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Development of Social Skills with an Intellectual Disability Using Mobile Application

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Abstract The study extends on a novel idea of using mobile application for the development of social skills such as communication skills and behavioral skills for student with intellectual disabilities. A quasi-experimental study design was applied, and an experimental group and a control group (15 students each) of Intellectual Disability Center, Tabuk, Saudi Arabia, filled a pre-test and post-test questionnaire. The students with intellectual disability, mental age between (10-12) years, and (12-15) years old on "Binet" and the measure of adaptive behavior "Alshakhs." A follow-up study was also conducted to evaluate the long-term effectiveness of the mobile application for the development of social skills. ANOVA analysis of variance was applied to test the hypothesis. Results of this study show that communication skills and behavioral skills of the students improved and have statistically significant value in post-test and follow-up at the significance level of 0.05.

Keywords: *social skill, intellectual disability, accessible via electronic devices*

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1. Introduction

The use of mobile technologies to support the disabled person has increased worldwide [25]. The recent research has shown that all these technologies are focused on increasing the skills of students with moderate/severe intellectual disabilities. Studies also show that parents and advocates of mobile technologies request the school administrations to allow the use of inexpensive devices for students with intellectual disabilities. Parents also reported that children feel fascinated from visual media learning such as by the use of computers [4]. The students with intellectual disability lack the necessary social skills and are unable to interact appropriately with the society. Social skills are described as a set of behaviors that leads to positive interactions with the community [1]. The set of behaviors included in the social skills is both verbal and non-verbal to promote effective communication. The basic social skills are smiling and making eye contact, responding to questions, giving compliments during social interactions [6].

Shane & Albert [34], reported the development of significant skills in students with intellectual disabilities by the use of mobile technologies. The students also developed reading skills using mobile technologies [41]. It is also seen that students with intellectual disabilities have poor communication skills and are unable to communicate with their friends and have limited contacts. Several observational and longitudinal studies also reported that students with an intellectual disability have limited relationships [12,28]. The findings from a Longitudinal Study shows that 17% of the children with Intellectual disability have never visited any friend, and about 50% of such children have never contacted friends on telephone [33]. These studies show the lack of communication skills in children with intellectual disability.

Several studies also reported that intellectually disabled students face complex communication challenges and need a supportive system such as augmentative and alternative communication (ACC) systems to increase their communication skills [22]. The children with intellectual disability also reported the limited ability to (a) start and maintained conversations, (b) ask questions and request information from teachers, (c) respond to the teacher, and (d) participate in extra-curricular activities [22]. Ramdoss et al. [30], reported that if the communication impairment is not managed effectively, it will develop into challenging behavior and such individuals will have fewer opportunities in the school and society The National Research Council in 2001 suggested that communication deficit leads will persist for a lifetime if untreated [36].

One of the researches has focused on developing an effective intervention to improve the social communication skills of children with intellectual disability [42]. The special education schools focus on the development of social communications skills for children with intellectual disability. The special education institutes have been using technology for efficiently delivering instructions to the intellectually disabled students [20]. These findings suggests that the use of technology for students with an intellectual disability is not a novel strategy. In the recent

years, the mobile technology has grown more with versatility and cost effectiveness [18] study the use of mobile technologies in schools for children with disabilities to develop essential social communication skills and other behavioral skills.

Children with an intellectual disability lack social communication skills and also behavioral skills which are vital to positive social interaction and social development. According to American Psychiatric Association (2000), the intellectually disabled students have normal intelligence and language [3]. Despite these, the intellectual functioning of children is preserved and have impaired social skills such as communication and behavioral skills. These children have difficulty in academic, social and emotional development. These social deficits limit their normal development and establishment of familial relationships [38]. The mobile technology and smartphones in the community, but their use to develop the behavioral skills is not reported in the past. Several studies have shown the use of mobile technology in behavioral health [7], supporting an individual with an intellectual disability [15], and other mental disorders [16].

The recent development of mobile technology and the introduction of smartphones have opened the new gateway to opportunities. The smartphone applications can serve as a valuable tool in school psychology training to develop behavioral and social communication skills in students with intellectual disability. This technology can be deployed effectively in the classrooms to support the learning process of intellectually disabled students. According to Bell et al,. [5], the use of computer programs in the institutions to teach the students with intellectual disability proved to be beneficial. Mitchell, Parsons, & Leonard [27], determined the benefit of using virtual technology for teaching social behaviors and social communication skills to the individuals with intellectual disability [27]. Another study revealed that virtual reality environment helps in the development of social skills [40]. Farr, Yuill & Raffle [19], explained the success of technology in promoting social interactions. In another scientific review, it was found that the use of multimedia programs enhances the emotional recognition and social skills in individuals with intellectual disability [39]. In the last 5-7 years, the use of mobile technology has been increased. One of the studies evaluated the use of Personal Digital Assistant (PDA) in the form of mobile technology can enhance the capability of individuals to perform the different intellectual tasks [26]. According to Tentori and Hayes [37], the use of smartphone applications gives the children with an intellectual disability social cues to act in the particular social environment [37].

The aim of this study is to develop the social skills in students with intellectual disability using assessable mobile application. The present research will address the following questions:

a) What is the nature of social communication between the students with intellectual disabilities and their peer and teacher in classrooms?
b) What are the behavioral barriers to students with intellectual disabilities?
c) How the use of mobile application developed the social communication skills and behavioral skills for students with an intellectual disability?

2. Summary of the Literature Review

The literature review has revealed that social skills are very important for students with intellectual disabilities to survive in the society. These skills enable children to communicate and interact positively within a society. It is important to develop some of these social skills in students to accommodate these intellectually disabled students in a diverse society. The literature review has also revealed that mobile technology is rapidly developing and students actively use the mobile phones. The main problems of students with an intellectual disability are found to be poor communication skills. The lack of communication skills force the students to have limited relationships within a community. The opportunities also shrink for the students with intellectual disabilities. Therefore, the students with intellectual disability face communication challenges, which if not managed properly will develop for the rest of their life making life difficult. It was also found that special education institutes have successfully integrated latest technological devices to provide better education and develop some essential skills in students with intellectual disability. With the development of android smartphones, the use of mobile technology has become relatively easy. The teachers can provide better education and instructions to the students with the use of smartphones. These smartphones serve as an important tool in the development of social skills in the students with intellectual disability. Considering the benefits of smartphones in the development of social skills in students with a disability, the present research is focused on testing a mobile application which can develop social skills in students with intellectual disability. The findings of the present study will have a positive implication for future research in the field of social development of children with intellectual disabilities.

3. Methodology

3.1. Research Design

The present study is a Quasi-experimental pretest-posttest and a follow-up research to answer the research questions and accomplish its objectives. This research design helps in developing a comparability of study subjects on basic dimensions.

3.2. Participants

The study participants were students with the intellectual disability in age between (10-12) years and (12-15) years from Intellectual Disability Center, Tabuk City, Saudi Arabia. A total of 30 students were selected randomly and were divided into two groups an experimental group (15 students) and a control group (15 students) according to the pre-set criteria of intellectual disability. The participants of the experimental group were given mobile with the test application, and no mobile was given to the participants of the control group.

3.3. Study Criteria

The students are selected randomly in the study if the met the following criteria:

1. The students were in the mental age between (10-12) years.
2. Students diagnose with intellectual disability.
3. Students are studying in Intellectual Disability Center.
4. Students are having IQ level between 40-75.

3.4. Intervention

In the present study, Arabic mobile application (first step – 4th part) is used as an intervention for the students with intellectual disability. This application is an instructional tool which helps in developing social skills in the students. The different tools in this application include reading tools, and communication instruments and mathematics learning tool. There are other supplementary tools in this request, which can help the students to focus on their social skills development. This Arabic mobile application also demonstrates different features in aesthetic format and engages the students via games and other visual contents. There is another important feature in this application, which allows the teacher to find out the learning requirements of students, and to identify where the students are struggling in their learning process.

3.5. Instrument

A survey questionnaire was used to record the response of the students with intellectual disability. The criterion of the questionnaire is Likert-type and is rated as (Never=1, rarely=2, not much=3, sometimes=4, always=5). The selected students complete the survey with intellectual disability pre-test, post-test and a follow-up period of 1 year. The questionnaire has two sections; communication skills (10 items), behavioral skills (20 items).

3.6. The validity of Instrument

Before beginning the research, the students from Intellectual Disability Center, Tabuk City were asked about the use of mobile technology. It was found that none of the students had used a mobile or computer before. Five students were selected randomly and were given a questionnaire before giving them the cell phone for using Arabic mobile application for one week. The first phase of the project consisted of a pilot study with the students filling pre-test questionnaire and after one week of using Arabic mobile application a post-test questionnaire occupied by the five students. The change in social communication skills and behavioral skills was measured by comparing pre-test and post-test responses. The results were according to the objective of the study.

3.7. Social Validity

The social validity data of the study was collected to evaluate the proposed goal of the survey. The students and their teachers were analyzed to determine the impact of mobile technology use in the development of social skills among the students with intellectual disabilities. The social validity of the mobile application is investigated by collecting the data with the help of a little questionnaire. The teachers at the Intellectual Disability Center completed the survey after the completion of the study. The study is based on Likert Scale (1 = true, 2 = somewhat true, 3 = somewhat false, and 4 = false) regarding the development of communication skills and behavioral skills of the student after using mobile application. The staff also gave its comments about their experience with Arabic mobile application. The social validity questionnaire is provided in Appendix A.

3.8. Statistical Analysis

The collected data were analyzed using SPSS software. The mean scores, standard deviations of pre-, post- and follow-up test is recorded. The ANOVA analysis is applied to find the significant change in the scores of pre-test and post-test (p-value=0.05) and the pre-test with the follow-up test (p-value=0.05).

4. Results

Descriptive statistics of social communication skills variables is shown according to pre-test, post-test, and follow-up in the (Table 1). Descriptive statistics of social communication skills variables is shown according to pre-test, post-test, and follow-up in the (Table 2).

4.1. Social Validity

All the staff members reported a significant lack of communication and behavioral skills in the students before the start of the present study. Almost all the staff members reported that mobile application would be beneficial for developing communication and behavioral competencies in the students. The staff also reported that they are interested in using this mobile application for communication with the students. Staff member revealed no prior experience using mobile application for developing social communication and behavioral skills in the students. In the comments section, the staff suggested developing an application, which will help the students with intellectual disability in developing life skills.

To determine the effectiveness of the mobile application intervention on the development of social communication skills and behavioral skills ANOVA analysis of variance is applied. The assumption of homogeneity is the error variance that to check these assumption Levene test was used. The results show an overall increase in social communication skills in students with intellectual disabilities. The different items in the communication skills show statistically significant results ($p \leq 0.05$). In the (Table 3) below, shows that the students ask questions frequently (p=0.040), Greets his/her peers by saying "hi," "hello" or "similar" (p=0.008), his or her tone and body language (p=0.075). Similarly, other items of social communication skills are shown below.

The different items in the behavioral skills show statistically significant results ($p \leq 0.05$). The (Table 4) below, indicates that the students express joy (p=0.018), raise

his/her hand before asking a question (p=0.031), listen attentively (p=0.031) and can read facial expressions and differentiate between them. For example, the student can tell which emotions are depicted by narrowed eyebrows or a full open mouth (p=0.027). Similarly, other items of social communication skills are shown below. The (Table 5) shows the statistically significant at (p≤0.05) in the follow-up study controlling the pre-test scores.

Table 1. Mean and Standard deviations in Communication Skills

Variable	Position	Mean	S.D	Mean	S.D
Communication Skills		**Experimental Group**		**Control Group**	
	Pre-Test	1.80	0.676	1.74	0.668
Understands what the teacher says to him or her the very first time	Post Test	4.00	0.535	1.86	0.679
	Follow-up	3.93	0.458	1.70	0.662
	Pre-Test	1.07	0.258	1.03	0.246
Asks questions frequently	Post Test	4.00	0.000	1.20	0.273
	Follow-up	4.00	0.000	1.06	0.265
	Pre-Test	1.80	0.561	1.74	0.548
Greets his or her peers by saying "hi," "hello" or similar	Post Test	4.93	0.258	1.82	0.555
	Follow-up	4.60	0.507	1.60	0.538
	Pre-Test	1.20	0.414	1.22	0.416
Knows when something is done to them and says, "thank you."	Post Test	4.80	0.414	1.18	0.394
	Follow-up	4.27	0.961	1.20	0.414
	Pre-Test	1.00	0.000	1.02	0.223
Reads clearly and steadily in class	Post Test	4.40	0.632	1.07	0.238
	Follow-up	4.07	0.799	1.04	0.226
	Pre-Test	1.27	0.458	1.23	0.451
Can start a conversation quickly without thinking too hard	Post Test	2.87	0.352	2.72	0.347
	Follow-up	3.20	0.561	2.74	0.348
	Pre-Test	1.00	0.000	1.00	0.000
His or her tone and body language don't conflict	Post Test	3.47	0.516	1.47	0.268
	Follow-up	3.47	0.516	1.32	0.232
	Pre-Test	1.60	0.507	1.54	0.237
Calls for help or shouts when threatened or abused	Post Test	3.67	0.488	1.51	0.226
	Follow-up	3.60	0.507	1.49	0.221
	Pre-Test	1.00	0.000	1.00	0.000
Gives instructions to his or her peers coherently while working in groups	Post Test	3.73	0.594	1.12	0.250
	Follow-up	3.87	0.352	1.21	0.263
	Pre-Test	1.00	0.000	1.00	0.000
Uses hand and facial gestures to support his or her words	Post Test	3.80	0.561	1.32	0.263
	Follow-up	3.87	0.516	1.25	0.247

Table 2. Mean and Standard Deviations in Behavioral Skills

Variable	Position	Mean	S.D	Mean	S.D
Behavioral Skills		**Experimental Group**		**Control Group**	
	Pre-Test	1.80	0.676	1.77	0.668
Smiles or otherwise expresses joy where appropriate, for example, after receiving a good grade	Post Test	2.87	0.352	1.72	0.663
	Follow-up	3.47	0.516	1.75	0.665
	Pre-Test	1.07	0.258	1.07	0.258
Is nervous approaching or communicating with the opposite gender in his or her class	Post Test	3.47	0.516	1.10	0.264
	Follow-up	3.67	0.488	1.05	0.252
	Pre-Test	1.73	0.594	1.70	0.586
Identifies jokes, including sarcasm, promptly	Post Test	3.67	0.488	1.72	0.591
	Follow-up	4.00	0.535	1.63	0.572

Variable	Position	Mean	S.D	Mean	S.D
Behavioral Skills		**Experimental Group**		**Control Group**	
Involves self in social activities by volunteering to participate in them	Pre-Test	1.07	0.258	1.02	0.248
	Post Test	4.00	0.535	1.07	0.258
	Follow-up	3.47	0.640	1.07	0.258
Understands body language well. For example, he or she can tell when another person is angry, upset or scared	Pre-Test	1.20	0.414	1.20	0.414
	Post Test	4.00	0.000	1.21	0.416
	Follow-up	4.47	0.516	1.20	0.414
Raises his or her hand before asking a question	Pre-Test	1.20	0.414	1.20	0.414
	Post Test	4.93	0.258	1.25	0.421
	Follow-up	4.33	0.816	1.22	0.415
Listens attentively when someone else is talking	Pre-Test	1.07	0.258	1.07	0.258
	Post Test	4.80	0.414	1.05	0.254
	Follow-up	4.13	0.640	1.02	0.248
Identifies problems once they become transparent and tries to solve them without being asked to	Pre-Test	1.47	0.516	1.47	0.516
	Post Test	4.40	0.632	1.63	0.572
	Follow-up	2.87	0.352	1.56	0.563
Knows when to apologize for a mistake he or she made	Pre-Test	1.13	0.352	1.13	0.352
	Post Test	2.87	0.352	1.10	0.268
	Follow-up	3.47	0.516	1.07	0.258
Makes physical contact with peers while communicating	Pre-Test	1.07	0.258	1.07	0.258
	Post Test	3.47	0.516	1.05	0.254
	Follow-up	3.60	0.507	1.05	0.0254
Respects and looks up to the teacher	Pre-Test	1.27	0.458	1.25	0.454
	Post Test	3.93	0.799	1.20	0.414
	Follow-up	3.73	0.799	1.22	0.415
Can read facial expressions and differentiate between them. For example, the student can tell which emotions are depicted by narrowed eyebrows or a full open mouth	Pre-Test	1.07	0.258	1.07	0.258
	Post Test	4.00	0.845	1.05	0.254
	Follow-up	3.47	0.743	1.02	0.248
Helps those in need when help is solicited	Pre-Test	1.13	0.352	1.13	0.352
	Post Test	3.87	0.640	1.07	0.258
	Follow-up	4.60	0.507	1.03	0.249
Makes eye contact quickly	Pre-Test	1.13	0.352	1.13	0.352
	Post Test	4.93	0.258	1.10	0.265
	Follow-up	4.80	0.414	1.10	0.265
Identifies lies told by other friends or students	Pre-Test	1.40	0.507	1.40	0.507
	Post Test	4.80	0.414	1.20	0.414
	Follow-up	3.87	0.434	1.25	0.454
Talks to or socializes with friends more often than with strangers	Pre-Test	1.87	0.640	1.87	0.640
	Post Test	4.40	0.632	1.77	0.632
	Follow-up	3.67	0.488	1.80	0.634
Trusts his or her friends with secrets	Pre-Test	1.13	0.352	1.13	0.352
	Post Test	3.67	0.488	1.10	0.265
	Follow-up	3.87	0.516	1.12	0.349
Defends his or her friends when other people confront them	Pre-Test	1.67	0.617	1.67	0.617
	Post Test	4.00	0.535	1.40	0.507
	Follow-up	3.47	0.743	1.45	0.564
Shakes hands or hugs his or her friends once school is over for the day	Pre Test	1.27	0.458	1.27	0.458
	Post Test	4.00	0.000	1.25	0.454
	Follow-up	3.80	0.862	1.22	0.415
Would rather be in a group with his or her friends in a sports or team activity	Pre-Test	1.00	0.000	1.00	0.000
	Post Test	4.93	0.258	1.02	0.248
	Follow-up	4.67	0.488	1.02	0.248

Table 3. Results of ANOVA analysis of variance to assess the communication skills in posttest controlling the pre-test

Dependent Variables	Sum of Squares	Degree of Freedom	Mean Squared	The Amount of F	Significance Level
Communication Skills					
Understands what the teacher says to him or her the very first time	36.300	1	36.300	97.731	0.097
Asks questions frequently	64.533	1	64.533	1936.000	0.040
Greets his or her peers by saying "hi," "hello" or similar	73.633	1	73.633	386.575	0.008*
Knows when something is done to them and says, "thank you."	97.200	1	97.200	567.000	1.000
Reads clearly and steadily in class	86.700	1----	86.700	433.500	0.000*
Can start a conversation easily without thinking too hard.	19.200	1	19.200	115.200	0.075
His or her tone and body language don't conflict	45.633	1	45.633	342.250	0.000*
Calls for help or shouts when threatened or abused.	32.033	1	32.033	129.365	0.478
Gives instructions to his or her peers coherently while working in groups.	56.033	1	56.033	318.027	0.000*
Uses hand and facial gestures to support his or her words.	58.800	1	58.800	374.182	0.000*

(* Statistically significant at, P≤0.01).

Table 4. Results of ANOVA analysis variance to assess the Behavioral skills in posttest controlling the pre-test

Dependent Variables	Sum of Squares	Degree of Freedom	Mean Squared	The Amount of F	Significance Level
Behavioral Skills					
Smiles or otherwise expresses joy where appropriate, for example, after receiving a good grade	8.533	1	8.533	29.377	0.018
Is nervous approaching or communicating with the opposite gender in his or her class	43.200	1	43.200	259.200	0.000*
Identifies jokes, including sarcasm, promptly	28.033	1	28.033	94.952	0.627
Involves self in social activities by volunteering to participate in them	64.533	1	64.533	366.270	0.289
Understands body language well. For example, he or she can tell when another person is angry, upset or scared	58.800	1	58.800	686.000	0.000*
Raises his or her hand before asking a question	104.533	1	104.533	878.080	0.031
Listens attentively when someone else is talking	104.533	1	104.533	878.080	0.031
Identifies problems once they become transparent and tries to solve them without being asked to	64.533	1	64.533	193.600	0.353
Knows when to apologize for a mistake he or she made	22.533	1	22.533	182.000	1.000
Makes physical contact with peers while communicating	43.200	1	43.200	259.200	0.000*
Respects and looks up to the teacher	53.333	1	53.333	125.843	0.095
Can read facial expressions and differentiate between them. For example, the student can tell which emotions are depicted by narrowed eyebrows or a full open mouth	64.533	1	64.533	165.268	0.027
Helps those in need when help is solicited	56.033	1	56.033	210.125	0.083
Makes eye contact quickly	108.300	1	108.300	1137.150	0.237
Identifies lies told by other friends or students	86.700	1	86.700	404.600	0.029
Talks to or socializes with friends more often than with strangers	48.133	1	48.133	118.918	0.450
Trusts his or her friends with secrets	48.133	1	48.133	266.000	0.011
Defends his or her friends when other people confront them	40.833	1	40.833	122.500	0.064
Shakes hands or hugs his or her friends once school is over for the day	56.033	1	56.033	534.864	0.000*
Would rather be in a group with his or her friends in a sports or team activity	116.033	1	116.033	3481.000	0.040

Table 5. Results of ANOVA analysis variance to assess the Social Communication skills and Behavioral skills in Follow up controlling the pre-test

Dependent Variables	Sum of Squares	Degree of Freedom	Mean Squared	The Amount of F	Significance Level
Communication Skills					
Greets his or her peers by saying "hi," "hello" or similar	0.833	1	0.833	5.147	0.031
Knows when something is done to them and says, "thank you."	2.133	1	2.133	3.896	0.058
Can start a conversation easily without thinking too hard.	0.833	1	0.833	3.804	0.061

Dependent Variables	Sum of Squares	Degree of Freedom	Mean Squared	The Amount of F	Significance Level
Behavioral Skills					
Smiles or otherwise expresses joy where appropriate, for example, after receiving a good grade	2.700	1	2.700	13.829	0.001*
Identifies jokes, including sarcasm, promptly	0.833	1	0.833	3.182	0.085
Involves self in social activities by volunteering to participate in them	2.133	1	2.133	6.137	0.020
Understands body language well. For example, he or she can tell when another person is angry, upset or scared	1.633	1	1.633	12.250	0.002
Raises his or her hand before asking a question	2.700	1	2.700	7.364	0.011
Listens attentively when someone else is talking	3.333	1	3.333	11.475	0.002
Identifies problems once they become transparent and tries to solve them without being asked to	17.633	1	17.633	67.327	0.000*
Knows when to apologize for a mistake he or she made	2.700	1	2.700	13.829	0.001*
Can read facial expressions and differentiate between them. For example, the student can tell which emotions are depicted by narrowed eyebrows or a full open mouth	2.133	1	64.533	3.368	0.077
Helps those in need when help is solicited	4.033	1	4.033	12.100	0.002
Identifies lies told by other friends or students	6.533	1	6.533	15.077	0.001*
Talks to or socializes with friends more often than with strangers	4.033	1	4.033	12.642	0.01*
Defends his or her friends when other people confront them	2.133	1	2.133	5.091	0.032
Would rather be in a group with his or her friends in a sports or team activity	0.533	1	0.533	3.500	0.072

(* Statistically significant at, P≤0.01).

5. Discussion

The primary objective of this quasi-experimental study was to develop social skills in a student with an intellectual disability by the use of Arabic mobile application which is readily available to the students. The mobile devices are considered as a useful tool for communication and behavior development. The use of mobile devices has been associated with effective communication skills and behavioral skills. In the present study, ten different items were evaluated to determine the development of social skills in the student with an intellectual disability by using Arabic mobile application. The present study revealed a significant different between the experimental and control groups. The pre-test scores of both the groups are almost similar. After the intervention of mobile application, the experimental group showed a significant improvement in their scores and demonstrated the development of social communication and behavioral skills. The post-test scores of the experimental group were significantly higher than the control group. The comparison of two group reflects the effectiveness of mobile application and its impact on the development of social communication skills and behavioral skills. The students were asked if they "Understands what the teacher says to him or her the very first time," the Pre-Test (mean=1.80) and Post-Test (mean=4.00) responses show a significant increase in the understanding of students. When a similar question was asked of the control group the Pre-Test (mean=1.74), and Post-Test (mean=1.86) was recorded which shows almost identical pre-test and post-test scores. The Follow-up (mean=3.93) was slightly small which shows a slight improvement in the application to enhance the knowledge of the students. These results indicate that mobile application is a valuable tool for developing the communication skills of the students. The students also developed the habit of asking questions frequently Pre-Test (mean=1.07) and Post Test (mean=4.00). This show the students have developed some confidence to ask the question. Trust is one of the essential components of communication skills. Similarly, the students started to greet their peers by the kind gesture of "hi" and "hello." The results of the present study are consistent with the previous studies in which the researchers evaluated the effect of different AAC devices on the development of communication skills in the students [10].

The present study also revealed that the confidence of the students is boosted after the use of the mobile application, which is ultimately reflected in their enhanced communication skills. The students can read clearly Pre-Test (mean= 1.00), Post-Test (mean=4.40). Chen et al. [11] and Hsu [21] also reported a similar significant improvement in reading comprehension by the use of computer devices [11,21]. This shows that when adaptive mobile applications are used for the students with intellectual disability, it not only enhances their communication skills but also improves their learning ability, which will benefit them in their educational career. One another study shows a similar increase in communication skills with the use of iPad, but exact pattern of development of communication skills among the students is not clear [17].

In the present study it was found that students had difficulty starting a conversation and often think too hard before conversation and had the Pre-Test mean score of (1.27), which improved after the intervention of our mobile application in the Post-Test average score (2.87), and the Follow-up Test to about (3.20). These findings suggest that the mobile application has boosted the ability of the students to start a conversation without thinking too hard or too often. This hesitation to start a conversation is

associated with lack of emotional awareness and self-regulation. These are essential for the intellectual development of an individual. Cognitive behavioral therapy is the key to teaching these self-awareness skills and to overcome the hesitation. One of the studies also revealed that the mobile applications had the ability to teach state-of-the-art skills which are helpful in overcoming the hesitation [24]. So, the result of the present study is consistent with the past study that mobile application can impart the self-regulation and self-awareness skills and students learned to start a conversation without any hesitation.

The students also reported an improved mean score of (3.67) in their safety issues. The students became aware of the threats and abuse, which is clear in the increase in Post-Test scores. Bryen et al. (2007) suggested that it is the basic requirement of the communication that a mobile phone user can figure out the safety issues [9]. In this research Bryen et al. determined that the mobile phones are effective in emergencies situations. The present study also shows similar results that students have improved their safety issues by the use of the mobile application and this show a clear improvement in their communication skills. One of the essential features of learning in an electronic environment is that it enables the learner to present different ideas and concepts in multiple ways [2]. The present study also shows a similar result. The students can use hands and facial gestures to support their ideas and words Post-Test (mean score=3.80). One of the studies indicates that the electronic mean of conveying a message is useful for all the student's such demonstration helps in developing multiple options for expression of ideas [8]. The present study also shows that mobile application convey the message of communication skills effectively and the students learned to express their words in multiple ways.

Like communication skills, there are also different items to evaluate the behavioral skills of the students. The students learned to smile and express joy after the intervention of mobile application. The Post-Test score (2.87). One of the studies also shows that children express their thoughts and emotions in proper with the use of technology which they were unable to share with others [29]. The students are also able to identify jokes and sarcasm after using mobile application Post-Test score (3.67). Similarly, there is a clear increase in the variables of behavioral skills from Pre-Test scores to Post-Test scores. This shows that the intervention is somewhat successful in imparting useful communication and behavioral skills in the students with intellectual disabilities.

To understand which variable of communication skills and behavioral skills has significantly changed after the use of mobile application ANOVA analysis was performed. In the communication skills, it was found that there is a statistically significant increase in the variable of Asks questions frequently (p=0.040, F=1939.00) at (Significance level p=0.05). The other variables which are found to be statistically significant includes, Greets his or her peers by saying “hi” or “hello” (p=0.008, F=386.57). The students read clearly and steadily in class (p=0.00, F=433.50), No conflict in the body tone and body language (p=0.000, F=342.25), and the use of hand and facial gestures to support his words (p=0.000, F=374.182) at (Significance level p=0.001) Table 3. All these variables have strong relation with the increase in communication skills of the students. One of the variables is statistically insignificant that is knows when something is done for them (p=1.000, F=567.00). These results are consistent with the previous studies, and there is a clear increase in communication skills of the students with intellectual disability by the use of the mobile application. The previous study in which iPad is used to engage the students also provide the evidence that the communication skills of the students improved after the use of technological devices. The running software programs in the iPad provide visual aesthetics and improve the social communication skills. The previous studies also revealed that with the use of mobile technology, the vocabulary and learning process of the students improves.

The use of technology can provide great opportunity to control the environment and enhance the social skills to integrate into the community [23]. The impact of mobile technology on the community integration by the development of social skills is not studied previously. In the present study, social skills are enhanced by the use of the mobile application and their impact on the social integration is determined. The previous studies show that mobile technology allows greater independence in daily life. Similarly, the present study also revealed that with the use of mobile application the students have greats independence and confidence which is reflected by their enhanced communication skills.

Various variables of behavioral skills are found to be statistically significant in the present study. These variables include smiles and express joy (p=0.018, F=29.37), raises hand before questioning (p=0.031, F=878.08), listen attentively (p=0.031, F=878.08), identifies lies (p=0.029, F=404.60), trust friends (p=0.011, F=266.00), and prefer to be in group in a sports or team activity (p=0.040, F=3281.00) at the (Significance level p=0.05 and p=0.01) Table 4. These statistically significant values show the development of essential behavioral skills in the students with the use of the mobile application. One of the previous studies also indicates that the video-based interactive interventions promote the life skills in students with intellectual disability [29]. This study also shows that these interactive interventions improve community behavior and integrate the skills with the learning process.

In the present study, motivation was seen in the student after the use of the mobile application which shows that integration of mobile applications and the learning process, behavior, and enthusiasm of the students can be boosted [32]. The previous study links the increase in behavioral skills with the flexibility of technology use. This shows that the more flexible electronic technology, the more behavioral and communication skills. Salend (2009) revealed that when the educational material is presented in the form of aesthetic quizzes on mobile application and games formats, the students feel motivated and develop behavioral skills from such requests [32]. One other study in which iPad is evaluated; both the teachers and students identified the benefit of its use in communication, learning, independence, and change in behavior [17]. In this study, the teacher also supported the idea of using mobile applications for developing social skills in the students.

The use of mobile devices for students with learning disabilities has been reported in several studies. The present study shows an improvement in learning behavior of the students. This result is consistent with the previous research which states that the use of mobile technology can increase the learning ability of the students [17]. The findings of the present study are supportive of the idea of using mobile applications for the development of social skills. Chiak et al. (2010) also reported that the use of portable mobile devices is helpful in teaching social skills to students with different disabilities such as autism and intellectual disability [13]. One another study suggested that iPad can be used in place of television and computers to boost the behavioral and communication skills at wider settings [14].

6. Limitation of the Survey

There are several constraints in this study. The results of this study cannot be generalized to all the students with an intellectual disability as we have selected only one institute The Intellectual Disability Center, Tabuk, Saudi Arabia. The success of mobile application as a valuable tool for development of social skills, it has to be expanded to other disability centers. The follow-up study revealed a slight decrease in the mean score which shows there are some gaps in the mobile application which needs to be addressed for long-term effectiveness.

7. Conclusion

The use of mobile applications via easily accessible mobile devices is the most practical approach for the development of social skills in the students with intellectual disabilities. The findings of the present study show a significant development of social communication skills and the behavioral skills among the intellectually disabled students. The results are quite encouraging to extend the use of the mobile application for the development of all the social skills and enable the student with an intellectual disability to enjoy the social life, and adequately express themselves. The present study is a baseline and inspires others to develop a more effective mobile application to encourage face-to-face social interactions for the students with intellectual disability.

References

[1] Algozzine, B., Wang, C., & Violette, A. S. (2011). Reexamining the relationship between academic achievement and social behavior. *Journal of positive behavior interventions, 13*(1), 3-16.

[2] ANDERSON‐INMAN, L., & Horney, M. A. (2007). Supported eText: Assistive technology through text transformations. *Reading Research Quarterly, 42*(1), 153-160.

[3] Ashburner, J., Ziviani, J., & Rodger, S. (2010). Surviving in the mainstream: Capacity of children with autism spectrum disorders to perform academically and regulate their emotions and behavior at school. *Research in Autism Spectrum Disorders, 4*(1), 18-27.

[4] Ayres, K. M., Mechling, L., & Sansosti, F. J. (2013). The use of mobile technologies to assist with life skills/independence of students with moderate/severe intellectual disability and/or autism spectrum disorders: Considerations for the future of school psychology. *Psychology in the Schools, 50*(3), 259-271.

[5] Bell, R. L., Maeng, J. L., & Binns, I. C. (2013). Learning in context: Technology integration in a teacher preparation program informed by situated learning theory. *Journal of Research in Science Teaching, 50*(3), 348-379.

[6] Bohlander, A. J., Orlich, F., & Varley, C. K. (2012). Social skills training for children with autism. *Pediatric Clinics of North America, 59*(1), 165-174.

[7] Brendryen, H., & Kraft, P. (2008). Happy Ending: a randomized controlled trial of a digital multi-media smoking cessation intervention. *Addiction, 103*(3), 478-484.

[8] Bruce, D., Di Cesare, D. M., Kaczorowski, T., Hashey, A., Boyd, E. H., Mixon, T., & Sullivan, M. (2013). Multimodal composing in special education: A review of the literature. *Journal of Special Education Technology, 28*(2), 25-42.

[9] Bryen, D. N., Carey, A., Friedman, M., & Taylor, S. J. (2007). Cell phone use by adults with intellectual disabilities. *Intellectual and developmental disabilities, 45*(1), 1-2.

[10] Cannella-Malone, H. I., DeBar, R. M., & Sigafoos, J. (2009). An examination of preference for augmentative and alternative communication devices with two boys with significant intellectual disabilities. *Augmentative and Alternative Communication, 25*(4), 262-273.

[11] Chen, J., Man, H., Yen, N. Y., Jin, Q., & Shih, T. K. (2010). *Dynamic navigation for personalized learning activities based on gradual adaption recommendation model.* Paper presented at the International Conference on Web-Based Learning.

[12] Chung, Y.-C., Carter, E. W., & Sisco, L. G. (2012). Social interactions of students with disabilities who use augmentative and alternative communication in inclusive classrooms. *American Journal on Intellectual and Developmental Disabilities, 117*(5), 349-367.

[13] Cihak, D., Fahrenkrog, C., Ayres, K. M., & Smith, C. (2009). The use of video modeling via a video iPod and a system of least prompts to improve transitional behaviors for students with autism spectrum disorders in the general education classroom. *Journal of Positive Behavior Interventions*.

[14] Cumming, T. M., Strnadová, I., & Singh, S. (2014). iPads as instructional tools to enhance learning opportunities for students with developmental disabilities: An action research project. *Action Research, 12*(2), 151-176.

[15] DePompei, R., Gillette, Y., Goetz, E., Xenopoulos-Oddsson, A., Bryen, D., & Dowds, M. (2008). Practical applications for use of PDAs and smartphones with children and adolescents who have traumatic brain injury. *NeuroRehabilitation, 23*(6), 487-499.

[16] Depp, C. A., Mausbach, B., Granholm, E., Cardenas, V., Ben-Zeev, D., Patterson, T. L., . . . Jeste, D. V. (2010). Mobile interventions for severe mental illness: design and preliminary data from three approaches. *The Journal of nervous and mental disease, 198*(10), 715.

[17] Draper Rodríguez, C., Strnadová, I., & Cumming, T. (2014). Using iPads with students with disabilities: Lessons learned from students, teachers, and parents. *Intervention in School and Clinic, 49*(4), 244-250.

[18] Etzo, S., & Collender, G. (2010). The mobile phone 'revolution'in africa: Rhetoric or realty? *African affairs*, adq045.

[19] Farr, W., Yuill, N., & Raffle, H. (2010). Social benefits of a tangible user interface for children with autistic spectrum conditions. *Autism, 14*(3), 237-252.

[20] FernáNdez-LóPez, Á., RodríGuez-FóRtiz, M. J., RodríGuez-Almendros, M. L., & MartíNez-Segura, M. J. (2013). Mobile learning technology based on iOS devices to support students with special education needs. *Computers & Education, 61*, 77-90.

[21] Hsu, M.-H. (2008). A personalized English learning recommender system for ESL students. *Expert Systems with Applications, 34*(1), 683-688.

[22] King, A. M., & Fahsl, A. J. (2012). Supporting social competence in children who use augmentative and alternative communication. *TEACHING Exceptional Children, 45*(1), 42-49.

[23] Lefever, R., & Currant, B. (2010). How can technology be used to improve the learner experience at points of transition. *Higher Education Academy*.

[24] Lockley, T., & Promnitz-Hayashi, L. (2012). Japanese university students' CALL attitudes, aspirations and motivations. *CALL-EJ online, 13*(1), 1-16.

[25] Mechling, L. C. (2011). Review of twenty-first century portable electronic devices for persons with moderate intellectual disabilities and autism spectrum disorders. *Education and Training in Autism and Developmental Disabilities*, 479-498.

[26] Mechling, L. C., Gast, D. L., & Seid, N. H. (2009). Using a personal digital assistant to increase independent task completion by students with autism spectrum disorder. *Journal of autism and developmental disorders, 39*(10), 1420-1434.

[27] Mitchell, P., Parsons, S., & Leonard, A. (2007). Using virtual environments for teaching social understanding to 6 adolescents with autistic spectrum disorders. *Journal of autism and developmental disorders, 37*(3), 589-600.

[28] Nurmi, J.-E. (2012). Students' characteristics and teacher–child relationships in instruction: A meta-analysis. *Educational Research Review, 7*(3), 177-197.

[29] Picard, R. W. (2009). Future affective technology for autism and emotion communication. *Philosophical Transactions of the Royal Society B: Biological Sciences, 364*(1535), 3575-3584. doi: 10.1098/rstb.2009.0143

[30] Ramdoss, Sathiyaprakash, Mulloy, Austin, Lang, Russell, O'Reilly, Mark, Sigafoos, Jeff, Lancioni, Giulio, . . . El Zein, Farah. (2011). Use of computer-based interventions to improve literacy skills in students with autism spectrum disorders: A systematic review. *Research in Autism Spectrum Disorders, 5*(4), 1306-1318.

[31] Rayner, C., Denholm, C., & Sigafoos, J. (2009). Video-based intervention for individuals with autism: Key questions that remain unanswered. *Research in Autism Spectrum Disorders, 3*(2), 291-303.

[32] Salend, S. (2009). Using technology to create and administer accessible tests. *Teaching Exceptional Children, 41*(3), 40-51.

[33] Schaefer, J. M., Cannella-Malone, H. I., & Carter, E. W. (2016). The Place of Peers in Peer-Mediated Interventions for Students With Intellectual Disability. *Remedial and Special Education, 37*(6), 345-356.

[34] Shane, Howard C, & Albert, Patti Ducoff. (2008). Electronic screen media for persons with autism spectrum disorders: Results of a survey. *Journal of autism and developmental disorders, 38*(8), 1499-1508.

[35] Son, S.-H., Sigafoos, J., O'Reilly, M., & Lancioni, G. E. (2006). Comparing two types of augmentative and alternative communication systems for children with autism. *Pediatric Rehabilitation, 9*(4), 389-395.

[36] Study, B. S. C., & Health, N. I. o. (2007). Information about Mental Illness and the Brain.

[37] Tentori, M., & Hayes, G. R. (2010). *Designing for interaction immediacy to enhance social skills of children with autism.* Paper presented at the Proceedings of the 12th ACM international conference on Ubiquitous computing.

[38] The St. Petersburg, U. S. A. O. R. T. (2008). THE EFFECTS OF EARLY SOCIAL-EMOTIONAL AND RELATIONSHIP EXPERIENCE ON THE DEVELOPMENT OF YOUNG ORPHANAGE CHILDREN. *Monographs of the Society for Research in Child Development, 73*(3), vii-295.

[39] Wainer, A. L., & Ingersoll, B. R. (2011). The use of innovative computer technology for teaching social communication to individuals with autism spectrum disorders. *Research in Autism Spectrum Disorders, 5*(1), 96-107.

[40] Wallace, S., Parsons, S., Westbury, A., White, K., White, K., & Bailey, A. (2010). Sense of presence and atypical social judgments in immersive virtual environments Responses of adolescents with Autism Spectrum Disorders. *Autism, 14*(3), 199-213.

[41] Wang, S., & Smith, S. (2013). Reading and grammar learning through mobile phones. *Language Learning & Technology, 17*(3), 117-134.

[42] White, S. W., Keonig, K., & Scahill, L. (2007). Social skills development in children with autism spectrum disorders: A review of the intervention research. *Journal of autism and developmental disorders, 37*(10), 1858-1868.

Appendix A

Social Validity Scale

Items Given before Intervention

There is a need for an electronic digital application (picture system or SGD) for my students for the development of social skills

True □ Somewhat True □ Somewhat False □ False □

My students would benefit from a mobile application for developing communication skills and behavioral skills.

True □ Somewhat True □ Somewhat False □ False □

I would be interested in using a mobile application for communication.

True □ Somewhat True □ Somewhat untrue □ False □

I have had prior experience using a mobile application for developing communication and behavioral skills.

True □ Somewhat True □ Somewhat False □ False □

Use the below box to describe your past experiences with the mobile application for development of communication and behavioral skills.