Saudi Teachers' Perceptions of ICT Implementation for Student with Autism Spectrum Disorder at Mainstream Schools

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Abstract
This study aimed at examining Saudi Teachers' Perceptions of ICT Implementation for Student with Autism Spectrum Disorder at Mainstream Schools. Studies have shown that the use of ICT can improve learning activities of students' with autism through improved communication, better interactions and enhanced skills. However, the perceptions of teachers may differ with the findings of these studies, particularly in the case of Saud Arabia. The study used qualitative methodology that entailed a review the past literature on this topic and a survey questionnaire that involved sample of 70 teachers from Riyadh City who specializes in teaching students with autism. The sample was determined randomly and data was collected using questionnaires. Cronbach's alpha coefficient was used to determine the reliability of the data. The findings indicate that the teachers have a positive attitude towards the use of ICT in teaching students with autism. They agreed that simple systems that can support social interactions among students would be beneficial for their studies. It is thus concluded that the use of teachers to collect necessary information for designing the right systems would ensure a number of barriers are eliminated and the systems proved beneficial in educating students with autism
Keywords: ICT, Implementation, Autism Spectrum Disorder (ASD), Teachers' perceptions

1. Introduction

Autism is a developmental disorder that is characterized by social interaction impairment, communication deficits and behavioral challenges (American Psychiatric Association, 2000) . According to Jordan (2005) the symptoms of autism are highly heterogeneous and ranges from severe damage to mild delay.   The number of students with autism keeps on increasing in Saudi schools. It has been documented that special learning attributes of these children vary widely from other children, requiring teachers to apply specialized skills and tools (Simpson, 2005). Jordan (2005) observes that in spite of advancements achieved in teaching practices for children with autism, very little attention has been shown towards the perceptions of teachers who offer services to these students in mainstream classes.

Integrating technology in learning will enhance the education of student with autism. Saudi Arabia has shown keen interest in implementing technology in its schools. Over the last twenty years, Saudi has implemented technology in schools as part of its program to develop human resources. Al-Maini (2009) notes that in Crown Prince Abdullah in 2000 publicized the "Watani" program, an ambitious Saudi project to integrate information technology into classrooms. In addition, there have been efforts by the Ministry of Education to improve teaching methodologies focusing on how to effectively use computers to support learning. This implies that teachers teaching students with autism will have a chance to use ICT in teaching children with autism. Certainly, the use of ICT will improve the learning outcomes of these students. The use of ICT is meant to equip teachers with tools that can captivate the interest of students with autism. However, very little studies have been done on the perceptions teachers' over use of ICT in classrooms in Saudi. This implies that there is need to evaluate perceptions of teachers in implementing ICT in classrooms for students with Autism in terms of their views about ICT, main barriers to ICT implementation and requirements for ICT implementation in mainstreams schools.

1.1 The Aim of the study
This study aims to understand the views of teachers on ICT, the leading barriers against implementation of ICT, and what measures are required to promote implementation of ICT in mainstream schools.

1.2 Study Questions
1. What are the teachers' perceptions of ICT implementation for students with ASD?
2. What are the teachers' perceptions of the main barriers to ICT implementation for students with ASD?
3. What are the teachers' perceptions of the measures needed to improve ICT implementation in mainstream schools?

2. Literature review
2.1 Autism Spectrum Disorder (ASD)
Autism Spectrum Disorder (ASD) has been described by DSM-5 American Psychiatric Association (APA) (2013)

as a spectrum disorder representing a group of neurodevelopmental disorders where people display marked and continuous challenges in aspects of communication and social interaction together with repetitive behaviors. Data from Centers for Disease Control and Prevention (CDCP) (2014) show that 1 in 68 children in America have autism or related Autism Spectrum Disorder (ASD). Though current data on children with autism and ASD is not available in Saudi Arabia, the above data on America indicates the global picture. Autism can be recognized by the various abnormalities in behavior, communication and social interaction. In addition, children with ASD are unable to perform certain activities (Jordan, 1999). According to IDEA (2010), children with ASD are negatively affected in their education performance.

2.2 Information and Communication Technology (ICT)

Information and Communication Technology (ICT) refers to applications and devices used in communication, for instance, computers and network software and hardware, and videoconferencing applications among others (Li, 2012). ICT has become beneficially in various aspects of life in education. For the last 20 years, the use of ICT has been fundamental in changing of procedures and practices of almost every form of endeavor within governance and business (Karagiannidis, Politis, & Karasavvidis, 2014). Moreover, the implementation of ICT in education creates a learning setting that is more student-centered. However, with the rapid movement of the world into digital information and media, the importance of ICT in education is becoming rapidly significant, and will continuously grow within the 21st century business (Li, 2012).

ICT has highly influenced learning, teaching, and research in education sector. A number of studies have proved that ICT is highly beneficial for the improvement of the quality of education. ICTs have the ability of accelerating, innovating, deepening, and enriching skills (Hourigan, Murray, & Riordan, 2011). According to Price (2009), ICT is significant in the motivation and engagement of students and helping them relate their experience at school to practical at work. Istenic Starcic and Bagon (2014) assert that computers have been used for education since they were discovered, and their application has been evolving with time.

O'Brien, et al (2011) explains that the present generation has been brought up with technology particularly computers. This generation is familiar with computers; therefore, teachers should have ICT skills to apply in the classroom. Using various technologies in classrooms could increase the performance, attitudes and skills of students. This is required most by special education students. O'Brien, et al (2011) affirms that teachers can offer creativity and engagement when they use technology in their classrooms. Through the use of technology in classrooms, students with disabilities such as autism feel included. According to O'Brien, et al (2011) technology provides confidence and achievement required by students.

2.3 ICT in the Saudi educational system

Saudi Arabia, like many other countries is rapidly adopting the use of ICT in schools as a way of improving its education system (Alharbi, 2013). The use of ICT in the education systems in Saudi Arabia started in the form of teaching it as a subject, instead of ensuring that ICT was integrated in the whole education system. There were computer labs constructed in schools to help in teaching of students on the use of computers. The subject would be examined like the other subjects in the curriculum (Alharbi, 2013). There was thus no major connection between ICT and the general learning environment (Roblyer & Doering, 2013).

The government of Saudi Arabia has however been working towards the full integration of ICT into the learning system to enhance its computer literacy level in schools (Haimour & Obaidat, 2013). Al-Maini (2013) explains that the Saudi Arabia has developed a great program to spur the use of ICT in schools referred to as Watani. Similarly, the Ministry of Education as developed Tawteer Project whose objective is to enhance ICT learning and teaching in Saudi Schools (Al-Maini, 2013). In spite of these noble projects, Al-Maini (2013) argues that ICT use in Saudi Arabia schools has been very successful. According to Al-Maini (2013) there are a number of reasons that hinder this success key among them being lack of enough funds, resistance from teachers and inadequate training of teachers in ICT skills.

Programs that are related to technology in education have been created to help in training of teachers as well as girls in the Saudi Kingdom. The country has 27 technical centers established by Ministry of Education has established to deliver methodological services to the Saudi teachers in ICT (Alshehri, 2014). This is significance in the improvement of the performance of these teachers in classrooms.

In a study carried out by Almalki & Wlliams (2012) that examined the use of ICT in Saudi schools established that one of the challenges facing use of ICT in schools is lack of well trained and confident teachers to take on ICT lessons. Other limitations established by Almalki & Wlliams (2012) included negative perceptions held by teachers, lack of enough time allocated to computer lessons and inadequate support from school administration on use of ICT. Cultural and religious beliefs were as well noted to hinder the use of ICT in Saudi schools.

2.4 Perspectives of Teachers on the Use of ICT for Students with Autism

Research on the implementation of ICT in teaching students with autism has shown that the initiative is important in the achievement of the effectiveness of the education programs of the students. A perfect example is the discovery that Computer Assisted Instruction (CAI) is important in the development of reading skills of the students with autism (Coleman-Martin, 2005; Tuedor, 2006; Luckevich, 2008), and improvement of listening skills, language, and vocabulary (Massaro & Bosseler, 2006). Other studies have proved that ICT platforms can help in improving the students' basic communication competencies (Sansosti & Powell-Smith, 2008), activity schedules and task completion (Kimball et al., 2008), development of social skills (Moore et al., 2005), and development of symbolic play skills (Herrara et al., 2008). However, reliability of these findings have been questioned due to the fact that majority of the studies relied on a small sample from clinical trials to make conclusions. Ghesquiere and Van der Aslsvoort (2009) argued that a perfect picture could be determined by shifting focus from individual perspectives to systematic and interactional points of view. Carnahan et al., (2009) stated that research among teachers could give clear perspectives of the successful implementation of ICT platforms in teaching students with autism.

Though there are potentials that ICT platforms can perfectly support social and academic needs of students with Autism, the teachers may find the implementation of ICT intimidating. They may experience major difficulty in creation of the time to collect content, perfectly understand the software, or redevelop their teaching aids to match with the requirements of the ICT platforms. Cloleman-Martin et al (2005) concluded that teachers show significant unwillingness towards the creation of PowerPoint presentations since they do not possess adequate knowledge about the program or they lack adequate time to create the presentations.

Many studies to date have majored on the usage of individualized computer databases (Kinney, Vedora, & Stromer, 2003). The researchers agreed to the claim that there is a general lack of knowledge on how a teacher can apply the individualized databases in the setting of a classroom. Additionally, Judge (2006) demonstrates that a number of teachers prefer the use of low technologies strategies rather than the high technology strategies that they often perceive to be hast to implement.

A few studies have also reported on the social validity of the introduction of ICT platforms in classrooms (Kinney, Vedora, & Stromer, 2003). Teachers are hardly interviewed on their perception of the significance of technology on learning among groups. Research often concentrates on the individual interventions, neglecting the significance of the context of classroom learning on ICT platforms. Issues of collaborative learning and social support are significant in classroom learning, and many studies ought to be performed in the area to determine how the whole initiative helps in achieving objectives of lessons among students. The presence of a learning environment that has the ability of maintaining high level of interaction between teachers and students has been pointed out to be highly significant in incorporation of ICT platforms in teaching students with autism. Teachers should always have the ability of influencing the learning directions among the students, and it is thus significant to have a platform that offers the ability. Research carried out among the teachers is thus significant in creating a platform that would ensure both the teachers and the students are pleased with the incorporation of technology in teaching students with autism (Alharbi, 2013).

2.5 Challenges Facing ICT use with Students with Autism

There are many challenges on the field of the use of ICT to improve the education systems for students with autism. These challenges emerge from both the perspectives of implementing technology and the research that has been carried out in the field. A significant challenge is the need for consideration of the users' individual needs (Maor et al., 2011; Edyburn, 2006). Understanding the user of a system is a fundamental aspect in the interaction between humans and computers (Dix et al., 2004). The fact that students with special needs are different from normal people implies that the needs of system designers cannot be assumed similar to the needs of the students with autism. The designers of the systems have to understand the needs of the students perfectly to ensure that the systems applied in provision of education perfectly meet the objectives. However, the teachers are the only people who perfectly understand the needs of the students, as they have undergone special training to ensure they interact with the students with special needs beneficially. Though the designers can easily learn the functional needs in the system, other significant factors like social implications of the systems also play a significant role in education of the students (Shinohara & Wobbrock, 2011).

Another significant challenge is the level of access that the users of the systems should get to ensure they use the technology beneficially. Issues of security of systems have brought up several discussions in the current literature regarding the need to protect systems from access of information by unauthorized users. However, students with special needs often suffer from lack of knowledge and ability to memorize information. There is the challenge of creation of systems that have information protected from unauthorized users or systems that can be accessed by everyone. Students with autism would definitely have problems with the access of systems in case passwords, pin codes or other security factors are incorporated (Hoppestad, 2007; McNaught, 2011).

A number of studies have also stated that successful implementation of systems call for the involvement of the user in designing and implementing the systems (Wright et al., 2011; Watkins, 2011; Longdon & Thimbleby, 2010; Farmer & Macleod, 2011). This is because the users of the systems should be aware of their needs and factors that would ensure they perfectly use the systems. However, students with autism might have problem in expressing their actual needs regarding system implementation due to the inability to express themselves precisely (Read et al., 2010).

3. Methodology
3.1 Questionnaire Construction
As explained by Brace (2004) the process of questionnaire construction is required where the researcher seeks overt information from participants. Brace (2004) nevertheless observes that questionnaire construction is a very delicate and critical research activity. Formulating the right questions that offer reliable and valid information for informed decision and theory testing requires good research skills. Bearing this in mind, the researcher formulated questionnaires because he sought to obtain pertinent information from teachers regarding their personal perception. As asserted by Babbie (1990), when undertaking a study centered on people and their views, beliefs, motivations and behaviors, the most suitable methodology is survey. The current study was carried out in Saudi Arabia, in Riyadh City, with a sample of 70 teachers. The questionnaire used contained 34-item structured questions based on the objectives of the study and the scope of the research.

Four experts were used to validate the instrument to ensure that it was relevant and addressed the stated aims. Similarly, the internal reliability of instrument was established through test-retest using Cronbach alpha method that gave a coefficient of 0.83, proving that the instrument was indeed reliable enough to be used for this study. The data collection instrument comprised of three sections: the first addressed teachers' views regarding ICT implementation, the second touched on barriers facing ICT implementation, and the third enquired about requirements for improving ICT implementation. The items used a Likert scale based on strongly agree, agree, neutral, disagree or strongly disagree. The results were afterwards coded from 5-1, where 1 represented "*strongly disagree*" and 5 represented "*strongly agree*". The researchers enlisted four research assistants to help in administering the questionnaires.

3.2 Sampling
Sampling is very important in a study because it allows the researcher to study the general attributes of the population (Miller, 1991). As mentioned by Miller (1991) there are two main ways of sampling methods, probability and nonprobability. For this study the researcher used probability methods, where he randomly selected 100 teachers from various   schools teaching children with ASD.. These teachers were from four mainstream schools located in Riyadh, in Saudi Arabia. The schools selected offered different services, such as support classes which facilitated the transition of special needs children into regular classes, and also segregated programs. From the 100 teachers selected, only 70 returned the questionnaires.

3.3 Data analysis
The researcher applied descriptive analysis to analyse the questionnaire data on the teachers' perspectives of using ICT. Accordingly, descriptive statistical analysis was applied to explain the general attributes of the data collected. The results were summarized and simple graphics used for analysis. The researcher also used SPSS (Statistical Package for the Social Sciences) to analyse the data, as Briggs and Coleman (2007) underlined that SPSS is an effective tool for processing statistical data.

4. Results
4.1 Research question 1: Teachers' views regarding ICT implementation
Table 1 displays the findings of the views of teachers on implementation of ICT. It uses relative frequencies, means and standard deviations to give a summary of the teachers' views. The majority of participants indicated a positive response to the investigation on the influence of ICT in supporting the teaching process, learning process, and social interaction skills of students with ASD. Positive response came from 52.3% of the participants (mean rating of 4.61 on the 5-point Likert scale). The majority of the responses to the idea that ICT should be included in the curriculum were very positive. The respondents who indicated a very strong agreement were 47.3% and this resulted in a mean rating of 4.26. There was also a very strong agreement on the question as to whether ICT could support improvement of students' social skills. The percentage of the respondents who gave a very strong agreement was 48.2%, and this resulted in a rating of 4.55. There was a fairly evenly distributed response to the question as to whether the use of ICT in teaching consumes a lot of time. However, the majority of the respondents disagreed with the statement. The percentage of the respondents who agreed was 32.0%, and this resulted in a mean of 3.07. Most respondents (60.4%) agreed that the use of ICT in teaching would require them to put in more effort. The mean response was 3.90 on the 5-point Likert scale. About half of

the respondents (49.1%) indicated a strong agreement with the suggestion that ICT can help in the development of communication skills and social interaction among students with ASD when different programs are used. The average response was rated at 4.44. The belief that implementation of ICT in schools is difficult attracted a largely negative response, with 37.5% indicating a disagreement to the statement. The average response was rated at 2.88 on the 5-point scale. The majority of the respondents (59.2%) disagreed with the statement that they preferred to continue with traditional ways of teaching.

Table 1: Teachers' views regarding ICT implementation (percentages)							
Items	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean	Std. Deviation
1. ICT greatly contributes to overall improvement of the learning and teaching processes and the social interaction skills of the students with ASD.	45.6	52.3	1.8	1.0	.03	4.61	2.90
2. ICT implementation should be included in the curriculum.	47.3	38.2	9.8	3.0	0.9	4.26	0.85
3. ICT could support improvement of student's social skills.	48.2	42.0	6.3	2.8	0	4.55	3.70
4. I think that using ICT for teaching is time consuming.	10.5	27.1	22.9	32.0	7.5	3.07	1.21
5. Using ICT in my teaching will need more effort from me.	18.8	60.4	7.2	13.1	0.6	3.90	0.99
6. ICT may help to develop communication skills and social interaction of students with ASD with using different programs.	49.1	42.9	5.0	3.0	0	4.44	3.66
7. I believe that ICT implementation is difficult in our school.	7.2	24	22.4	37.5	8.9	2.88	1.14
8. I prefer to keep using traditional ways of teaching.	3.0	6.2	12.4	59.2	19.3	2.18	0.89

4.2 Research question 2: Main barriers to ICT implementation

Table 2 shows an analysis of the responses to the second research question that was designed to investigate the major barriers to implementation of ICT. On the statement that an implementation barrier exists because ICT is not viewed as a major priority by schools, 45.1% of respondents indicated a strong agreement. The mean response was 4.33. Similarly, 40.0% of respondents agreed that the lack of technical support, as well as maintenance of computers in schools, creates barriers to ICT implementation. The mean was 4.12. On the statement that suitable training workshops for use of computers were unavailable and caused implementation barriers, 48.2% of respondents indicated a very strong agreement; the mean score was 4.51. A similar proportion of the respondents (47.3%) indicated agreement with the statement that, "taking ICT courses is not beneficial salary-wise and thus cause barriers to implementation". The mean response was 4.73. However, 36.6% disagreed with the statement that the lack of software (learning resources) for teaching students with autism created an implementation barrier. The mean was 1.95. A similar proportion (35.9%) indicated agreement with the statement that home obligations as well as collaboration with the families of the students is a barrier to ICT implementation. The mean response was rated at 3.01 on the 5-point scale. On the statement that financial difficulties of schools are a barrier to ICT implementation, nearly half (48.9%) indicated a very strong agreement. The mean response was 3.52. Over one-third of the respondents (37.0%) indicated agreement that the lack of ICT experience by teachers is a barrier to implementation. The average response was rated at 3.47. There was a fairly evenly distributed response to the statement that absence of awareness of benefits of the use of ICT created a barrier to implementation. A fair distribution also existed on the statement that the bad influence of some teachers on others creates a barrier. A fair proportion of the respondents (30.0%) agreed with this. A similar proportion of the respondents (29.0%) indicated agreement with the statement that lack of ICT access at home by some students created an implementation barrier. This resulted in an average response of 2.91. The statement that lack of class management skills created a barrier to ICT implementation generally attracted a negative response, with about one-third of the respondents (35.0%) indicating strong disagreement. The mean response was 2.85.

Table 2: Main barriers to ICT implementation							
Constructs	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean	Std. Deviation
1. ICT is not seen as a key priority by the school.	45.1	40.9	3.0	7.3	3.7	4.33	2.66
2. Lack of technical support and maintenance for computers at schools	30.0	40.0	15.9	11.1	3.0	4.12	0.84
3. Unavailability of suitable training workshops for computer use	48.2	42.0	5.3	3.8	0	4.51	3.80
4. Taking ICT courses is not beneficial salary-wise.	38.2	47.3	7.8	3.0	2.9	4.73	0.82
5. Lack of learning resources (software) for teaching students with ASD	9.9	15.7	12.2	36.6	27.6	1.95	1.18
6. Home obligations and collaboration with student's family	20.1	35.9	17.9	15.1	11.0	3.01	0.93
7. School financial difficulties	48.9	40.1	14.0	10.0	5.0	3.52	1.15
8. Teachers' lack of ICT experience	30.0	37.0	9.0	13.0	11.0	3.47	1.28
9. Absence of awareness regarding advantages of using ICT	17.0	43.0	5.0	5.0	21.0	2.97	0.77
10. Some teachers have a bad influence on others.	11.0	30.0	6.0	17.0	6.0	2.77	1.22
11. Some students do not have ICT access at home.	9.0	29.0	12.0	10.0	10.0	2.91	1.22
12. Lack of class management skills	9.0	16.0	10.0	30.0	35.0	2.85	1.17

4.3 Research question 3: Requirements for better ICT implementation

In this section of the questionnaire, participants were required to rank proposed requirements for the implementation of ICT on a scale of 1 to 5 with regard to importance. 1 represented the most important requirement while 5 represented the least important. The percentage of the frequency was determined by the number of times an item was selected as first choice by the participants. Tables 3 and 4 show the results.

Table 3 shows the analysis of the school-related requirements for implementation of ICT. The respondents stated that the most important requirement is the provision of enough relevant educational resources, including hardware and software, in Arabic language to the students with autism. The respondents ranked this requirement at 90.6%. The requirement ranked second was the inclusion of ICT implementation in the curriculum. The respondents ranked this requirement at 53%. Provision of financial support to schools to help in obtaining computers was ranked third, with a score of 28%. The fourth requirement was the application of ICT in administering the communication between schools and the Ministry of Education, with a score of 15%. The requirement that was ranked as least significant was the preparation of schools with adequate network and Internet access. This requirement had a score of 10.9%.

Table 3: School related requirements		
Constructs	Percentage frequency	Rank
1. Providing schools with enough educational resources, hardware and software suitable for teaching different skills to students with ASD in Arabic language	90.6%	First
2. Preparing schools with sufficient network and Internet access	10.9%	Fourth
3 Providing financial support to schools to obtain computers	28%	Third
4. Including ICT implementation in curriculum	53%	Second
5. Applying ICT in administration communication between schools and Ministry of Education	15%.	Fifth

Table 4 shows the results for the requirements that help in the development of teachers. The most significant requirement was the provision of computers to every student with ASD within the mainstream schools. The respondents ranked this requirement at 56%. The second requirement with regard to importance was the provision of continuous training to teachers. This requirement was ranked at 52.7%. At the third place, with a ranking of 35.8%, was the requirement that teachers should be obliged to use ICT with students with ASD. The fourth requirement was the provision of adequate information to teachers regarding the significance of using new technology in the education of students with ASD. This requirement had a score of 28.3%. The least

significant requirement, with a score of 16.7%, was the inclusion of ICT in teachers' preparation programs.

Table 4: Requirements for teachers' development		
Constructs	Percentage frequency	Rank
1. Teachers should be obliged to use ICT with students with ASD	35.8%	Third
2. Providing teachers with adequate information about the importance of using new technology in education of students with autism	28.3%	Fourth
3. Providing continuous training for teachers	51.7%	Second
4. Including ICT in teachers' preparation programs.	16.7%	Fifth
5. Providing computers for each student with ASD within mainstream schools.	56%	First

5. Discussion

The use of ICT has been described as important in improving the behavior, communication and learning skills of children with ASD. The first research question aimed to elicit the views of teachers regarding the implementation of ICT in education programs for students with ASD. From the responses, it was evident that majority of teachers are in support of the use of ICT in teaching students with ASD. The overall response to the claim regarding the preference for continuation of the use of traditional methods was negative. The finding agrees with those of Ahmadi (2009), who found that ICT helped children with ASD in their learning. This is an indication that the teachers have preference for the implementation of ICT in their classrooms. In the views of the teachers, the use of ICT has several benefits to the students. This include an improvement in the learning and teaching process, ability to save time, and the ability to improve the communication and social skills of the students with ASD. Indeed, the findings echo those of Detheridge (1997) who underscored that use of ICT significantly improves the communication and skills of children with ASD. The second research question asked for teachers' views regarding possible barriers to the implementation of ICT in education programs for students with ASD. The factors that hinder use of ICT in teaching of autistic students include the inability of schools to view ICT implementation as a key priority, the lack of technical support and computer maintenance in schools, and lack of suitable training workshops on the use of computers, among others. These findings mirror those of Al-Maini (2013), who established that lack of computer skills and competencies is a big barrier for Saudi Arabia teachers.

The last question investigated the factors that are required for successful ICT implementation. The study established that for success factors include the provision of schools with adequate educational resources, hardware and software suitable for teaching different skills among students with ASD, and inclusion of ICT in the curriculum. Provision of financial support to obtain computers was also a significant requirement as it has the ability of solving the problem of the implementation barrier caused by the lack of finances in schools. The use of ICT to enhance communication between schools and the Ministry of Education is another important requirement, as it would ensure a real time evaluation of the whole implementation process. These findings seem to agree with Detheridge (1997), who found that training and support for teachers who teach students with ASD could enhance ICT implementation in schools.

6. Conclusion

The present study sought to explain teachers' perceptions of ICT implementation for students with ASD at mainstreams schools. To achieve this goal, three research questions were formulated: *what are the teachers' views about ICT implementation for students with ASD? What are the main barriers towards ICT implementation for students with ASD? And what is required to improve ICT implementation in mainstream schools?* The findings from the past literature and the study survey reveal that ICT is a critical tool in improving the teaching and learning of students with ASD. However, ICT has not been successfully implemented in Saudi Arabian mainstream schools, particularly when it comes to using ICT in teaching children with ASD.

In answering the research questions, the study established that teachers hold varying views regarding the use of ICT in teaching students with ASD. Still, many of these teachers agree that ICT can greatly improve the social interaction and communication of students with ASD. In addition, the teachers believed that students could benefit from the initiative to implement ICT in their education programs. ICT can help improve the learning skills of the students, as well as enhancing their communication and social skills. These can be achieved when ICT is included in the curriculum and the teachers put in serious effort to ensure that the implementation process is a success. There are a number of barriers that hinder successful implementation of ICT, they include lack of ICT training of teachers; lack of sufficient funding to acquire ICT resources; lack of awareness of the importance of ICT; inability of schools to treat ICT implementation as a priority; a lack of technical support and computer maintenance in schools; lack of computer experience among the teachers; and lack of information regarding benefits of using ICT. To address these barriers, the study established that providing ICT resources, training of teachers in ICT and funding are some of the key factors that need to be addressed. The Saudi government seems is responding to these barriers and, through its Ministry of Education, the government has

started projects like *Watani and Tatweer* to increase ICT integration in public schools. However, as noted in the study, what is most required is training of teachers and reviewing the curriculum to strengthen ICT use in schools.

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