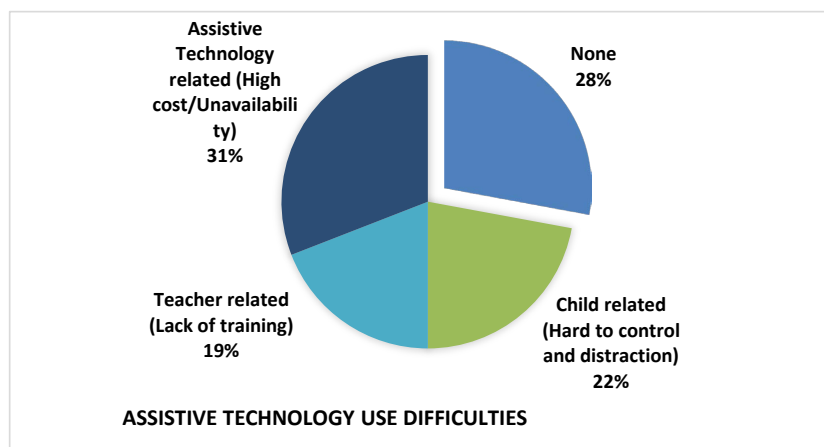
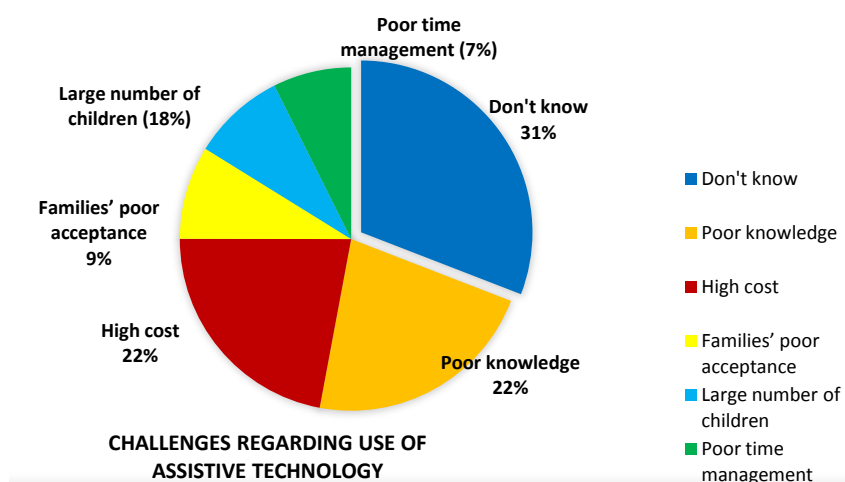**Figure 1.** Assistive technology use difficulties among the studied teachers.

Figure 2. Assistive technology use challenges from the studied subject's perspective.

Table 3 showed the distribution of the studied teachers according to their knowledge regarding assistive technology pre and post-the program. Regarding the definition of AT slightly more than two-fifths (44.1%) correctly defined it pre-program compared to more than three quarters (77.9%) post-program implementation. Concerning the advantages of using AT with disabled in classrooms only 42.6% correctly know its advantages pre-program compared to 72.1% pos-program. Whereas 41.2% correctly know its disadvantages compared to 82.4% pos-program.

Regarding the teacher's knowledge to differentiate between the low, medium, or high AT. It was noticed from the table that minor improvement in teacher's knowledge noticed pre-program compared to post-program, where around one-third (35.3%) of them correctly know the type of the modified drinking cup tech. pre-program compared to 57.4% post-program. Slightly more than half (51.5%) of them correctly know the type of audiobooks tech. pre-program compared to 44.1% post-program. Slightly less than half (47.1%) of them correctly know the type of the Talking calculator tech. pre-program compared to 35.3%

post-program. Slightly less than half (48.5%) of them correctly know the type of Wheelchair tech. pre-program compared to 45.6% post-program. Around one quarter (22.1%) of them correctly know the type of the large print materials tech. pre-program compared to 26.5% post-program. Around one-third (36.8%) of them correctly know the type of computer switches tech. pre-program compared to 33.8% post-program. Finally, more than half (55.9%) of them correctly know the type of the concept-mapping software tech. pre-program compared to 70.6% post-program.

Table 4 showed that there is a highly significant difference between pre and post-test among studied teachers according to their total knowledge and attitude scores regarding assistive technology pre and post-the program at *p*-value < .05.

Table 3. Distribution of the studied teachers according to their knowledge regarding assistive technology pre and post the program.

Knowledge regarding AT	Pre				Post			
	Incorrect		Correct		Incorrect		Correct	
	No.	%	No.	%	No.	%	No.	%
- *Definition of AT*	38	55.9	30	44.1	15	22.1	53	77.9
- *Advantages of using AT with disabled in classrooms*	39	57.4	29	42.6	19	27.9	49	72.1
- *Disadvantages of using AT with disabled in classrooms*	40	58.8	28	41.2	12	17.6	56	82.4
Which of the following devices are considered low, medium, or high AT								
- *Modified drinking cup*	44	64.7	24	35.3	29	42.6	39	57.4
- *Audiobooks*	33	48.5	35	51.5	38	55.9	30	44.1
- *Talking calculator*	36	52.9	32	47.1	44	64.7	24	35.3
- *Wheelchair*	35	51.5	33	48.5	37	54.4	31	45.6
- *Large print materials*	53	77.9	15	22.1	50	73.5	18	26.5
- *Computer switches*	43	63.2	25	36.8	45	66.2	23	33.8
- *Concept-mapping software*	30	44.1	38	55.9	20	29.4	48	70.6

Table 4. Distribution of the studied teachers according to their total knowledge and attitude scores regarding assistive technology pre and post the program.

	Pre		Post		Test of significance
	No.	%	No.	%	
Total knowledge					
Poor	17	25.0	12	17.6	
Fair	34	50.0	18	26.5	
Good	17	25.0	38	55.9	
Mean% ± SD	66.1 ± 11.4		72.9 ± 12.0		t: −3.631 *P*: .001*
Total attitude					
Negative	34	50.0	21	30.9	
Positive	34	50.0	47	69.1	
Mean% ± SD	77.9 ± 11.2		86.4 ± 11.2		t: −4.815 *P*: <.001*

t: Student's t-test *P*: *P*-value of test of significance *: Significance at *p* value < .05.

Table 5 presented the significant statistical difference between pre and post-test of the studied teachers according to their total responsibility, support, and perspective scores regarding assistive technology pre and post-the program at *p*-value < .05.

Figure 3 exhibited the studied teachers' evaluation of the program, almost two-third were indicated that the program was good compared with 25% indicating fair response, and only 16% were indicted poor response.

Table 6 showed that there was a highly significant difference between total knowledge, total attitude, teacher responsibility, teacher support, total perspectives, and program evaluation among studied teachers at *p* = .01.
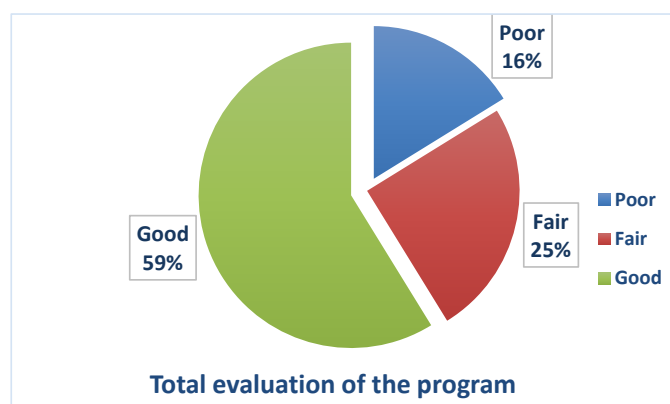

Figure 3. The studied subject's evaluation of the program.

Table 5. Distribution of the studied teachers according to their total responsibility, support, and perspective scores regarding assistive technology pre and post the program. (N = 68)

Total responsibility, support, and perspective scores regarding assistive technology pre and post the program	Pre		Post		Test of significance
	No.	%	No.	%	
Total teacher responsibility toward AT score					
Poor	18	26.5	4	5.9	
Fair	35	51.5	12	17.6	
Good	15	22.1	52	76.5	
Mean ± SD	77.5 ± 13.5		86.8 ± 13.2		t: −5.458 *P*: <.001*
Total teacher support score					
Poor	16	23.5	9	13.2	
Fair	25	36.8	12	17.6	
Good	27	39.7	47	69.1	
Mean ± SD	76.8 ± 12.2		85.5 ± 13.8		t: −4.397 *P*: <.001*
Teacher perspective toward AT					
Poor	20	29.4	19	27.9	
Fair	34	50.0	25	36.8	
Good	14	20.6	24	35.3	
Mean ± SD	77.1 ± 11.5		86.2 ± 12.8		t: −5.411 *P*: <.001*

t: Student's t-test. *P*: *P* value of test of significance. *: Significance at *p* value< .05.

Table 6. Correlation matrix between total knowledge, total attitude, teacher responsibility, teacher support, total perspectives, and program evaluation (N = 68).

	Total knowledge score		Total attitude score		Teacher Responsibility toward AT		Teacher support toward AT		Teacher perspective toward AT		Program evaluation	
	r	P	r	P	r	p	r	p	r	p	r	p
Total knowledge score			.754**	.000	.576**	.000	.659**	.000	.653**	.000	.434**	.000
Total attitude score	.754**	.000			.771**	.000	.801**	.000	.831**	.000	.342**	.004
Teacher Responsibility toward AT	.576**	.000	.771**	.000			.790**	.000	.944**	.000	.288*	.017
Teacher support toward AT	.659**	.000	.801**	.000	.790**	.000			.948**	.000	.403**	.001
Teacher perspective toward AT	.653**	.000	.831**	.000	.944**	.000	.948**	.000			.366**	.002
Program evaluation	.434**	.000	.342**	.004	.288*	.017	.403**	.001	.366**	.002		

r: Pearson Correlation. *P*: *P*-value of Pearson Correlation. **: Correlation is significant at the .01 level. **NB:** r < .2: no correlation. r: .2 - .4: weak correlation. r: .4 - .6: A moderate correlation r: .6 - .8: A strong correlation. r > .8: A perfect correlation.

4. Discussion

The current study aim was to investigate the effectiveness of an interventional program on developing knowledge and attitudes of Teachers managing disabled children toward using the assistive technology. Doubtless that, teachers should use appropriate teaching strategies and materials to reduce or eliminate children's deficits in specific learning areas. The major responsibility of a teacher is to provide children with successful learning experiences regardless of their disabilities, to reach their goal for a brilliant future (Tony, 2019). All participants in the current study were female teachers, the majority of them have bachelor's degrees and more than two-thirds of them are working as special teachers concerning their years of working experience, one-third of them had 3 - 5 years compared by only ten percent who had 11 years and more working experience. These findings go in line with Alkahtani's, 2013 findings, who studied teachers' Knowledge and use of assistive technology for students with special educational needs.

The use of assistive technology (AT) as a support for students with special needs is becoming more prevalent as the technology becomes increasingly affordable and more widely available. Consequently, it is important that the staff who are most likely to be working closely with these students be more competent and confident in the use of AT (Chambers, 2011).

The world is a global village where many useful tools are available to assist children with learning disabilities. Studies have investigated how information and communications technologies (ICT) cum assistive technology (AT) can influence the education of students with special needs and have shown that this technology can play an important and useful role (Adebisi, Liman, & Longpoe, 2015).

The type of support varies according to the type and degree of disability as

well as the degree of student's willingness and the supportive services available in their teaching environment. Regarding the types of disability among the students in the studied rehabilitation centers, the current study revealed that nearly half of the students were autistic children followed by nearly three-quarters having intellectual disabilities. On the other hand, around one-fifth of them have multiple disabilities and learning difficulties whereas, the minorities of them have physical, communication, vision, hearing disabilities, and down syndrome. The presence of all types of these disabilities in the selected settings should force all managers to be ready to deal with these conditions specifically and tailor the appropriate plan of teaching based on their needs. Accordingly, it is noteworthy to consider that the teaching team must be ready to carry teaching plan effectively and efficiently.

These findings were congruent with Coleman et al.'s (2015) findings, who evaluated the art educators' use of AT and found that there is a need for more in-service and pre-service training for teachers for the implementation of technology-based interventions. Thus, training teachers on the use of AT will be translated to positive attitudes and behavior toward the use of AT. Additionally, Alanazi (2020) added that it is clear that teachers' knowledge toward the use of AT in classrooms for students depends on different factors including training and the results of this study also show that AT training significantly affects teachers' knowledge and attitudes toward the use of AT.

Furthermore, only slightly more than one-tenth of the studied teachers in the current study received formal AT training, a sixty percent of them received AT workshops, followed by thirty percent who received Bab-noor platform to grow (an Arabic Tablet App) training and only ten percent of them received 40 hrs occupational therapy training. The process of teacher's engagement of AT training in the current study revealed that the majority of the teachers were forced to attend the training as a form of organizational improvement desire compared to only less than one-fifth who have a self-improvement desire toward AT. In addition, the absence of the devices of assistive technology in the selected settings is due to the higher financial cost of high technology devices and poor training and qualification of the teachers of the selected settings (Ghazi Abed, 2018). These findings reflect the importance of encouraging these teachers to be ready to accept training and creating an obligatory plan for self-improvement. Achieving the meaningful use of assistive technologies in the field of education can be influenced by many factors. One of these factors is teachers' perceptions towards the importance of the use of technology in teaching and the learning process. Teachers' perceptions and understanding of AT values depend upon the effective instructions they received during their pre-service training programs and professional developments.

One of the remarkable findings of the current study revealed that only two-fifths of the studied teachers committed to continuing AT training, among them nearly two-fifths willing to attend specialized courses and less than one-third of them willing to attend on-job training and workshop or seminars. These find-

ings indicate the importance of encouraging those teachers to accept training and increasing their commitment to do so.

To integrate technology for children with learning disabilities, the availability of appropriate software and learning programs is essential in the classrooms. Ghazi Abed, 2018 explored teacher concerns regarding the unavailability of devices, lack of technical support, and the high cost of different software programs. Also, assistive technology can include mobility devices such as walkers and wheelchairs, as well as hardware, software, and peripherals that assist people with disabilities in accessing computers or other information technologies (Faruk & Cagiltay, 2012).

Regarding the available types of assistive technology at the studied centers, it is noteworthy to report that the studied teachers in the current study indicated that less than one-fifth of the schools have no AT, whereas more than sixty percent of the schools provided low-tech devices (light pen to enhance writing area, pencil grips, adaptive desks), followed by around one-tenth who provide Mid-tech devices (Sticky keys, Iris pen, Neo 2 portable keyboard) and high-tech devices (hearing aid and/or assistive listening device, word prediction programs, keyboard alternatives).

These findings shed the light on the importance to consider that low-tech ATs are devices or equipment that don't require much training, may be less expensive, and do not have complex or mechanical features. Whereas AT devices or equipment that range in the middle of the continuum may have some complex features, may require some training to learn how to use, and are more expensive than low-tech devices (Georgia Tech., 2021).

Every child with a specific disability has unique needs that require accommodations or modifications based on his/her needs. Therefore, the school's environment should be improved, and teachers must improve their knowledge and instructional practice regarding dealing with assistive technology based on the identified needs (Sydeski, 2013).

In this regard, the current study showed that around two-thirds of the studied teachers reported that assistive technology needs should be considered at the center of rehabilitation. Just half of the studied teachers confirmed that the students have access to assistive technology at the school. Only one-third of the studied teachers use /planned to use AT in student evaluation. These considered one of the helpful findings since it reflects the effort done by the studied schools regard to provide a high-quality support service for disabled children based on their technological needs.

Classroom teachers are responsible for the student's entire educational programming, arrangement, tailored based on the needs assessment process. They have an understanding of the student's abilities and the opportunities for participation in the curriculum. Teachers are also responsible for implementing educational strategies so that educational, functional, and social goals can be achieved. Both special and general educators involved with the student should be

on the team acting to use all assistive devices effectively and efficiently (Harris, 2013).

Regarding teacher readiness and or preparedness to assistive technology services, the current study revealed that only slightly more than one-tenth of the teachers were not ready at all, where slightly more than one-third of them were somewhat prepared compared to the minority who were extremely ready. These findings go in line with Constantinescu (2015) who added that for students with disabilities to benefit from AT, special education teachers must demonstrate the capacity to select AT that is well-suited to the individual and the setting's demands. Successful special educators understand the needs of students, the requirements of classroom tasks, and how assistive technology can be used to foster independence.

The current study revealed that the estimated level of AT knowledge as teacher's self-evaluation, less than one-fifth of them reported that they have zero knowledge compared to slightly more than one third have poor knowledge of the AT. These findings indicate the importance of conducting training programs regarding AT based on teachers' needs. In this regard, one of the significant findings of the current study is that nearly two-thirds of the studied teachers were satisfied by the received training. That affects their subsequent training desires. Regarding the preferred method of received training, hands-on instruction was documented by around one-third of the studied teachers followed by mixed methods, one-on-one individualized instruction, attending workshops or conferences sessions, and formalized courses (University credit). These findings were similarly obtained and approved by Alkahtani (2013) in his study.

Concerning the barriers to using Assistive Technology among studied participants, it seems that the current study findings are similar to the barriers and challenges reported by Jacobsen and Dawn (2012) in their study entitled "Assistive technology for students with disabilities: Resources and challenges encountered by teachers" includes, fiscal restraints, limited teacher knowledge, teacher awareness, attitude and acceptance, equipment as a barrier (Efficacy, Explosion), and abandonment of AT devices (Matching, Motivation. Additionally, the current study showed different types of assistive technology user difficulties such as the unavailability of AT because of high cost followed by the child-related disabilities and lack of trained teachers. Moreover, assistive technology use challenges from the study teachers' perspective were reported on the nonacceptable attitudes from children's families, large number and varieties of disabled children, and poor time management are their challenges to using assistive technology.

These findings confirm Woodbury (2015) findings as they studied the effects of a training session on teacher knowledge, perceptions, and implementation of assistive technology in secondary schools and they reported that the perceived barriers to and benefits of assistive technology implementation yielded several common themes. The most common responses include a lack of knowledge/

training, a lack of resources/cost of obtaining sufficient technology, a lack of time to use technology, unreliable and changing technology, lack of student motivation, class size/hard to individualize, and difficulties in integrating technology into the classes. Furthermore, Chambers (2011), Alkahtani (2013), Flanagan et al. (2013), and Ghazi Abed (2018) also added that teachers' knowledge and self-efficacy, and confidence in software applications and professional development is essential for the successful implementation of assistive technologies.

Additionally, WHO (2016) defined assistive technology as the application of organized knowledge and skills related to assistive products, including systems and services. So, a pre-prepared teacher who has adequate knowledge and skills regarding effective use of AT was able to deal with the modifiable challenges and difficulties of using it, such as proper time management, minimizing the number of the students by proper scheduling, raising staff knowledge level through on-job training, engagement of family in the planning process to gain their cooperation and acceptance as well as continuous positive reinforcement for the children.

The current study assesses the knowledge regarding assistive technology pre and post the program and shed the light on teacher's AT knowledge from many aspects. Regarding the definition of AT slightly more than two-fifths correctly defined it pre-program compared to more than three quarters post-program implementation. Concerning the advantages of using AT with disabled in classrooms only slightly more than two fifths correctly know its advantages pre-program compared to around three-quarters post-program. Whereas slightly more than two fifths correctly know its disadvantages compared to more than three-quarters post-program. These findings are interesting since there is a noticeable improvement in knowledge level post-training program implementation. These findings were also approved by Woodbury (2015) study in Utah State USA and Alanazi's (2020) study in Hail, Saudi Arabia.

Likewise, teachers' attitudes regarding AT also affect their knowledge level and affect their acceptance level of training as Woodbury (2015), Alkahtani (2013) reported. These findings are not a novel discovery since the current study reflected that there is a highly significant difference between pre and post-test among study subjects' according to their total knowledge and attitude scores regarding assistive technology pre and post the program at p-value < .05. Nearly the same findings were reported by Laarhoven et al. (2012), and Ahmed (2018) who stated that preparing future teachers to use AT is necessary due to mandates that require them to be responsible for considering AT needs and services for all students receiving special education services, and believed that teachers acknowledge the importance of assistive technology was ready to use AT effectively. That also pertained in the current study that presented the significant statistical difference between pre and post-test of the study teachers according to their total responsibility, support, and perspective scores regarding assistive technology pre and post-the program at p-value < .05. Regarding teachers' evaluation of the training program received, almost two-third were indicated that the program

was good compared by one quarter indicated fair response nearly the same findings documented by Nordström et al. (2019).

To sum up, disability is not a fault or stigma and people with disabilities are a part of our community and have equal rights with us (United Nations Convention on the Rights of Persons with Disabilities (CRPD), 2006). Technology has seen a recent widespread integration into daily life, where access to vast amounts of information is now available with ease. Today's generation of students has grown up with technology all around them in an ever-increasing manner. To create an effective 21st-century classroom that meets the needs of the students, a modern teacher must factor in a student's motivation to learn (Francis, 2017).

The proper implementation of assistive technology in the classroom to assist students in tasks they otherwise might not be able to compete requires training for the student and teachers. If teachers are not trained properly then assistive technology may not be implemented properly, or may not be implemented at all (Bruinsma, 2011). Knowledge and attitudes are important environmental factors, affecting all areas of service provision and social life. Raising awareness and challenging negative attitudes are often the first steps towards creating more accessible environments for persons with disabilities. People's capabilities must be considered (WHO, World Report on Disability, 2011). In summary, investment in teacher training can make learning available and meaningful for all students World Bank (2019).

5. Conclusion

Based on the findings of the current study, it is concluded that the estimated level of AT knowledge (teacher's self-evaluation) indicates that less than one-fifth of them reported that they do not know compared to around one third who expect that they may have somewhat knowledge. However, there is a highly significant difference between pre and post-test among studied teachers according to their total knowledge and attitude scores regarding assistive technology pre- and post-the program. Additionally, there was a highly significant difference between total knowledge, total attitude, teacher responsibility, teacher support, total perspectives, and program evaluation among studied teachers.

The process of teacher's engagement of AT training revealed that most of the teachers forced to attend the training as a form of organizational improvement desire compared to only less than one-fifth who have a self-improvement desire toward AT. Regarding teacher readiness—preparedness to assistive technology services, the study revealed that more than one-tenth of the teachers were not ready at all, where slightly more than one-third were somewhat prepared compared to minorities who were extremely ready. Nearly two-thirds of the studied teachers were satisfied by the received training. Finally, regarding the types of assistive technology available at the studied schools, less than one-fifth of the schools have no AT, whereas more than sixty percent of the schools provided low-tech devices, followed by around one-tenth who provide Mid-tech devices and high-tech devices.

Recommendations

Based on the previous findings the following recommendations are suggested:

1) A well-planned and structured educational program should be undertaken to improve the level of awareness and contribute to better practice toward the use of Assistive Technology for disabled children management.

2) Conduct community awareness campaigns based on the pre-assessment of community needs and problems related to Assistive Technology and using the issued guidelines.

3) Using mass media to broadcast all relevant, culturally acceptable healthy messages regarding Assistive Technologies and its benefits.

4) Future studies could investigate the correlation between the level of teachers' awareness regarding Assistive technology and the study subject's health state.

Research Clinical Implications

The following clinical implications are suggested:

1) It is highly important to communicate the results of the current study with the managers and stakeholders to attain a deeper insight into the long-term usefulness of AT and its benefits.

2) Policymakers and rehabilitation teams at all levels must be aware of the results of such studies that focus on enhancing the use of AT to be considered when they are going to write their strategic improvement plan.

3) Pre-service teachers' awareness of the AT and how they are prepared for using it for children with special needs as a part of their training and professional development.

4) Creating personalized learning environments for both teachers and students at schools that enhance the use of AT must be encouraged.

Acknowledgements

The authors would like to express their appreciation to the managers of the centers and studied subjects who devoted their time to participate in this research.

Authors' Contribution

All authors were part of the initial design of the research. They shared in collected and analyzed the data, wrote and edited the final version of the text of the manuscript and formatted it, and submitted it for publication.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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