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Improving Social Communication and Social Interaction Skills in Students with Autism-Spectrum Disorder through Smart-Board Use

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Abstract. Many students with autism-spectrum disorder (ASD) suffer from problems with social communication and social interaction, which inhibit their academic and personal lives. This research has evaluated the effectiveness of a training program that used the smart board (SB) to improve social communication and interaction skills in a sample of 20 students with ASD, aged 8–13. Ten of those students underwent the training program, constituting the experimental group, while the other 10 who did not undergo training, serve as the control group. The study employed a quasi-experimental approach using components, both developed by the researchers of this study: the training program just described and social communication and a social- interactive skills scale (SCSISS). The results showed a difference ($p<0.05$) between the experimental and the control groups on the SCSISS in the post-test (i.e., post-training test) in favour of the experimental group. There was furthermore a difference ($p<0.05$) between the experimental group on the SCSISS in the pre-test and in the post-test in favour of the post-tests. There was no difference between the experimental group on the SCSISS in the post-test and in the follow-up tests. Thus, the study's findings suggest that the use of the SB should be expanded in the Autism Institute and integration schools, due to its significant benefit in improving social communication and social-interaction skills in students with ASD.

Keywords: smart board; social communication; social interaction; autism-spectrum disorder

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1. Introduction

Recent years have seen significant advances in both global and local levels in treatments for students with ASD. ASD is a neuro-developmental condition that requires educational, social, and rehabilitative assistance. It is one of the many developmental disorders that produce both restricted and repetitive behaviours and that impair social communication. Both verbal and non-verbal exchanges inhibit the creative and the reciprocal social relationships of individuals with ASD (Besler & Kurt, 2016; Golan et al., 2022). Students with ASD have difficulty talking and engaging socially with their classmates, educators, and parents. Their deficiencies in the skills of communication and social interaction place them in a different category than people with other disorders; since they are at risk of living in isolation, unable to interact with those around them. Psychological intervention and educational programs can address their skill deficits. With appropriate care and training, they can improve their skills in communication and social interaction, learning rather to lead normal lives (Pira, 2021; Radley, et al., 2017). Typically, ASD students have significant challenges with social communication and engagement, and their speech issues can hinder their social connections with both their peers and adults. Consequently, one of the primary objectives of therapies for ASD students is to promote their social and communication development. To achieve this objective, teachers should emphasise enhancing their social communication skills and decreasing improper conduct (Xin, & Sutman, 2011).

The condition called ASD in the Diagnostic and Statistical Manual of Mental Disorders DSM-IV-TR of 2000 is now understood to encompass Autism; Childhood-Disintegrative Disorder; Asperger's disease; and Pervasive Developmental Disorder, Not Otherwise Specified. Thus, Asperger's is no longer classified as a distinct condition. Based on the clinical presentation and pathological evidence, the DSM-5 considers these disorders to belong to a single spectrum. ASD is characterised by difficulties with social interaction and communication, as well as fixated interest and repetitive activities. The severity ranges from low to severe. Social communication difficulties and limited interests or repetitive behaviours each have three levels: Level 1: needs support; Level 2: requires considerable assistance; and Level 3: demands very substantial support (American Psychiatric Association, 2013, 2022). Around 1 in 44 students has ASD, according to the Centres for Disease Control and Prevention in 2022; males are four times more likely to be diagnosed with the disease than girls (CDC, 2022).

In recent years, technological advances in education have made a variety of improvements possible. Those advances have significantly affected the selection of instructional techniques, which serve a variety of objectives. The educational process has become more efficient and sophisticated; and it now comprises far more than simple indoctrination and recitation from the textbook. It has evolved to encompass diverse activities, utilising a variety of sources that cater to students' needs, wants, and preferences. We must now keep pace with technological advances, learning to co-exist with them and considering how to use them in the future. Instructional procedures are designed to achieve the intended outcome (Bradshaw, et al, 2017).

Martin (2010) describes smart board (SB) as an interactive, wall-mounted display that is linked to a projector and computer, and that the user can write or tap on by using a finger or specialised stylus. Additionally, Handler (2011) notes that the SB can be used by several students simultaneously, communicating in the classroom by using their fingertips to manipulate computer apps through the device. The SB is now frequently used in schools throughout the world. It enables educators to foster more co-operation and collaboration in the classroom. With the use of SB technology, students can now engage in interactive activities. Obaid (2022) views the SB as a special type of SB; its basic form enables the user to display an image with a projector and to "interact" with it by writing on it, or moving it around. The SB is linked to a computer operating nearby. When used with a projector, the device displays computer windows. An SB is a touch screen that enables the user to operate anything on the screen by using fingertips instead of a mouse or keyboard, although those could be used as well. The mode of operation resembles that of an iPad or other tablet device. The SB includes special pens that make it possible to write quickly and clearly by using several colours if desired.

The SB is at the top of the pyramid of technological developments. Its introduction constitutes a revolution in teaching aids due to the SB's flexible range of uses, including its ability to create an engaging classroom atmosphere. This attractive device is interactive, having the ability to contribute to the achievement of the intended educational goals. The SB helps to improve and to develop various student skills, complementing and reinforcing thereby the perceptions that students acquire through their senses in the real world. Thus, this technology has now become an integral part of students' learning experiences. It is interwoven with the educational curriculum; and it offers choices, including features that enable connected activities and facilitate training techniques and methodologies. Consequently, the demand for training in the usage of the SB in the educational process has surged. Training is offered in diverse educational institutions for various levels and types of pupils (Tezcan Kardas & Sadik, 2018).

This study aims to discover whether an SB can help students with ASD improve their communication and social interaction. To pursue that goal, we have formulated the following research hypotheses.

H1: There is a statistically significant difference between the mean ranks of the experimental and control groups in the post-test (i.e., post-training test) on the SCSISS in favour of the experimental group.

H2: There is a statistically significant difference between the mean ranks of the experimental group in the pre- and post-test on the SCSISS in favour of the post-test.

H3: There is no difference between the mean ranks of the experimental group in the post-test and in the follow-up tests on the SCSISS.

2. The Literature Review

A review of the research literature reveals that students with ASD conditions may learn a variety of skills through the SB, including playing digital games, matching images and words, finishing an activity, and reading letters and words (Cattik & Odluyurt, 2017). The SB fosters student learning in additional ways. It helps to

increase student participation in the classroom,; it motivates students, and it boosts their enthusiasm for learning. Furthermore, it supports multiple learning styles; andit has been successfully implemented in audio-visual learning environments. According to research, it also allows students to concentrate for a longer period of time during the class, and to easily check the notes kept on the SB. Observations show that in addition to facilitating student learning, SBs enable courses to be adapted in ways that may assist instructors in expediting lesson preparation and in boosting their efficiency in incorporating information and communication technology into classrooms (Tan, et al., 2018). The application of the SB and its associated programs in the classroom has also been shown to produce significant positive effects. It easily and effectively facilitates the integration of a wide variety of multi-media resources into lessons; and it promotes learning through those resources, as well as by increasing students' motivation. Even teachers who were previously resistant have enthusiastically embraced the SB as a teaching tool, since its pre-stored resources eliminate the need to write on the traditional board, thereby enabling them to teach more material. The application of the SB and its associated programs also facilitates the accurate presentation of study materials, thereby promoting student comprehension, as well as their interaction. It has a significant impact on student performance and the motivation to participate (Barbarić Pardanjac, et al., 2018).

The SB can accommodate students with a range of challenges. It allows visual learners of all ages to see their writing and other creations. It engages kinaesthetic or tactile learners in classroom activities that involve touching the interactive SB. It facilitates learning by deaf and hard-of-hearing students by presenting visual materials. For all these students, it reinforces their learning. The visually challenged can control large items and use large text on the SB's immense screen, for example: The SB also improves the focus of kids with impairments and assists them in overcoming learning obstacles and behavioural issues. Group SB work is beneficial for children with impairments, helping them to develop gross and fine-motor skills, learning to wait, taking turns, remaining in place, and maintaining their personal space.

However, researchers believe that the learning outcomes of students with intellectual disabilities (ID) would not improve unless teachers learn to use SB tools effectively and efficiently (Drigas & Papanastasiou, 2014). The effective use by teachers is vital; because this highly important tool for explanation and clarification makes it possible for teachers to visually present information that was previously inaccessible to many students. Since the majority of the pupils are visual learners, the SB facilitates their comprehension and information acquisition. Moreover, Qiang (2018) concludes that the SB improves the efficacy of teaching and learning in the classroom via the impact of "move on demand."

This involves conveying engineering topics by utilising texts and narratives in conjunction with images, drawings, and animations. Similarly, instructors in immersion programs may find the SB to be a beneficial tool; since it can help them to create an interesting learning environment. This affords teachers more time for instruction.

To minimise disruptions to teaching and learning activities that rely on SBs, schools should be equipped with back-up generators, which would ensure a continuous power supply in the event of an emergency. The study identified various obstacles to the optimal use of SBs in educational activities for students with ASD, including a malfunctioning SB, computer viruses, restricted or lack of access to the internet, and an inadequate preparatory period for integrating the SB into the classroom. Such obstacles impede the effective incorporation of the SB into the educational process. As an additional consequence, instructors who anticipate such difficulties when including the SB in the instructional process could develop negative attitudes toward the technology (Khosa, 2020).

The most notable advance in the care and rehabilitation of students with ASD over the past few decades has been the use of the SB. Educational programs designed specifically to utilise modern technologies have reduced the difficulties for many students with ASD, resulting in educational alternatives suitable for all students. Since the primary areas of deficiency for students with ASD are the interrelated skills of communication and social interaction, which have a powerful impact on the educational process and the academic skills, it is important to ensure equal opportunities and to foster the development and improvement of those skills. Without such assistance, their reactions and behaviour in various types of social and educational activities would remain inferior to those of their peers who do not have ASD. In particular, students with ASD often exhibit responses that are inappropriate to the situation, reflecting misjudgment, a lack of emotional maturity, and a failure to understand the psychosocial climate that characterises various social situations. They are also less able to express approval or other opinions. These difficulties may cause them to exhibit behaviours that prevent them from performing many everyday duties and developing social contact connections (American Psychiatric Association, 2022; Gaber, 2022; Jozkowski & Cermak, 2020).

A number of studies have been conducted on educational technology generally, in order to determine its usefulness for students with ASD and related disorders. A study conducted by Mangafa (2018), for instance, reported that although parents have considered tablet devices to be useful for their children as tools for motivating children and teaching social-communication skills; they also expressed concern about their children's screen time and difficulties in sharing. Pira (2021), who researched the use of mobile technology to assist ASD students in acquiring the social, communication, linguistic, and educational abilities needed for scholastic achievement, found that these pupils continued to face challenges with social integration in the classroom.

To promote the social inclusion of ASD students, it is necessary to discover effective strategies for incorporating mobile devices into the classroom. Schwartz (2021) investigated the use of the tablet and its efficacy in helping students with ASD to improve their social skills and express their feelings. Similarly, Yeong et al. (2022) evaluated the use of iPads and e-books to assist with daily life the skills among students with ASD and ID; after an initial training phase in operating a mobile device, such as an iPad, they sought to teach the students to use it to access

e-books, subsequently using the newly acquired e-books to perform everyday tasks.

Other studies have investigated the use of the SB with students with ASD and similar disorders. Focusing on students with ID, Carol (2015) examined the use of SB in early reading lessons, in particular its effect on the participation and knowledge acquisition in the aspect of reading that is being taught. Focusing on students with Asperger's Syndrome, Sagia (2015) explored ways to facilitate both learning and the students' inclusion through the use of SB. Although the results indicated that new technologies provide new strategies for overcoming barriers to children's participation in education and social life, they also indicated that successfully incorporating a new technology depends entirely on teachers' perceptions. More specifically, success depends on how well the teachers think the new technology facilitates learning, and on their attitudes towards the needs of students with ASD. Stanley (2016) sought to discover what happened when he used an SB to teach reading to students with ASD; and he also evaluated their academic performance. Cattik & Odluyurt (2017) taught digital-gaming skills to a small group of students with ASD, using an SB with graduated guidance instruction; they aimed to determine the participants' learning levels by observation and also to learn their families' opinions about the teaching method. McKinstry (2018) investigated how using an SB impacts the effectiveness of teachers' lessons for students with ASD. The research was conducted by observing students' behaviour and level of attention when they were not on task, both with and without the use of an SB. Karakuş & Varalan (2021) also tried to develop the skills of students with MID by utilising interactive map applications (e.g., Google Maps and Yandex Maps) as well as applications on the telephone, computer, and the SB; to determine the most effective way to implement applications, they sought details about the issues that arose during practice, which would enable them to suggest potential solutions. Melo et al. (2022) investigated the use of augmented reality as a modern education technology that could enhance class participation by students with ASD by promoting the integration of modified school activities.

Thus, the research literature includes many previous studies investigating the use of the SB in the educational process for students with ASD. Those studies evaluated the SB and demonstrated its effectiveness for assisting in the teaching of reading, writing, and arithmetic and for promoting communication, social skills, and classroom participation. It is also clear from reviewing the literature that there are no Arabic studies that address the use of the SB in improving skills in social communication and interaction among students with ASD. Therefore, the present researchers relied on general studies, both those that used educational technology with students having ASD or related disorders and those that used the SB in particular with students having ASD. From the preceding discussion, it is evident that the SB is essential for the development of several skills, most notably for communication and social interaction.

3. The Methodology

3.1 Research Approach

The quasi-experimental approach was used, which relied on a two-group design, the experimental group and the control group. The experimental group was exposed to SB, while the control group was not exposed to SB. The independent variable in the research sample was the use of the SB; while the dependent variable was the effect of SB on communication and social interaction skills. This approach was used because it fits the nature of the research. The research was an experiment to find out how well a program based on the use of the SB helped a group of students with ASD to improve their social communication and social interaction skills.

3.2 The Research Sample

The original research community consisted of ASD students in Al-Ahsa. The study sample included 20 ASD students who ranged in age from 8 to 13 years (mean 10.76, standard deviation ±1.84). The students were deliberately selected for the study; because they were the only available sample for which the researchers had obtained formal approval from the parents of these students to apply the experiment to them. They were divided into two groups: an experimental group (n=10) and a control group (n=10). The researchers used the Mann-Whitney test to verify that the two groups were equivalent in terms of age, IQ score, and ASD score. The researchers received clearance from the Scientific Research Ethics Council at King Faisal University in the Kingdom of Saudi Arabia.

3.3 Research Instruments

3.3.1 Social Communication and Social Interaction Skills Scale (SCSISS)

The present researchers developed the SCSISS, a scale for assessing the social communication and social interaction skills of ASD students. It includes 26 items. Questions are answered on a three-point Likert scale: 3 (always), 2 (sometimes), and 1 (never). The total possible score on the scale ranges from 26-78. To verify the internal validity of the scale, the researchers employed factor analysis by using the principal component method; the factors were rotated to be perpendicular to the Varimax method on a sample of 102 ASD students. The results indicated that the value of the Kaiser-Meyer-Olkin test statistic was equal to (0.63). The results of the factor analysis showed that all the items on the scale were loaded with only one factor. The loading of the factor ranged between 0.369-0.725, and through the literature review presented earlier, The researchers were able to name this factor: social communication and social interaction, which included 26 items. After one month, the test-rest reliability was used to confirm the scale's reliability. The correlation coefficient for the scale was 0.746, which is statistically significant at 0.01.

3.3.2 Training Program

Participants in the training program, which aims to improve the social communication and social interaction skills of ASD students, constituted the experimental group in this research. The program was implemented for a period of four months; and it included 48 sessions. A follow-up test was conducted two months after the end of the program; and the experimental group members were

then evaluated on their performance in the program by using the SCSISS. The experimental group received program training in the following order, while the control group did not undergo any intervention or training sessions.

Sessions 1-2:
The first two sessions were devoted to acquainting the members of the experimental group with the researchers and vice versa, establishing a spirit of affection and familiarity between them in part through play activities. Additionally, the pre-test for SCSISS was administered to students in the experimental group.

Sessions 3-46:
These sessions were devoted to training the experimental group in social communication and interactive skills. The training of the experimental group included: taking the initiative to speak with others; looking directly at the faces of others while speaking to them; controlling the pitch of the voice, in order to produce a pitch, tone, and rate of speech that were natural and appropriate to the situation; cooperating with other students while playing; noticing other students' activities, such as drawing or playing music; understanding the facial expressions of others; expressing emotions in proportion to the situation; forming friendships with peers of the same age; showing a smile in social situations; taking into account the spatial distance called personal space; accepting physical contact with familiar people; employing language socially; responding to praise from others; and sharing the interests of others through social activities, such as stories.

Sessions 47–48:
These sessions were devoted to evaluating the experimental group's performance for the skills targeted in the program by applying the post-test SCSISS to the students of the experimental and control groups. The training program included a range of techniques, most notably free play; dialogue and discussion; video modelling; chaining; shaping (i.e., responding to gestural, physical, spatial, and verbal prompts); and reinforcement.

3.4 Data analysis
After collecting the data and confirming the homogeneity of the two groups, the data were analysed by using many tests to determine the program's efficacy. The Mann-Whitney test was used to determine the significance of the difference between the mean ranks of the experimental and the control groups in the post-test on the SCSISS. The Wilcoxon test was then used to determine the significance of the difference between the mean ranks of the experimental group in the pre- and post-tests on the SCSISS, as well as the difference between the mean ranks of the experimental group in the post-tests and in the follow-up tests on the SCSISS.

4. The Results:
4.1. The difference between the mean ranks of the experimental and the control groups in the post-test on the SCSISS is relevant.
The Mann-Whitney test was used to test the hypothesis which stated that H1: "*There is a statistically significant difference between the mean ranks of the experimental*

and the control groups in the post-test (i.e., post-training test) on the SCSISS in favour of the experimental group".

Statistically, the result reveals a significant difference ($p<0.05$) between the mean ran

ks of the social communication and the social interaction skills of the control and the experimental groups on the post-test in favour of the experimental group, as shown in Table 1.

Table 1. The results of the Mann-Whitney test show the difference between the mean ranks of the experimental group and the control group in the post-test on the SCSISS

Scale	Con. Group (n=10)		Exp. Group (n=10)		Z	P-Value
	Mean Rank	Sum of Ranks	Mean Rank	Sum of Ranks		
	5.50	55	15.50	155	-3.791	<0.001

Table 1 shows that the value of Z for the total scale was -3.791, and the p-value was <0.001, which is less than 0.05. This difference was in favour of the group with the highest average, which was the experimental group. This implies that the program used to improve the social communication and the social-interaction skills of the ASD students was effective.

4.2. The mean ranks of the experimental group pre-test and post-tests scores on the SCSISS.

The researchers used the Wilcoxon test to detect the significance of the difference between the mean ranks of the experimental group at two different stages, verifying the H2: "*There is a statistically significant difference between the mean ranks of the experimental group in the pre-and-in-the-post-tests on the SCSISS in favour of the post-test*". The results reveal a significant difference ($p<0.05$) between the mean ranks of the scores, thereby indicating the social communication and the social interaction skills of the experimental group on the pre- and on the post-tests in favour of the post-test, as shown in Table 2.

Table 2. The results of the Wilcoxon test for the significance of the difference between the mean ranks of the experimental group in the pre-and post-test scores of the SCSISS

Exp. Group (Pre and Post) Tests	N	Mean Rank	Sum of Ranks	Z	P-Value
Neg. Ranks	0	0	0	-2.809	0.005
Pos. Ranks	10	5.50	55		
Ties	0				

Table 2 shows that the value of Z for the entire scale was -2.809 and the p-value = 0.005, which is less than 0.05. This further indicates that the training program was effective in improving the social communication and the social interactive skills of the ASD students.

4.3. The mean difference between the experimental group post-test and the follow-up tests on the SCSISS.

To verify the H3: "*There is no difference between the mean ranks of the experimental group in the post-test and in the follow-up tests on the SCSISS*", the Wilcoxon test was used.

Table 3 shows the difference between the mean ranks of the experimental group at two different stages. Based on the data shown in Table 3, this indicates that there was no significant difference between the mean ranks of the scores, revealing the social communication and the social interaction skills of the experimental group in the post- and in the follow-up tests.

Table 3. The results of the Wilcoxon test for the significance of the difference between the mean ranks of the experimental group in the post-test and the follow-up tests on the SCSISS

Exp. Group (Post and Follow-up) Tests	N	Mean Rank	Sum of Ranks	Z	P-Value
Neg. Ranks	4	2.50	10	-1.890	0.059
Pos. Ranks	0	0	0		
Ties	6				

Table 3 shows that there is no difference between the mean ranks of the experimental group in the post- and in the follow-up tests. The value of Z for the entire scale was -1.890 and the p-value = 0.059, which is greater than 0.05. This indicates that the training program was effective in improving the social communication and in the social interactive skills of students with ASD. This also indicates that the training program's positive effects were enduring; the improvements remained even two months after the program had finished.

5. Discussion

The previous studies that investigated the role of educational technology for students with ASD evaluated the SB's effectiveness in developing academic, communicative, and social skills for students with ASD. The SB is considered a technology that is safe, easy to control by computer, and relatively inexpensive for teaching skills to students with ASD. The present research focused specifically on the SB's effectiveness in improving social communicative and social interactive skills in students with ASD. The results indicated that the experimental group's post-test level of social communication and social interaction increased as compared to the control group. This outcome agrees with the findings of Carol's study (2015), which demonstrated that all the students learned the taught reading concept, with the students taught by using the SB, making greater use of verbal explanations.

Stanley (2016) showed that using an SB to teach reading helped ASD students with participation and academic performance. Maajeeny (2017) found that with discrete trial training, the SB was effective in teaching early numeracy skills to students with ASD. Utilising mobile technology, Pira (2021) revealed some key elements (enhancers) in boosting the social inclusion of students with ASD. He

stressed that these augmentations might help students to achieve adequate degrees of social integration and to thereby satisfy their communicative, social, linguistic, and educational needs. Looking beyond the SB, Melo et al. (2022) showed that training teachers and assistants to use additional digital technology resources is necessary to develop other practices and to foster greater inclusion of students with ASD. Additionally, the aforementioned study by Yeong et al. (2022), whose results showed that all students with ASD learned to operate the iPad independently, access the educational materials provided through e-books, and apply these skills when learning independently and performing new daily living tasks, also showed that the students' responses improved after training in the use of the iPad.

The training program, which was based on the use of the SB, and the accompanying educational activities, which were designed with scientific foundations, can explain the statistically significant difference between the experimental group's mean scores in the pre- and in the post-test on the SCSISS; that difference signifies a clear improvement in the experimental group's level of social communication and interaction. These results agree with the above-mentioned study by Sagia (2015), which found that new technologies offer new solutions for helping students with ASD to participate in education and social life. Similarly, as we saw earlier, Cattik & Odluyurt (2017) showed that SB-based, graded instruction in small groups was effective in teaching digital-gaming skills to children with ASD. It was also observed that children gained a high level of accuracy in non-directly targeted gaming skills through observational learning. Mangafa (2018) showed the tablet's effectiveness in attracting the attention of students with ASD, telling social stories, and enhancing social communication skills in general. According to the findings of McKinstry's (2018) research, there was a substantial difference between the on-task and the off-task groups regarding the utilisation of the SB. When the SB was employed, there was a substantial difference between the rate of on-task behaviour and off-task behaviour. Karakuş & Varalan (2021), who evaluated the ability of students with minor ID to utilise interactive map apps on the phone, computers, and SB discovered that students' directional abilities and reading and writing skills increased. It has also been found that developing those skills raised students' self-confidence and abstract thinking abilities, which helped them develop their life skills. In addition, Schwartz (2021) reported using tablet applications and video modelling to help students with ASD learn to recognise emotions and facial expressions, and also to express their feelings. This study's results, which demonstrated the training program's effectiveness in improving the experimental group's social communication and interaction, indirectly supports the first hypothesis.

Concerning the third hypothesis, the study's results indicated no difference between the scores of the individuals in the experimental group on the SCSISS after two months in the training program, which demonstrates the validity of that hypothesis. This result is consistent with the study by Gaber (2022), which indicated that the SB-based training program had enduring results, with students continuing to achieve the desired goals after the program had ended. This result

can be attributed to several factors, including the training that students received in communication skills and social interaction, utilising the technique of reinforcement, which plays a major role in supporting positive behaviors. The partial retraining that students had received through the program's sessions positively impacting the program's continuing effectiveness.

The students' proficiency levels in the targeted skills did not decline, which helps to explain the enduring achievements produced by the training program. Another explanatory factor is the training the experimental group had received during the training program's third phase, which is the evaluation phase. During that phase, the students learned how to interact with others in a variety of social contexts; and they were also retrained in social communication and interaction skills that they had learned through the SB during the program's second phase. Retraining played a prominent role in transmitting the impact of training and generalisation. It enhanced their mastery of what they had been taught, helping their achievements to endure over time.

6. Conclusions

This research has shown that students with ASD are in dire need of training in the use of the SB to foster their academic, communication, and social skills. Notably, social communication skills and social interaction skills are interrelated, and therefore, it is necessary to develop these in tandem. It follows that ASD students who improve their social interactive skills simultaneously improve their social communicative skills; and learning to employ the language socially ensures that they can attain an acceptable skill level in social interactions. The importance of social communication and interaction skills cannot be overstated; and SB has become a vital tool for developing them. Social interaction, in particular, is important for students with ASD, and the SB can be used to help them acquire certain socially-desirable behaviours, while reducing socially-unacceptable behaviours. Through the SB-based user program, ASD students can acquire social communication and social interaction skills through the participation of these students with other students in daily life situations, which are useful in establishing relationships with others in the psychological field through expressing themselves to others, attracting them, and communicating. With them, establishing friendships with them, in order to participate in various activities with them, and to observe the rules of public decency in dealing with others.

7. Recommendations

Given the results of the research, some recommendations were formulated. Firstly, training programs and workshops to train teachers of students with ASD; and these should be established in schools. These programs should assist teachers not only in learning how to employ the modern technology associated with SB, but also in helping students to use SB to improve their communication skills and social interactions. Also, because of the SBs' importance in stimulating students' motivation, improving their interaction with educational content in general, and increasing their level of communication and social interaction, a sufficient number of SBs should be made available in all schools attended by students with ASD.

Likewise, SBs should be made available in the community centres that care for them. Finally, it should be remembered that the SB is highly effective in helping students with ASD to learn different skills, progressing from simple communication and social interactive skills to more complex communication and interaction skills.

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