

**ENHANCING COMMUNICATION FOR CHILDREN WITH AUTISM IN
KENYA. INSIGHTS ON THE PICTURE EXCHANGE
COMMUNICATION SYSTEM**

BY

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DECLARATION

Declaration Candidate

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DEDICATION

I wish to dedicate this work to my family; my wife Mary, Sons Paul, Steve, and Felix for they gave me a peaceful time and support to pursue this study. And to my late sister Njeri, who lived with Cerebral Palsy, for her quiet but useful inspiration.

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ABSTRACT

Picture Exchange Communication System (PECS), has been used successfully as an intervention strategy for children with Autism Spectrum Disorders (ASD) and other developmental disorders, without a functional means of communication. PECS uses photos to convey needs, wants and express their feelings, which enables the non-verbal student to initiate communication, request for a desired item, and also to have spontaneous speech by exchanging a photo for a real item. Although it was founded more than three decades ago, there has been no tangible evidence of its use in Kenya, yet the numbers of non-verbal children with autism who need to be able to express themselves is increasing. In this study, we apply Behaviorist theory by B.F. Skinner, which relies on direct reinforcement, holding that; behavior can be changed by repetition of drills and rewards, hence the reason for having ten trials in each of the three sessions in twenty four days, adding to a total of 720 trials thus the theory guided in the data collection, choice of tools and how they were administered. The study explored the ability of the student to initiate communication, request for a desired item and spontaneously speak using PECS with a view to improving communication, using experimental single subject changing criterion design. The experiment involved two non-verbal boys, 6-8 years old with autism spectrum disorders. The focus was on the first three phases of PECS, which are: The physical exchange, Expanding Spontaneity (distance and persistence) and picture discrimination, in which research has indicated evidence of change. Each of the study subject, student one and student two, was under one teacher (communication partner) and one parent (physical prompter) for training of PECS. Recording was done by communication partner for either student. The researcher (independent observer) also recorded for each student. The teachers and parents were trained before baseline, on their roles in the experiment. The data was analyzed using Standard Mean Difference (SMD), Percentage of Non-Overlapping Data (PND) and Inter-Observer Agreement (IOA). The findings indicated that initiating communication improved from a range of 10%-30% in the baseline to a range of 47.5%-100% in the treatment phases. The Inter Observer Agreement (IOA) gave a result of 9.5% for student 1 and 4.8% for student 2. The Standard Mean Difference (SMD) for student 1 was 1.04% and 1.67% for student 2 while the Percentage of Non-overlapping Data (PND) both student 1 and student 2 had 100%, an indication of high level effectiveness. The ability to request for a desired item also improved greatly for both student 1 and 2, with a baseline range of 0-10% to treatment phases' range of 45-100%. The IOA gave a result of 14.3% for student 1 and 4.8% for student 2. The SMD for student 1 was 70.85% and 2.09% for student 2, while the PND was 100% for both student 1 and 2. In the spontaneous speech using picture cards, the baseline was at 0% while the treatment ranged from 0-100% for both students. IOA was 71.4% for student 1 and 52.4% for student 2. The SMD for student 1 was 58.11% and 46.05% for student 2. Meanwhile, the PND was 75% for both student 1 and 2. The impact of this training was high in the first two depended variables, initiating communication and requesting for a desired item, while the spontaneity proved difficult during baseline and the treatment phases. However, there was a clear indication that PECS could indeed help the students express their needs and wants to teachers, parents and significant others by use of Pictures, given more time, repetition of drills and rewards, and therefore enable the pictures to truly speak for the student.

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OPERATIONAL DEFINITION OF TERMS

The following terms were defined herein as was used in the study. The operational definitions of terms in the study are operationalized to make this Thesis easy to understand for the readers.

American psychological Association (APA):

This is a scientific and professional organization that represents psychologists in the United States of America and Canada. In this study, APA is used as the standardized writing, formatting and citation style for consistency in referencing.

Applied Behavior Analysis (ABA):

This is an approach used to modify behavior of children with developmental problems and training them in social skills, communication and behavior modification. It is based on reward system to bring about change. In the study ABA is the structured application of Behaviour change techniques such as prompt, reinforcement used to increase desired communication like initiation or requesting.

Augmentative and Alternative communication(AAC):

AAC is any additional method that helps an individual to communicate (International Society of Augmentative and Alternative Communication-(ISAAC)). American Speech, Language and Hearing Association (ASHA) concur adding that AAC are all forms of communication other than oral speech that are used to express thoughts, needs, wants and ideas.

According to the researcher, Augmentative means to add to someone's speech while Alternative means to be used instead of speech.

Indeed, Beukelman, et al. (1998), refers to AAC as part of habilitation and rehabilitation services for those with communication needs.

Ideally, these are supportive or optional methods of communication that may include, sign language, use of pictures, gestures, communication boards, and total communication.(Bedwani, Bruck, & Costly, 2015). In the study PECS photos are used as AAC to replace verbal expression.

Autism Spectrum Disorder (ASD):

Autism was first described as a triad of impairment by Lorna Wing and Judith Gould in 1970 while working at the Medical Research Council Social Psychiatry Unit at the Institute of Psychiatry in London.

According to Woods & Wetherby (2003), in (Moore 2009) autism is a range of disorders involving a triad of impairments of social interaction, verbal and non-verbal communication and restricted repetitive and stereotyped patterns of behavior, activities and interests. Jarrold (2003) adds another defining characteristic as impaired play. The Diagnostic and statistical manual of mental Disorders- Fourth Edition(DSM-4, APA 1994) defined autism as a developmental disorder which impairs communication, social skills, range of interests and activities. It is a spectrum disorder ranging from mild to severe with each of the five categories given its own diagnoses. These categories include; Autistic Disorder (299.00-DSM 4), Asperger's Disorder (299.80-DSM 4), Rett's Disorder (299.80- DSM 4), Childhood Disintegrative Disorder (299.10-DSM 4), and Pervasive Developmental Disorder- Not Otherwise Specified (PDD-NOS) (299.80-DSM 4). However, DSM 5, APA (2013)called autism a neurodevelopmental disorder and gave it a new diagnoses, integrating them to one, Autism Spectrum Disorder (F84.0) to include; Autistic

Disorder, Asperger's Disorder and Pervasive Developmental Disorder- Not Otherwise Specified(PDD-NOS), leaving out Rett's Disorder and Childhood Disintegrative Disorder. World Health Organization (WHO) -International Classification of Diseases and Related Health Problems 10th revision(ICD-10) agree with DSM 5 and classifies autism as a neurodevelopmental disorder coding it under Mental and Behavioral Disorders (F00-F99), as Pervasive Developmental Disorders(F84).(Reed, 2010). More recently, the ICD-10, WHO (2016) codes autism as a disorder of psychological development (F80-F89).

In this study, autism refers to a neurodevelopmental condition in which the child demonstrates observable difficulties in social communication, specifically shown by reduced initiation of communication, limited ability to request desired items independently and minimal spontaneous communicative attempts.

Communication Partner:

The communication partner is the person who helps the one with communication disorder in AAC to communicate, this could be anyone that a person who uses Augmentative and Alternative Communication might interact with such as parents/caregivers, family members, teachers, teacher aids, therapist, friends, strangers and peers among others, the term is used synonymously with primary trainer, research assistant and also the experimenter.

Developmental Disorder:

Developmental Disorder is any disorder that interferes with developmental milestones in childhood, such as communication. It is specific if it affects one area of development and it is pervasive if it affects several areas of development.

Neurodevelopmental Disorders:

Neurodevelopmental Disorders are disorders associated with functioning of the neurological system arising from atypical brain development that affect communication, such as Attention Deficit Hyperactivity Disorders (ADHD), Autism, Learning Disabilities, Intellectual Disability, Conduct Disorders, and Cerebral Palsy.

Pervasive Developmental Disorders:

A group of conditions that involve delay in development of many basic skills such as; delay in ability to socialize, communicate and imagine. They are identified around age three. They may include; Autism, Asperger's syndrome, Childhood disintegrative disorders, Rett's syndrome and Pervasive developmental disorders not otherwise Specified (PDD-NOS).

Physical Prompter:

The physical prompter is the person who provides physical assistance to the student like guiding the hand to pick up or exchange a photo card with an item.

Prompt:

This term is used to refer to the any verbal, physical, gestural, or visual act of encouraging, triggering or evoking a response in respect to a communication Behaviour. It is the act of making someone to decide to do something.

Picture Exchange Communication System (PECS):

Picture Exchange Communication system is a method that uses picture exchange to teach individuals who are non-verbal, have limited speech, and/or unintelligible in order that they may develop functional and socially acceptable communication skills (Frost & Bondy 2002). In the study, PECS is a structured AAC system where the

students exchange the photo with communication partner to initiate communication, request items, or acquire spontaneity in speech.

Reinforcer sampling:

This is the informal inventory of items and activities that are of particular interest to the student, the most preferred item by the specific student. In the study, the student is presented with different items to identify preferred reinforcers

Replication:

Replication, in this study is used to refer to the process of repeating a study using the same methods and materials, different subjects and different experimenters, in order to increase validity and reliability of the findings of the study.

Speech:

In this study, speech is used to mean the use of a photo to say/express/ask for whatever they want as represented in the photo. In this case the student would pick a photo that is of the desired item and present it to the one having the item (communication partner) to be given the desired item.

ABBREVIATIONS AND ACRONYMS

AAC-	Augmentative and Alternative Communication
ABA-	Applied Behaviour Analysis
ADDM-Autism	and Developmental Disabilities Monitoring
ADHD-	Attention Deficit Hyperactivity Disorder
APA-	American Psychological Association
ASD-	Autism Spectrum Disorder
ASHA-	American Speech and Hearing Association
ASK-	Autism Society of Kenya
AT-	Assistive Technology
CCC/SLP-	Certificate of Clinical Competence for Speech-Language Pathology
CDC –	Centre for Disease Control and Prevention.
DIR-	Difference Relationship Model
DSM-	Diagnostic and Statistical Manual of Mental Disorders
DTT-	Discrete Trial Teaching
ICD-10 –	International Classification of Diseases and related Health problems, tenth revision.
IDEA-	Individuals with Disabilities Education Act
IEP-	Individualized Educational Program
IOA –	Inter - Observer Agreement
KICD-	Kenya Institute of Curriculum Development
M-CHAT-	Modified Checklist for Autism in Toddlers.
MOE-	Ministry of Education
NACOSTI -	National Commission for Science, Technology and Innovation.
NCPWD-	National Council for Persons with Disability

PDD-NOS	– Pervasive Developmental Disorders-Not otherwise specified
PECS-	Picture Exchange Communication System
PND-	Percentage of Non-Overlapping Data
PRT-	Pivotal Response Treatment
RDI-	Relationship Developmental Intervention
SCERTS-	Social Communication Emotional Regulation Transactional Support
SMD	– Standard Mean Difference
TEACCH-	Training and Education of Autistic Related Communication Handicapped Children.
USA-	United States of America
VB-	Verbal Behavior
WHO-	World Health Organization

CHAPTER ONE

INTRODUCTION

The chapter comprises of; background to the study, statement of the problem, objectives of the study. Further it contains research questions, justification of the study, and scope and limitations of the study.

1.1 Background to the Study

In this study on “ Enhancing communication for Children with Autism in Kenya: Insights on the Picture Exchange Communication System,” Autism Spectrum Disorder (ASD) is the condition the subjects are living with, communication (being none-Verbal) is the deficit or problem while Picture Exchange Communication System (PECS) is the intervening tool that was used in resolving the impasse. According to Diagnostic and Statistical Manual of Mental Disorders edition five (DSM5- APA 2013), ASD is a group of neurodevelopmental disorders usually congenital, comprising of Autism, Rett’s Syndrome, Childhood Disintegrative Disorder, Asperger’s Syndrome and Pervasive Developmental Disorders. The main characteristics of a child living within the Autism Spectrum Disorder is a deficit in social communication and social interaction, restricted and repetitive patterns of behavior interest or activities. The deficit in communication, where the child was non-verbal (without speech) called for Alternative and/or Augmentative Communication (AAC). Alternative and Augmentative Communication is a term that encompassed the communication methods that are used to supplement/support or replace speech or writing for those with impairment in spoken or written language.(Beukelman, D. R. & Light, J. C. 2020)

PECS has been lately accepted as one of the most effective augmentative and alternative communication strategy for children with ASD (Kai-Chien, Tien. 2008),

especially those who are non-verbal. It is a basic aided system of communication. PECS is preferred because, children with ASD benefit most by use of visual tools, that stays in the room and give more permanent visual information, in this case pictures and real objects/activities. PECS is a visual form of AAC, there is evidence that people on the autism spectrum are highly visual (Ganz, et al 2012), explaining why it could be a successful strategy. PECS is useful to those who lack a method of functional communication that allow them to adequately express their needs and wants, have trouble making their communication understood, have a functional communication system that is NOT adequate in its ability to convey needs and wants, and/or lack a communication system that allows spontaneous expressive communication across a variety of settings. The picture exchange communication system was developed by Dr. Andrew Bondy & Lori Frost MS, CCC/SLP in 1984, with an aim to teach children with autism a fast independent, self-initiated functional communication system, as early as possible (Kai-Chien Tien 2008 and Lunda & Troha, 2008). Indeed previous research has shown that PECS is a communication method that can enable students without functional communication skills to communicate with others (Frost & Bondy, 2002, Ganz et al., 2005, Honton, Mateo, Waegenare & Frost 2008; Kravits, Kamps, Kemmer & Potucek, 2002) in (Virgile, 2009). Bondy & Frost first used PECS at the Delaware Autism Program in 1985. The aim of PECS was to enable the person to spontaneously initiate communication exchange by use of small picture cards, ultimately improving the functional communication of an individual (More 2009). The learner is taught to give a picture of a desired item to a communication partner in exchange for the real item in the picture. PECS approach has six phases;

- (1) Teaching the physically assisted exchange.

- (2) Expanding spontaneity,
- (3) Simultaneous discrimination of pictures,
- (4) Building sentence structure,
- (5) Responding to, “what do you want?” and
- (6) Commenting in response to a question (Collet-Klingenberg 2008).

In Africa, there has been no much research so far in the use of PECS for children with ASD. Some studies by Travis, J., & Geiger, M. (2010), of the University of Cape Town. In their study on ‘Effectiveness of PECS for children with ASD’ they confirmed absence of research in this area. In Kenya, there has been some effort on studies on the use of PECS however the focus was on enhancing expressive language skills by use of communication boards’ strategy, visual support strategy, and routine cards. These points to a gap on lack of studies specific to the use PECS to enhance initiation, request for desired items and spontaneity using pictures. This study focused on “Enhancing communication for children with autism in Kenya: Insights on Picture Exchange Communication System”, with an aim to impact on requesting, initiating communication and spontaneous speech through the first three phases of PECS since there exist strong evidence of change within those phases.

1.2 Statement of the Problem

Communication is a critical aspect of social human life, lack of communication makes people unable to express feelings, desires, needs, wants and wishes and to share their aspirations with others, so it is an important tool (Virgile, 2009). A person with ASD, who is non-verbal, will be able to hear, understand and even take instructions but be unable to express themselves. The teachers, parents and caregivers will often think for the child and more often than not misinterpret what the child wants or mean. For instance, if the child points at the fridge, the parent is left to guess what the child

wants or mean. This means that such persons will require augmentative and alternative methods of communication to enable them to indicate exactly what they require from inside the fridge. According to Drozdiel (2012), of all the approaches one of the most effective known to enhance communication for Children with ASD is Picture Exchange Communication System (PECS). This system has several benefits, such as; enables a child to express their needs to adults who then meet their needs, initiate interaction and communication making it functional, meaningful and highly motivating, reduces ambiguity while naturally providing reinforcement and reward, as was postulated by Bogdashina (2005). It provides a shared communication system where both the ‘speaker’- initiator and the ‘listener’ are working towards a common goal. This Research was therefore done to enhance communication for children with ASD as an intervention study for improving communication in the areas of initiating communication, requesting and spontaneous speech. Through this study, the non-verbal student will be able to express himself, this is the gap the research addresses. “Let the pictures speak for the Child” is the researchers anticipation of the outcome of the study.

1.3 Objectives of the Study

This section shows the general objective and the specific objectives of the study. It brings out the overall goal of this study as well as the three specific goals.

1.3.1 General objective

The general objective of the study was to: investigate the extent to which PECS could be used as a tool to enhance communication among children with autism spectrum Disorder who are non-verbal.

1.3.2 Specific objectives

The specific objectives of the study included to:

- i. Establish the extent to which PECS contributes to a child's ability to initiate communication.
- ii. Investigate the extent to which PECS contribute to a child's ability on requesting for a preferred item.
- iii. Find out the extent to which PECS contribute to spontaneity in communication

1.4 Research Questions

This study was pegged on three study questions, which guided and gave direction to the entire process to the end. They included;

- i. Was the child able to initiate communication without any assistance using PECS?
- ii. Did the child make requests for a desired item without any help using PECS?
- iii. What was the child's frequency of spontaneous communication using PECS?

1.5 Significance of the Study

The picture exchange communication system has not been used by the teachers to support children with autism to enhance communication, from the researchers own experience, having been in the field of Special Education for over fifteen years and from the available literature, there is no indication of the use of PECS in schools for children with ASD in Kenya. Even though, Willis (2012), says that PECS enables learners to have more meaningful communicative interactions; build vocabulary, build communication intent, increase length of utterance, make friends and learn more social skills. According to Amina Abubakar, et al, (2016) and Riccio, Ariana (2011) there has been no research done in the area of ASD in Kenya. This has however been

overtaken by time since studies by Orero, M. A.,(2024), Chebet, G., (2019) were on ASD, they did not nevertheless, focus on the aspect of communication deficiency. This study brings with it to the field of education for learners with autism new knowledge on how to communicate even among the non-verbal persons. It is hoped that this study will convince the stakeholders of learners with autism spectrum disorders on the effectiveness of PECS, and therefore help teachers, parents and caregivers to know how to use PECS with their Non-verbal children with autism spectrum disorders at school and at home and so be able to understand them. . The study was even made more necessary by the author's experience of more than fifteen years, working with children with various disabilities including ASD, showing that there has been no indication of use of this method among the children in their various schools. It may also inform policy makers to regulate legislations that advocate for the use of PECS in schools for children with ASD.

1.6 Scope and Limitation of the Study

The study was geared towards exploring the insights of PECS approach on initiating communication, requesting for a preferred item, and spontaneous speech. The study subjects were two boys of ages 6-8 who have Autism Spectrum Disorder and who are also non-verbal. The selection of that age group was due to the fact that most children with this condition delay to go to school due to their inability to talk and so the parent/guardian may remain over protective, either due to fear and/or lack of knowledge of how to handle them and sometimes due to denial(Anderson, L, et al. 2020). The student one being hyperactive and the other hypo-active, were sometimes quite difficult to deal with, hence a need for a little more patience, the parents were of great help in such instances, and also the library room was convenient. However, there were instances when parents or teachers would be unavailable due to other

commitments, or the school would have other events such as sports, this necessitated rescheduling of the day's activities, and also the hyperactive participant would at times tear the photo cards or simply pick the photo card and /or the ball then run away. However, the door remained closed to avoid instances of running out of the room. On the other hand, the hypoactive student would be so docile that one would not be able to tell actually whether he enjoyed playing with the ball. At times he would get the ball and just stand till the parent had to initiate the play. The experiment period was nineteen days spread across eight weeks whereby each day had three sessions and a session had ten trials for each student. Hence each student finally performed a total of seven hundred and twenty trials. These were quite a substantial number of trials, sufficient enough to make the experiment results verifiable. PECS is usually a six phase approach, however the study was an experiment on the first three phases given that it has its strongest evidence in the first three phases. The data collection process was also an area that may have affected the IOA, as the two teachers may not have mastered fully how to record each trial and so created some variations from that of the researcher, or probably the doubling up as the communication partner and the rater, making it a complicated multi-task. The use of photo album rather than have a Velcro was a possible embedment as it appeared difficult for the students to locate an appropriate photo from the album, the Velcro would have been easier and exciting as it makes the sound, /kwaaaaaa/. Nevertheless, the many trials worked as a mitigation strategy to ensure the vigor of the research. The role of the students' mothers as physical prompter, even though well intentioned, may have, to some extent, affected the study results. This is because there were instances that the student would appear to play with the mother more than taking the experiment as planned, a serious communication. In this study, out of the three

dependent variables, the third one, spontaneous speech, was the most difficult to achieve, as it can be seen in the data analysis, this indicated that there was probably need for more time for the student to be fluent in the use of photo cards to spontaneously communicate.

This Chapter one gave an introduction of this study. It dived into the background of the study, statement of the problem, objectives of the study, research questions, significance of the study and scope and limitation of the study.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

This chapter was made up of the literature review, comprising of; Autism: characteristics, brief history, prevalence and intervention. Communication methods used, PECS: - meaning, origin, criteria for use, benefits, PECS phases, and the Theoretical Framework.

2.2 Autism

The most recent meaning of Autism according to Diagnostic and statistical manual of mental Disorders- Fifth Edition, American Psychiatric Association- Text Revision (DSM-5, APA-TR. 2022) is: a neurodevelopmental condition characterized by persistent difficulties in social communication and social interaction, together with restricted, repetitive patterns of behavior, interests, or sensory experiences, with symptoms present from early development and causing significant impairment in daily functioning. In this study, autism is seen to make the student to have reduced initiation of communication, limited ability to request for desired items independently and minimal spontaneous communicative attempts.

2.2.1 Characteristics of ASD

DSM 4-(APA 2000), DSM 5-(APA 2013) and ICD-10, WHO(2016), all agree that the main characteristics of autism are;(1) persistent deficits in social communication and social interaction which include; deficits in social emotional reciprocity, deficits in nonverbal communicative behaviors and deficits in developing, maintaining and understanding relationship.(2) Restricted and repetitive patterns of behavior, interests or activities in at least two of the following; stereotyped or repetitive motor movements, insistence on sameness, inflexible adherence to routines, highly

restricted, fixated interests that are abnormal in intensity or focus and hyperactivity or hypoactivity to sensory input or unusual interest in sensory aspects of the environment, for instance, they are known to be highly visual and hence as Ganz (2007) posited, the use of visual support and visual schedules is useful and improves their skills in processing information, understanding and using language, and also understanding and interacting with their physical and social environments.

2.2.3 Brief History of autism

The first person known to use the word autism was Eugen Bleuler, a Swiss psychiatrist in 1911, who used it to describe withdrawal into one's inner world, which he observed as one symptom of Schizophrenia. Leo Kanner in 1943 identified it as a condition which he referred to as "early infantile autism", Kanner used 'auto' which meant 'self' in Greek (self-sufficiency, being oblivious to surroundings and acting as if hypnotized), he used it to describe their characteristic of being withdrawn, since he realized those children did not seem to care about the world surrounding them. In 1975 the Individuals with Disabilities Education Act (IDEA) in America classified autism as a subgroup of severe emotional disturbances, but was recognized as a discrete disability of the IDEA by 1991. Later the autism society of America defined it as a complex developmental disability that typically appears during the first three years of life and is the result of a neurological disorder that affects the normal functioning of the brain. In Africa, there have been some earlier studies on autism by Longe (1976), Lotter (1978), in Ghana, Nigeria, Kenya, Zimbabwe, Zambia and South Africa as cited in the African Journal of Psychiatry Publication.

2.2.4 Prevalence

According to Centre for Disease Control and Prevention (CDC-2010) in USA, the prevalence of children with autism stand at one in every sixty eight,(1 in 68) children

or 1.47% out of which the boys are 1 in 42 or 2.38% while girls are 1 in 189 or 0.529%. In Africa studies by Lotter (1978), indicated the prevalence of ASD by 1970 to be about 0.7% among those with intellectual Disability. However, according to The Centre for Autism Research and the Children's Hospital of Philadelphia (2016), 1% of the general populations have intellectual Disability among them 10% have ASD or autistic traits. Studies by Seif Giden et al (2008), show that prevalence in Tunisia was 11.5% and Egypt was 33.6%, while Bakare et al (2012), suggested prevalence in Nigeria was 11.4%. Another study in Uganda by Kakooza et al (2014) indicated a prevalence of 6.8/1000 which is about 0.68%. In Kenya a report by the Autism Society of Kenya (ASK; 2007), show they are about 4% of the Kenyan population.

2.2.5 Intervention

The intervention process for children with ASD should start early and made intensive for a better prognosis (Matson, et al 2009), this calls for early identification, assessment and intervention. There is a lot of emphasis for early intervention in the management of children on the Spectrum. For Educational intervention, which is to facilitate the learning process, the programs should focus on improving communication, social interaction, academic ability, behavioral and daily living skills (Hartnett, 2010). ASD being a complex spectrum with a lot of variations require a trans-disciplinary approach to succeed in intervention. The parents, health care providers, teachers, counselors, social workers, occupational therapist, physiotherapist and speech and language pathologists/ therapist, team up to promote better socialization, communication and reduce behaviors that interfere with learning and functioning. The community report from the Autism and Developmental Disabilities Monitoring (ADDM) Network(2014), suggested that a proper care plan for ASD include; special education services structured to meet specific needs of the child;

behavior modification strategies to support positive behavior; speech, physical or occupational therapy to increase the child's functional abilities and medication to reduce nervousness and hyperactivity.

In an article by Awuor & Karume (2014) the strategies that may be useful in the classroom for children with ASD include; gentle teaching/floor time to enhance interpersonal relationship, sensory integration/sensory learning to minimize physiological, biological and neurological effects, cognitive behavior modification /social stories which support cognitive development, assistive technology/visual schedules which uplift their skills and also music therapy and art. According to Riccio (2011), in Kenya the most common strategies are; Applied Behavior Analysis (ABA) and Training and Education of Autistic and Related communication Handicapped children (TEACCH), which require a lot of modifications to be done in the classroom, including using many visual organizers, visual schedules, with the environment designed to accommodate children in the spectrum, which is yet to be done in most regular schools to facilitate inclusivity. This is one area which still requires a lot of studies in Kenya to find out the most appropriate strategies that can be used for early intervention of those with ASD, in the inclusive education setting.

2.3 Communication Methods

One of the deficits of the children with ASD is communication; they have deficits in verbal and non-verbal communication. These may include lack of eye contact, body language, and understanding, use of gestures and even total lack of facial expression(DSM 5- APA 2013). When the communication deficiency is very severe, there is more need for augmentative (supportive) and/or alternative method of communication, such as Picture Exchange Communication System (PECS), which requires that the child initiates interaction by using a representative picture. The first

effort towards development and use of Augmentative and Alternative Communication(AAC) can be traced to the days of classical Rome and Grace, where the first recorded use of augmentative strategies with the deaf is found. A letter and word based communication board was developed for and with F.Hall Roe, who had cerebral palsy. It was first distributed for use in Minneapolis in the 1920s. This allows for more meaningful communicative interactions which enables the child to make more friends and learn important social skills (Willis 2012). As it is now, children with ASD in Kenyan schools communicate by pointing at the item, picking it, or pulling the partner to where the item of preference is (Daily Nation, 2016).It is true that Pointing at or picking items would not be interpreted in the same way by all people, it would not be clear what they meant by pointing or picking. The researcher affirms that after interacting with such children and their teachers for many years, there is indeed a great need of introducing Picture Exchange Communication System in Kenyan schools among children with Autism Spectrum Disorders and other developmental disorders who are non-verbal.

2.4 Picture Exchange Communication System (PECS)

This section contains literature review on meaning and origin of PECS, Criteria for use and benefits, use of photo cards, and phases of PECS, it helps the reader to comprehend aspects of PECS and how it relates and benefits children with autism.

2.4.1 Meaning and origin of PECS.

Picture Exchange Communication System (PECS) is a form of augmentative and alternative communication which is described by Frost and Bondy (2002) as a communication system used for teaching individuals who are non-verbal, have limited speech or are unintelligible, in order that they may develop functional and socially

acceptable communication skills. There are various augmentative and alternative communication methods used to enhance communication for children with Autism Spectrum Disorders (ASD) and others who are non-verbal (Frost and Bondy 2002). There are two main types of AAC, that is aided systems and unaided systems, people use one or both types. Unaided systems include gestures, body language, facial expressions, and sign language. Aided systems are of two types; basic and high tech. for instance a pen, paper, pointing to letters, words, or pictures on a board are basic aided systems. While touching letters or pictures on a computer screen that speaks out is a high-tech aided system also called electronic devices (Carr & Kologinsky, 1983; Miranda & Schuler, 1988; Reichle & Sigafos, 1991). And as Demetria, L. E (2015) stipulated, AAC provides a range of options for supporting or replacing speech for children and adults with ASD.

The Augmentative and Alternative Communication (AAC) Guidelines for Speech Pathologists who support people with Disability (2014) categorized PECS as a low tech aided AAC, which is considered simpler to operate than other AAC methods and not prone to technical difficulties. PECS was invented by two scholars, Bondy Andrew (PhD.) & Frost Lori MSc. CCC/SLP at the Delaware Autism Program in USA around 1985. Originally it was meant for pre-school age children with ASD and other communicative disorders who displayed no functional or socially acceptable speech (Kai-Chien Tien 2008), however today this method can also serve as an effective communication system for a range of individuals with communication impairments, such as Down Syndrome, developmental delays, language disorders, developmental verbal dyspraxia, head injury (Reed, Amanda; www.pecsaustralia.com). According to Virgile (2009), in USA PECS has been mandated under the Assistive Technology Act of 1998 (Assistive Technology (AT),

ACT 1998) embedded in the Individuals with Disabilities Education Act IDEA, Act of 1975, these became Federal Laws in USA in 2004, that required schools to serve the educational needs of eligible students with disabilities. According to this law schools must find and evaluate students suspected of having disabilities at no cost to the parent and also provide the Child with an Individualized Educational Program (IEP). Further, IDEA provides rights and protections to children with disabilities and to their parents. In PECS method the child is taught to exchange a picture for a desired item, in this case the child initiate a communicative act for a concrete outcome within a social context (Frost & Bondy 2002). PECS is based on the Pyramid Approach to Education which is drawn from the Applied Behavioral Analysis (ABA) which holds that behaviors can be changed by repetition of drills and rewards. In the PECS training the researcher keeps repeating the trials and offering rewards in form of the desired item, this is towards enhancing ability to initiate communication, request for a desired item and acquire spontaneity in use of photo cards.

2.4.2 Criteria for use and benefits

According to Bondy & Frost(2001), this system may be useful to those individuals who; lack functional communication to adequately express their needs and wants, have trouble making their communication understood, have an inadequate communication system and lack spontaneous expressive ability. Welch (2010), adds that it requires a child with motor skills, that is can grasp, reach out and walk independently. According to Frost & Bondy, in Ganz, et al (2012), those who qualify to use the system should have the characteristics that include; an intentional communicator, where a child drags the partner to the location of the object. A child who has preferences or is capable of developing a repertoire of preferences, a client who brings pictures to parents or teachers to indicate their desires, a child who is non-

verbal, also that child who has unintelligible speech and that with only few meaningful words or sign in their repertoire. It has several benefits to the user, Frost & Bondy (2011) postulates that it makes the individual learner to initiate communication rather than responding to prompts, it starts with requesting not labeling or commenting, it is fairly cheap as it only requires one to have a notebook, pictures of commonly used items, laminate and Velcro or picture album. There are other benefits of using this approach which are research based including; its ability to facilitate speech acquisition (Tincani et al 2010), increases social approach during play, reduces behavior problems, is easily understood in the community and by peers, and also makes use of the visual potential among children with ASD who are usually very visual learners (Charlop-Christy et al 2002)

2.4.3 Use of photo cards

The use of photo cards in this experiment was so significant that it cannot go unmentioned; the photo card played the role of a ‘spoken word’, such that every time it was used it represented the icon of the item the student required. In this regard the photo card has to be the icon so much so that when the student saw it, it really meant that item. In this study all the photos used were actually taken from the items themselves printed and laminated. Indeed the photo in itself becomes an icon and a word at the same time, carrying the meaning of the word/name of the desired item. In this case ‘speech’ was considered as a word which carried meaning in a given context by use of a photo card. Icons that represent real items or actual photographs as was posited by Ganz et al., (2012), in their article ‘The Picture Exchange Communication System (PECS): A Promising Method for Improving Communication Skills of Learners With Autism Spectrum Disorders.’

2.4.4 Phases of PECS

Phases	Steps
Phase 1 Physical exchange	1. Communication partner arranged room to provide one picture at a time and display reinforcer in view of the student. 2. Communication partner enticed the student by interacting with the item in front of him. 3. Communication partner open hand after student initiated, looked at icon of preferred item. 4. Student reached out to the preferred item, physical prompter interrupts and redirects him to pick icon. 5. Physical prompter help student reach towards communication partner 6. Student release icon into communication partners open hand. 7. Student receives preferred item instantly as communication partner names the item. 8. Communication partner allows student to play with item for 20 seconds.
Phase 2 Expanding spontaneity	1. Communication partner displays reinforcer in view of student. 2. Communication partner entices student by interacting with the item in front of him. 3. Student walks to communication book two meters away. 4. Student picks a picture of preferred item from the book without prompt. 5. Student walks to the communication partner two meters away. 6. Student release picture into communication partner's hand. 7. Communication partner immediately gives the item as he names it. 8. Student is allowed to play with item for 20 seconds.
Phase 3(a) Picture Discrimination- Highly preferred and distractor icon.	1. Communication partner provides two pictures of two items, one highly preferred and another non-preferred (distractor) . 2. Communication partner entices student by interacting with the two items. 3. Students walk to communication book two meters away. 4. Student selects picture of preferred item from the two pictures. 5. Student picks picture and proceeds to communication partner two meters away. 6. Student release picture into communication partner's hand. 7. Communication partner immediately hands the item and names it during the exchange. 8. Communication partner allows student to play with item for 20 seconds.
Phase 3(b) Teaching simultaneous	1. Communication partner provides adequate opportunities for student to make requests. 2. Communication partner provides two preferred items and pictures to student

discrimination of pictures.	3. Student goes to communication book two meters away, selects correct picture of preferred item. 4. Student picks picture and proceed to communication partner. 5. Student release picture into communication partner's hand. 6. Communication partner says, "okay, take it" 7. If student picked preferred item as in picture, praise him, label the item and allow him play with it for 20 seconds. 8. If student reached for different item from picture, block him and provide for error correction procedure.
Phase 4 Building Sentence structure	1. Student goes to communication book. 2. Student pick "I want" picture. 3. Student put "I want" picture on strip. 4. Student pick picture of what is wanted. 5. Student pick picture on sentence strip. 6. Student walk to communication partner 7. Student release sentence strip to communication partner. 8. Student receives desired item plays with it for 20 seconds.
Phase 5 Responding to "what do you want?"	1. Communication partner simultaneously points to the "I want" card and asks "what do you want?" 2. Communication partner delays between the point and verbal cue "what do you want?" 3. Communication partner give social praise to student when he demonstrates ability to respond with "I want" and the desired picture. 4. Communication partner offers ample opportunities for student to answer question, "what do you want?" and also to initiate request without prompt.
Phase 6 Commenting in response to a question	1. Communication partner gathers material in students requesting vocabulary, include new sentence starters such as "I see" 2. Communication holds an item, then places the "I see" picture of item near. 3. Communication partner holds up the item and asks, "What do you see?" point to "I see" symbol. 4. Communication partner waits to see if student picks and places it on sentence strip. 5. If able to do four, communication partner says, "yes I see a" 6. If not able to do 4, communication partner guides and then says, "you see a" 7. As student continues to use the exchange to answer, "what do you see?" communication partner increases the number of pictures and items so that student can discriminate between pictures.

Adapted from -Collet Klingenberg L. (2008). PECS: Steps for implementation, Madison, WI: The National Development Center on Autism Spectrum Disorders. The Wiseman Center, The University of Wisconsin.

The first PECS phase is referred to as physical exchange, its objective is to enable the student to look at, reach out for, pick up the icon, go to the communication partner and release it into the partner's hand to be able to get the preferred item. In this phase the physical prompter is heavily involved to guide the student towards being able to pick the icon and hand it to the communication partner, however the physical prompt and open hand prompts should be fade away before proceeding to the second phase. No verbal prompts at this level, it is silent. The purpose is to help the student to have a connection between pictures and the desired items. Move to the second Phase if the child can be able to independently request for 2-3 reinforcers with a communication partner.

The second PECS phase is referred to as expanding spontaneity and its objective is to enable the child go to his communication book, pull out a picture, go to the communication partner ,and release the picture into the partner's hand. During this phase physical and open hand prompts are discouraged and the student is expected to initiate communication and request for the desired item independently. There are still no verbal prompts at this level, it is still silent.

The third PECS phase is referred to as picture discrimination and is meant to enable the child request for a desired item by going to the communication book, select a picture from several others (discriminate), go to communication partner and give the picture. However, due to the intensity of this phase it is split into two parts; Phase 3A and Phase 3B. Where, phase 3A involves discrimination between a highly Preferred Icon and a distractor icon. No verbal prompts should be provided during the exchange. The pictures should be moved around on the book, for instance, diagonal, vertical, horizontal, during different trials. This will make the student search and select the appropriate icon.

Phase 3B on the other hand is teaching simultaneous discrimination of pictures. Here the student is exposed to two different icons for two different items both of which should be desirable. After the student chooses the icon and presents it to the partner, the partner looks at the two items and simply says “take it,” without naming the item. Whenever the student picked the correct item he was allowed some 20 seconds for play with the item. Otherwise, the error correction procedure of model/show, practice, switch and repeat was applied.

The error Correction Procedure entails;

- 1) Communication partner picks up the correct picture, shows it to the student and verbally labels it.
- 2) Student looks at the picture; communication partner prompts the student to give the correct picture by holding his hand near the picture.
- 3) If the student gives correct picture verbally acknowledge the correct response, but do not give the item. Instead give a non-related directive e.g., “touch your head”.
- 4) If the student follows directive, communication partner entices by interacting with the desired item.
- 5) If the student touched correct picture was given verbal praise.
- 6) If the student gave correct picture, handed the desired item to the child, allowed child to play with the item.

The fourth PECS phase is sentence structure meant to request for present and non-present items using a multi-word phrase. In this phase the student should be able to combine sentence strip with icons in order to request for the item desired. Such as “I want” sentence strip with icon for “ball” as a request for ball.

The objective in the fifth PECS phase is responding to "what do you want?" to enable the student to spontaneously request for a variety of items. Verbal prompts are used to ask the question "What do you want?" The learner initiates requests for items independently using the starter phrase, "I want" sentence strip, then a picture of the desired item. This prompt is initially given with a 0-second delay and then faded over time to encourage independent responding (National Professional Development Center on ASD, 2010)

The objective in the sixth PECS phase, 'commenting' in response to a question, is to expand communicative functions to include commenting, expression of feelings, likes and dislikes. This is done by giving the client an opportunity to comment in natural setting, for instance make a comment during snack time, "mm, I like cookies" use the student's picture to ask, "what do you like?" or "I feel happy", "How do you feel?" Eventually, transition to spontaneous commenting without prompts (National Professional Development Center on ASD, 2008, 2010).

In phases 1 and 2, the trainer worked with a physical prompter (parent), who prompted the student, where necessary, to pick the photo, walk to the communication partner and release the photo into the communication partners hand (Virgile 2009), for the student to get the desired item. While from phases 3 through to 6, prompt is withdrawn and student allowed to be as independent as possible to practice initiating, requesting and finally gain spontaneous speech.

2.5 Theoretical Framework

The study was based on the Behaviorist Theory by Skinner (1953) that is characterized by three important aspects which are the occurrence of a stimulus for a

desired behavior, the client demonstrating a response and the interventionist giving a verbal or tangible reinforcer like a ball if response is correct.

PECS relies primarily on direct positive reinforcement, similar to the one that occurs in a typical language development (Ganz, et al 2012). Its training system is based on the analysis of language as in verbal behavior by Skinner (1957) as postulated by Hilton (2015). Behaviorism holds that behaviors can be changed by repetition of drills and rewards, so learning is a response to a stimulus. That if a person does something then gets something he/she likes, then he/she is likely to do that thing again. Skinner's theory emphasizes the role of reinforcement in shaping behavior, in PECS when a client successfully uses a picture to communicate a need or desire and receives the desired item it reinforces the use of that communication method.

Human response is voluntarily controlled; a desired behavior can be achieved through operant conditioning by rewarding a random behavior that leads to the desired behavior. To achieve a desired behavior, there is antecedent stimulus that can influence the response, which in turn leads to the consequences. PECS uses the association between a picture of a preferred item, the item and the individuals need and hence the exchange of the picture for the desired item. The student realizes that as he engages in the picture exchange he gets what he wants and so will do more exchanges to get his desired item, and therefore likely to communicate more, since the behavior increase based on the contingent of the delivery of reinforcement and rewards concomitantly on selecting the desired behavior. PECS incorporates the prompting procedure of delay, this has to do with slowly allowing more time from the time the partner gives instructions to the time prompt is given, where the time between the instruction and the prompt is gradually increased, as was postulated by Charlop et al,(1985);Charlop and Walsh, (1986); Touchette, (1971), whereby there is

transfer of stimulus control of the communicative behavior to the presence of the desired item, the students desired item such as a ball is what stimulated the action of taking its icon to the communication partner to receive the item (ball) and get a chance to play with it.

This does not necessarily mean that the communication partner is not talking alongside providing the icon and then the item, because as Jasmine M. Williams (2018) established in his research, PECS is based on the principles of applied behavior analysis, specifically verbal behavior, with the goal of spontaneous and functional communication. The whole experiment was based on training one to communicate using photo cards through three phases of PECS. There was positive change in behavior towards being able to communicate, this explains the choice in the use of experimental design, single subject changing criterion. Just like in normal language acquisition use of positive reinforcement does realize positive results. Whereby, in this study the positive change observed was in the ability to communicate using pictures in regard to initiating communication, requesting for a desired item and spontaneous speech. Change was observed in the three areas step by step as the PECS training went on, repeatedly in the ten trials per session. From this study it was realized that the highest level to achieve was spontaneous speech using photo cards, it actually also proved to be the toughest of the three dependent variables. It is the equivalent of fluent speech in spoken terms, where one achieves a level of making self-understood by parents, guardians, teachers and significant others.

Skinner's theory emphasizes the role of reinforcement in shaping behavior, In PECS a picture is used to communicate one's desire/need and ultimately receives it, which reinforces communication. Prompting and shaping are integral in the implementation of PECS, the parent, physical prompter starts by supporting the learner through

providing cues to help the learner acquire the new behavior, in this case, using pictures to communicate. The parent also gradually guides (shapes) the learner towards the desired behavior and so enhance effective communication using pictures. Behaviorists underline the importance of functional communication, which is at the center of PECS training, hence facilitating functional communication, aligning with behaviorist principles of adaptive behavior.

There are key tenets of behaviorist theory by Skinner that make it relevant to this study as summarized in the table below:

Table summarizing Skinner’s key tenets of verbal behavior:

Key Tenets	Description	Example
Language as Behavior	Verbal behavior is a type of behavior shaped by consequences through others; not innate.	Saying “water” to get a drink.
Functional Analysis	Language is analyzed by its function (what it accomplishes), not form.	Labeling objects, requesting items, conversing.
Mand	A request controlled by a motivating operation (desire, need, or want).	“I want juice.”
Tact	A comment or label controlled by a nonverbal stimulus.	“That’s a dog.”
Echoic	Repetition of verbal stimulus; point-to-point correspondence with spoken words.	Hearing “cat” and saying “cat.”
Intraverbal	Responding to verbal stimuli without point-to-point correspondence; conversation or answering questions.	“What is your name?” → “John.”
Autoclitic	Modifies or qualifies other verbal behavior; adds information about context, attitude, or certainty.	“I think it’s raining.”
Textual	Reading written words; verbal behavior controlled by written stimulus.	Reading “cat” aloud.
Transcription	Writing or spelling spoken words; controlled by verbal stimuli.	Hearing “cat” and writing “cat.”
Environmental Control	Verbal behavior is shaped and maintained by social reinforcement and motivating operations.	Praise for saying “thank you.”
Reinforcement and Learning	Verbal behavior is acquired and maintained through reinforcement, similar to other behaviors.	Child requests snack → receives snack → behavior strengthened.

Adapted from Skinner, B. F. (1957). Verbal behavior. Appleton-Century-Crofts.

The table below links **Skinner’s verbal behavior** to **PECS Phases 1–3**, which focus on teaching functional communication in children with autism:

PECS Phase	Targeted Verbal Operant(s)	Objective / Behavior	Example in PECS
Phase 1: How to Communicate	Mand	Teach the child to request (mand) for a preferred item using a picture; focuses on the motivation to communicate.	Child picks up a picture of a snack and gives it to the communication partner to receive the snack.
Phase 2: Distance and Persistence	Mand	Increase the child’s ability to initiate requests over distance and across situations; encourages persistence in communication.	Child carries the picture across the room to give it to the partner to get the desired item.
Phase 3: Picture Discrimination	Mand	Teach the child to discriminate between multiple pictures to request specific items; strengthens precise requesting.	Child selects the picture of “cookie” instead of “juice” to request the correct item.

Adapted from empirical evidenced based study by; Charlop-Christy, M. H., Carpenter, M., Le, L., LeBlanc, L. A., & Kellet, K. (2002). Using the Picture Exchange Communication System (PECS) with children with autism: Assessment of PECS acquisition, speech, social-communicative behavior, and problem behavior. Journal of Applied Behavior Analysis, 35(3), 213–231. <https://doi.org/10.1901/jaba.2002.35-213>

It is worth noting that Phases 1–3 mainly focus on establishing functional initiation and requesting for communication.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The Research design and methodology comprised; research design, the study area, the study setting, target population, sample and sampling procedure, data sources and instruments, data collection process, data presentation, analysis and interpretation and the ethical considerations.

3.2 Research Design

The research was based on quantitative experimental, single subject changing criterion design. Since the effects of using PECS on initiating communication, requesting for a desired item, and spontaneous speech, were expected to increase step by step.

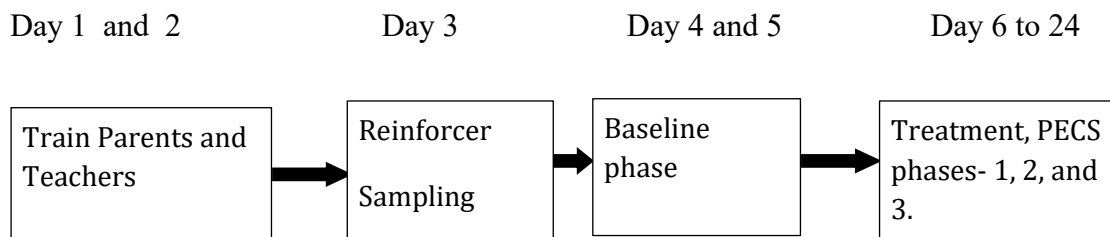


Figure 1: Timeline diagram showing the flow of activities during the experiment period

In this design, the first step was to train teachers and parents who were involved in the experiment in the first two days followed by reinforcer sampling to identify items preferred by the learner in the next one day. The whole process of PECS training start with parents/teachers list of the individual child's items of preference from which the investigator carry out a reinforcer sampling(stimulus preference assessment), as it was posited by Charlop-Christ et al (2002) it is simply the identification of the most

preferred item by the child. This ensures that the investigator has an inventory of the items to use as reinforcers during the training. These basically involved putting a number of items on a board or table then allow the student to pick one, allow the students to interact with it briefly then withdraw and allow another trial. If the student picks an item three times then it is considered preferred, and is replaced with another. This was done until the trainer had five items most preferred. After establishing the reinforcers the researcher carried out a baseline, to be able to ascertain the functional ability of the student as regards initiating communication, requesting for a preferred item, and spontaneous speech. The baseline was done for six sessions in two days, which was three sessions a day. The trainer sat in front of the child holding a preferred item and a picture (icon) of the same item placed on the table, no prompt. If the child picked the icon independently and handed it to the trainer it was recorded with a TICK sign as Able (A), if not able, a TICK sign as Not Able (NA), either way the child was allowed 20 seconds to play with the item. The independent observer also recorded this session. Upto 10 trials were done as it was proposed by Ganz, et al (2005). This was then calculated as number of correct trials divided by ten (10 = total number of trials), multiplied by 100% to get percentage of correct trials. Each of the PECS phases had an objective and the phase broken down into manageable steps, as was postulated by Park et al, (2011).

The items were selected from a list of preferred items that were given by the teachers and the parents. These items mainly comprised toys which as it was posited by Hilton (2015), had to be readily available. The next activity was baseline measurement as a point of reference or control phase, in which at least three data points were collected to establish dependent measure of stability for two days. Carson et al (2012) proposed the baseline to have an 80% stability of baseline data criterion level of correct

independent trials, which the subjects had to achieve to be able to proceed to the next level, however, in this study the researcher observed 18.75% since the subjects had not been exposed to PECS before. Further explanation of this baseline result could be related to variability in behavior; including fluctuations in attention or mood, learning readiness; unable to imitate, inability to understand simple gestures and sensory issues affecting participation and response consistencies.

Then every other subsequent phase formed the baseline for the next treatment phase. That continued through to phase three of PECS training phases. The flow of training activities included reinforcer sampling, baseline and three PECS training phases called treatment phases by Ganz, et al (2005). Three of the six phases were trained, there were three sessions per day, two days per week for twelve weeks, and each session was allowed ten trials where a session was in the range of 15-20 minutes. The days and weeks did not necessarily follow each other, they were spread over a longer period since the students required to attend ordinary class work and the parents could not manage a continuous experimental period as they had their livelihood activities to undertake. This meant that the student would retrogress and at times appear not to remember what we were doing. As a mitigation measure, the teachers and parents were to follow up use of PECS at school and at home with these students during the days they are away.

The following was a visual illustration of the training schedule.

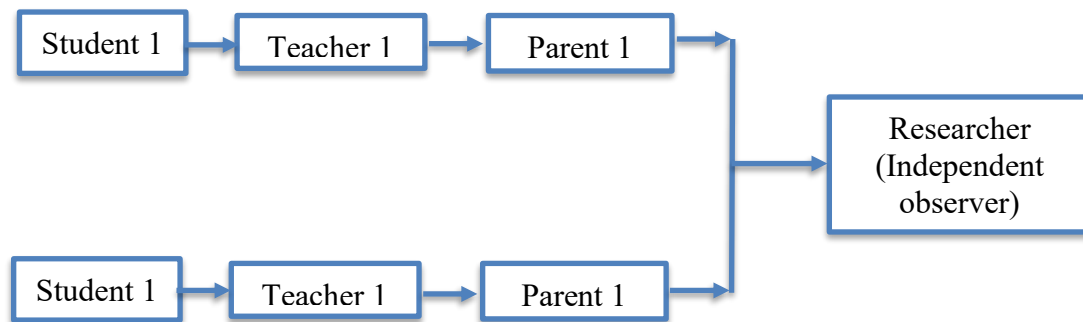


Figure 2: a visual illustration of training schedule

Teacher 1 together with parent 1 trained student 1, Teacher 2 together with parent 2 trained Student 2 independently to give the experiment an opportunity for replication, this replication was in the PECS training phases one to three and in the measurement areas of initiating communication, requesting for a desired item, and spontaneous speech. The whole training was done for nineteen days, with each day having three sessions and each session having ten trials, a total of five hundred and seventy trials.

3.3 The Study Area

This study was done in Mugumu-ini Special unit for Autism of Thika Sub-County of Kiambu County. Thika sub -county has five Special Schools and five special units. Eight of them are primary schools while two are secondary schools. Of all these schools only one school has a unit for children with ASD that is, Mugumu-ini Special unit for Autism, actually in the whole of Kiambu county. This made it the most preferred and so elected for the study. A public mixed primary school, recognized by the Ministry of Education as a Special unit for Autism.

3.4 Study Setting

The experiment setting was the library room, this room had two tables placed about three meters away. During the baseline and the first phase of treatment both the icon

and the preferred item with the communication partner were on the same table. While during the second and third treatment phases, on the first table was put the desired item while on the other table was placed the icon of the desired item. The materials used in the experiment were similar for both student one and student two. They were actual photo cards of the most preferred play items as shown in appendix 6; photo cards and the actual items themselves. The parents and teachers had also chosen such play items as most preferred by the study subjects. A photo album was used as a communication book as shown in appendix 7..

The Researcher, who was the independent observer during the experiment, witnessed exchange of both student 1 and student 2 at different times and also took measurements from the two study subjects, equally, the primary trainers(teacher 1 and teacher 2), who were the communication partners, took their measurements. These provided for inter-observer agreement, to ensure the result of the study was credible and verifiable. In this study, the PECS training phases 1-3 was the independent variable which had impact on dependent variables; initiating communication, requesting and spontaneous speech using picture cards.

3.4.1 Initiating communication

Initiating communication was said to have been done if the child pointed, pulled the communication partner or physical prompter by hand, shouted or fumbled to a desired item, any one or more of these was considered an initiation. These were in response to the preferred item on one end of the table.

There were ten opportunities to respond (trials). On attaining at least 15%, this was about one and a half out of the ten trials stability in the ability to initiate communication then preceded to the next PECS training session.

3.4.2 A Request

A request was said to have been done if a child picked a picture, took it to the communication partner, without any prompt to receive the desired item. There were ten opportunities to respond (trials) all involving; see the desired item, see picture of the desired item, pick picture of the desired item within reach, Release picture to communication partner's hand within arm's reach, on attaining at least 15%, meaning at least 1.5 out of the ten trials, level of stability in the ability to request for a desired item then proceeded to the next PECS training session.

3.4.3 Spontaneous Speech

Spontaneous speech happened if the child used a picture(s) to communicate any message, need or want without any other support. During the ten trials, five different cards with different pictures to communicate different naturally occurring needs or wants were put on the table. This gave the subject an opportunity to spontaneously use the picture cards to express himself. On attaining 10% levels of stability in the ability to use pictures to communicate then proceed to the next PECS training session.

3.5 The Target population.

The study population was drawn from the only school for learners with a unit for Autism spectrum Disorders in Thika sub-County, Kiambu county.

The school, Mugumu-ini special unit for Autism had an enrolment of thirty five, including twenty eight boys and seven girls; it had four teachers. The study, being an experimental single subject changing criterion design involved two boys, two of their teachers and two parents.

In this study the target population consisted of children with autism aged 6-8 years, who are nonverbal but demonstrate motivation to communicate through tangible reinforcers. This population is characterized by limited functional communication.

3.6 Sample and sampling procedure

The sample of the study was drawn from Mugumu-ini special unit for Autism; these were two boys, based on the fact that there are more boys with ASD compared to girls, but also to avoid any gender difference influence in the study. According to Autism Speaks, boys are nearly five times more likely than girls to have autism (Autism Speaks 2012). The criteria for selecting the two participants included having a medical diagnose of ASD, which was indicated by the registration card from National Council for Persons with Disabilities (NCPWD) or at least confirmation by the researcher using M-CHAT scores, be non-verbal and be 6-8 year old.

Their two teachers and two parents were also involved. The sampling procedure was purposive sampling based on the qualities above and the only school of Autism in the Sub-county (Mugenda & Mugenda 2004), while the criteria for getting the two study subjects to be trained in the use of PECS were intentional communicators, personal preferences they were also non-verbal, as they did not have any words or meaningful speech, they only made some humming! Sounds. However, both student 1 and 2 had necessary motor skills like, grasping, reaching out, and walking independently, even though one was hyperactive while the other was hypoactive. These Children were between the ages of 6-8 years old. The two teachers, played the role of research assistants and communication partner each with one student by training one child, while the researcher was independent observer and two parents, both of whom played the role of physical prompter of these learners were trained on the process of experiment and also to ensure continuity after the study, at school and at home and

also to provide for replication of the study. Meanwhile, the researcher was the independent observer who recorded data for both students 1 and 2, to provide for inter-observer agreement.

3.7 Data Sources and Instruments

According to Kpolovie (2016) data sources should have authenticity, accuracy, validity and reliability. The first data was the registration cards by National Council for persons with Disability (NCPWD) showing both student one and student two were confirmed to have autism and also used the M-CHAT to ascertain the child who has autism. Then the parents/teachers list of learners highly preferred items in order of priority that is; list of five most preferred play toys. The researcher used these lists of items to conduct a reinforcer sampling, using 'The Reinforcer Sampling Checklist', adapted, only for the purpose of this study, from Reinforcer Worksheet by Frost & Bondy 2nd edition (2002) p.347. The data source was from the measures of the Checklists on number of independent trials on initiating communication, requesting for a preferred item and spontaneity in communication, during the PECS training sessions. Each and every ten opportunities to respond were considered a trial. The percentage of correct trials in PECS initiating communication, requesting for a desired item and also in spontaneous speech, by use of picture cards, was calculated as number of correct trials divided by total number of trials (10) multiplied by one hundred to get a percentage. These were those trials the student was able to perform at least without any prompt in the first phase.

The counting of the responses and recording was done by the researcher and the research assistants (teachers), who were also the communication partners. Student two was trained by teacher two to provide for replication to increase reliability and generalization.

The tools for collecting data included; a parent/teacher **Reinforcer Assessment Form** to fill in the child's preferred items, mainly toys, as preferred by the child, researcher and research assistant's **Reinforcer Sampling Form**, to confirm reinforcers from the reinforcer assessment form. For the baseline assessment the researcher and research assistants (teachers) used checklists for the three measurement areas; initiating communication, requesting for a preferred item and spontaneous speech. While during the intervention period the data collection tools were, checklist for **number of times student initiated communication**, checklist for **number of independent requests** and checklist for **number of spontaneous speech made using pictures**. The other important material for PECS training was laminated **picture (photo) cards** and **photo album**.

3.8 Data Collection Process

The data collection process begun with the list of preferred items that was provided by the parents and teachers which was confirmed by the researcher. The confirmation procedure involved putting the items on the table then allowing the student to pick the most preferred, the one he picked first was the most preferred. That item picked was removed and student allowed to pick another, till all the photos were finished. This provided the researcher with adequate reinforcer samples. Reinforcer sampling is an informal inventory of items and activities that are of particular interest to the learner (Lerna, et al 2012). The Baseline was then undertaken based on the three dependent variables, which was the number of times the student was able to initiate communication without prompt, where either they pulled the partner, point, shout or fumbled towards a desired item. The number of times the student was able to request for a desired item by picking a picture, taking it to the partner to receive the desired item. The number of spontaneous speech, where the child used a photo card to

communicate a message. Training of teachers/ parents and baseline was done in the first five days, that is, the first two days training of parents together with teachers, one day for reinforcer sampling for the child's most preferred items, and two days of collecting baseline data. Each of the teachers worked with a parent to train a student while the researcher was the independent observer. This was done separately to allow for replication of the study. The intervention involved training the PECS phases and measuring the attainment of goals at each phase. The score were recorded in the form of either Able(A) or Not Able (NA), that was, 'A' for being able to make correct response at every trial in training session and 'NA' for inability to make correct response, there were 10 opportunities to respond per session. A trial was every opportunity to respond while a session comprised ten trials. There were three sessions a day, for two days in the baseline phase and nineteen days for the treatment phase. The training sessions where the student got opportunity to respond and the Measurement opportunity ran concurrently. So, as the PECS training went on, the Measurement and recording was also done at the same time.

The independent variable was the training of PECS's phases 1-3; the participants were scored on their accuracy to utilize PECS. The dependent variables were;

- (1) Number of times the subject initiated communication recorded in the Checklist count as either "A" or "NA".
- (2) Number of requests made to obtain a desired item, recorded in a checklist, each response opportunity was counted as either 'A' or 'NA'.
- (3) Number of spontaneous speech using pictures made during PECS training phases, recorded in the Checklist count as either "A" or "NA" .

The inter-observer agreement between the research assistants and the independent observer (researcher) were done to ensure verifiability of the data. Inter-Observer agreements were calculated as; total number of agreements between raters divided by total number of agreements plus disagreements, multiplied by 100%. Where the raters were the independent observer (Researcher), Teacher 1 (Research Assistant 1) and Teacher 2 (Research Assistant 2)

3.9 Data Presentation, Analysis and Interpretation

The raw data was presented in the form of tables which show scores of between zero and ten in either ability (A for Able) or Inability (NA for Not Able); these scores are the number of times of the ten trials per session the student was able or not able to initiate communication, request for a desired item and perform spontaneous speech. Each student had their tables well labeled as either student 1 or student 2. The raw data in the table form were analyzed by converting the scores into percentage per session in a table and a line graph to show ability (A). This was done at baseline and at every treatment (intervention) phase to clearly show the patterns and trends of behavior change as was observed by Kpolovie, (2016). The graph's vertical (y) axis indicated the dependent variables (percentage of number of requests made independently, percentage of the number of times made to initiate communication and percentage of number of attempts to spontaneity). The horizontal (x) axis indicated the sessions in phases both in baseline phase, and in treatment phase 1, treatment phase 2, treatment phase 3(a) and treatment phase 3(b). A discussion also followed to explain the happenings in the study.

The data was further analyzed and interpreted using IOA, SMD and PND as explained below;

3.9.1 Inter observer agreement (IOA)

The Inter observer agreement (IOA) is the degree to which two or more independent observers report the same observed values after measuring the same events. These help to first:-determine the competence of new observers (when the IOA is low) secondly to detect the observer drift over the course of a study (when the IOA is low), third to increase confidence that the target behavior was clearly designed (when IOA is high) and fourth to confirm that change in data is due to change in behavior and not in data collection (when IOA is high)

IOA was calculated as total number of agreements between raters over total number of agreements plus disagreements multiplied by 100 to make it a percentage. Results of 0.4% and lower are considered low/poor results, 0.4% - 0.6% show fair agreements, 0.6% – 0.75% show good agreements, while greater than 0.75% indicates excellent agreement. (Hartmann, Barrios & Wood, 2004)

3.9.2 The Standard Mean Difference (SMD)

Here we subtracted the mean of the baseline phase from the mean of the intervention phase divided by standard deviation of baseline. SMD of 0.2 meant small improvement, SMD of 0.5 meant medium improvement and SMD of 0.8 meant large improvement (Cohen, 1988).

3.9.3 Percentage of Non-overlapping Data (PND)

This was used to show the meaningful index of treatment effects as was suggested by Scruggs and Mastropieri (2001). These were in line with the three dependent variables, trials that were made to initiate communication, frequency of request and number of spontaneous speech. The steps towards calculating the PND included; identifying the highest baseline point, counting the number of intervention points that

exceeded the highest baseline point (non-overlapping) and then calculating the proportion of non-overlapping to the total number of intervention points.

$$PND = \frac{\text{No of intervention data exceeding the highest baseline data point} \times 100}{\text{Total No of data points in the intervention phase}}$$

If the results are less than 50% meant unreliable treatment, 50-70% meant questionable effectiveness, 70-90% meant fairly effective treatment and more than 90% meant highly effective treatment.

3.10 Discussion of the Methods

In this study, though the two subjects had several similar characteristics such as both having ASD, registered by the National Council for Persons With Disability (NCPWD), being non-verbal. They truly had their individual differences. One of the most outstanding variation included, student 1 being hypoactive while student 2 was hyperactive, so while student 1 was always silent, student 2 would make some humming sounds, mmmh.....mmmh...

Further, being hyperactive, student two would at times pick the photo card and run away with it or even tear it. These would at times make the parent feel embarrassed and at times wonder whether the child will ever change! Nevertheless, the parent played a critical role in restraining the student from running off or tearing the photo card in most cases by holding his hand. On his part, the researcher had prepared several similar cards for use and also conducted a debrief with the parents and teachers after every three sessions to encourage them to keep trying and not to give up. It's the researchers' view that, this may have impacted on the general outcome of the study, this is because the raters doubled up as the communication partners and hyperactivity would easily make the recording vary as has been observed in the inter

observer agreement. The methodology adapted in the study, that is , single subject design changing criterion was suitable as the study progressed from one level to the next as the PECS training progressed from phase one through to phase three(b). This blended well with the B.F. Skinner's Behaviorists theory, which employs principles such as operant conditioning, reinforcement, prompt, and shaping to teach those non-verbal's with communication disorders to effectively express themselves using pictures. Change of behavior was evident in the ability of the participants to communicate with parent and teacher using the photo cards.

3.11 Kenya Setting

This study having been done in Kenya, where limitations are still many had its share of challenges, even though this was only done with two students from one school in Kiambu County. This maybe a representation of what is in other parts of the same Country. However, as has already been indicated elsewhere, there has been no evidence of earlier research efforts in the use of PECS. This may explain why there was lack of Velcro, laminated pictures, and video recordings. Which were all not possible to get during the experiment period.

Being in the Kenya setting also meant parents expected to receive some refund for transport, and/or lunch for participating. Since, they would ordinarily be doing some chore to make a living. Since this was not forthcoming, they would feel demoralized, and at times view it as a waste of their time. Infact, there were a few instances when one parent or both would fail to turn up, necessitating postponement of the experiment. The researcher kept re-assuring them of the possible benefits of doing the experiment to their children as they would be able to reach out to them using the photo cards and so communicate with them.

3.12 Replication

The study had two participants, that is , student 1 and student 2, both had ASD and they were non-verbal they were also within same age bracket (6 and 8 years old) and they were boys, the objective of replicating the study was to ensure validity and reliability. However, the two differed in regard to one being hyperactive while the other was hypoactive. Nevertheless, replication was evident in the study findings, so much so that, even though the specific findings had some variations, they were not of a very high magnitude as to affect the overall study results. Kazdin (2021), underscores the importance of replication in single subject studies to ensure the study is credible and verifiable as well as providing for experimental control.

The methods used, the photo cards, the researcher and research assistants, the setting and the recording tools, were all the same for both participants. Hence, there was nothing that gave one participant any benefit over the other. Yet it can be seen that in all the variables the improvements in ability to initiate communication, make a request for a desired item and spontaneous speech was same for both participants.

This replication therefor made this study more authentic and confirmed the findings as evident how useful PECS can be to enhancing communication for non-verbal individuals with ASD. It is also worth noting that replication rules out the plausibility of an extraneous variable, confirming therefore that changes in ability to initiate communication, make a request for a desired item and spontaneous speech were all due to the PECS training of phases 1 to 3(b). There is no doubt that this study can still be repeated elsewhere with different participants and still give positive results.

3.13 Ethical Considerations

After getting the letter from Moi University (Appendix 13), the next step was to secure a license of approval by The National Commission for Science, Technology and Innovation (NACOSTI) (Appendix 8) prior to undertaking the research. This was followed by seeking authorization from the County Commissioner Kiambu (Appendix 9) and the County Director of Education, Kiambu (Appendix 10). Then authority by the Thika Sub-County Director of Education (Appendix 11) and finally the authority to carry out research was granted by the Head Teacher of the School (see appendix 12)

The ethical issues in this study were carefully considered to ensure that the participants were well protected against any form of abuse. The participant's written informed consent were obtained in advance through their parents as they gave their own consent, teachers also gave their own consent (see appendix 14 and 15). The participating school was to be given feedback of research findings for learners, teachers and parents to work on areas recommended for improvement and to continue using PECS. The names of all the participants were concealed and coded (titles) used instead, and also the subjects' information stored with high levels of confidentiality. This also means that issues in regard to the participants' details were treated with a lot of respect and were never discussed outside the experiment venue. All the data collected from the participants was to be kept by the researcher under lock and key, and no one was to be allowed to access them without further consent from the subjects. All the information collected from participants was only used for the purpose of the study.

This chapter was on Research Design and Methodology, it has explored the research design, the study area, the study setting, target population, sample and sampling

procedure, data sources and instruments, data collection process, data presentation, analysis and interpretation and the ethical consideration.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

The data presentation, analysis, and interpretation were done in this chapter using tables, graphs (which are labeled as figures), and clear explanation of each of them, based on the three research objectives which were:- to Probe the extent to which PECS contribute to a child's ability to initiate communication, to investigate the extent to which PECS contribute to a child's ability on requesting for a preferred item and to Scrutinize the extent to which PECS contribute to spontaneity in communication.

The chapter comprised the introduction, data presentation, data analysis, interpretation and discussion

4.2 Data Presentation

The raw data of the experiment (see appendix 1) was presented both for baseline days one and two and treatment days one to nineteen for student one and student two. This was done alongside the independent variables PECS training phases 1-3, which was expected to impact on the dependent variables of initiating communication, requesting for a desired item and spontaneous speech using pictures. Each of the experiment days involved having three sessions while each of the sessions had ten trials. A trial was every attempt made by the student to communicate using the picture. Below are the tables containing the scores for student 1 and for student 2 as recorded by the research assistants, showing three rows for sessions 1, 2, and 3 with three columns showing the dependent variables; initiate communication, request for a desired item and spontaneous speech.

4.3 Data Analysis and Interpretation

The data was analyzed and interpreted according to the three objectives for each subject, that is student 1 and student 2. The analysis and interpretation were based on the research design, experimental single subject changing criterion, as Gast, (2010) and Kennedy (2005) posited; single subject research is an experimental design that strives to record relationship between independent and dependent variables. While Olive and Smith (2010), recommended the use of Standard Mean Difference (SMD) to calculate the effective size in single subject design study. In a separate study, Kazdin(1978), Tawney and Gast(1984), agreed that Percentage of Non-overlapping Data (PND) is a primary consideration in evaluating single participant research. Being a single subject study it was therefore necessary to use all these methods of analysis and interpretation to determine the success of the experiment. The analysis also was done per the three different objectives of the study; initiating communication, requesting for a desired item and spontaneous speech.

4.3.1 Initiate Communication

Initiating communication was the first objective which required that the student be able to initiate communication by showing any of these indicators;- point to a desired item, pull the communication partner by hand towards the desired item and Shout or fumble towards a desired item.

The data showed whether student 1 and student 2 were able(A) to initiate communication or was not able(NA). The score was counted as the number of times the subject was able or not able to initiate communication out of the ten trials.

4.3.1.1 Baseline

The average for day 1 and day 2 was done to arrive to baseline data for initiating communication. The data for the ability of student 1 and of Student 2 to initiate communication was presented as a percentage shown in Figures 3 and 4, respectively, to show the change in percentage over the three sessions.

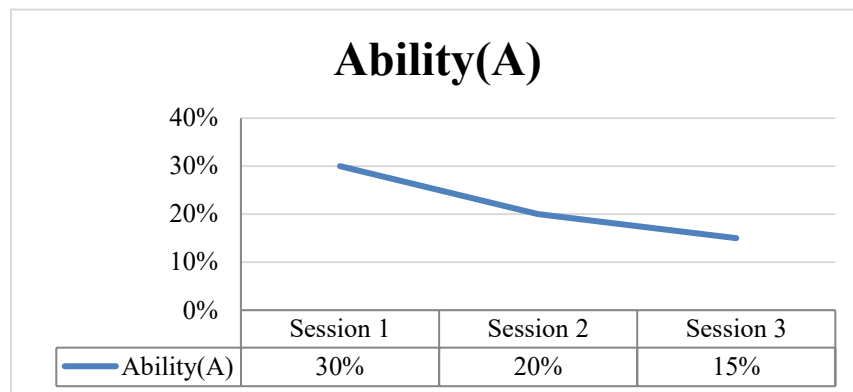


Figure 3: Ability of student 1 to initiate communication during baseline in percentage. It shows that student 1 scored 30% in the first session, 20% in the second session and 15% in third session.



Figure 4: Ability of student 2 to initiate communication during baseline in percentage. The figure shows that student 2 scored 15% in the first session, 10% in the second session and 22.5% in the third session.

4.3.1.2 Treatment

To arrive to treatment phases scores for treatment phase 1, an average of the scores for the first eight treatment days was done, to arrive to the scores for treatment phase 2, an average of the scores from treatment day 9 to treatment day 13 and to arrive to scores for treatment phase 3(a), an average of the scores from treatment day 14 to treatment day 16, while to arrive to scores for treatment phase 3(b), an average of the scores from treatment day 17 to treatment day 19 was done.

Treatment phase 1

The data for the ability of student 1 and Student 2 to initiate communication during treatment phase 1 was presented as an average of treatment days 1-8 as a percentage shown in Figures 5 and 6 respectively, indicating the change in percentage over the three sessions.

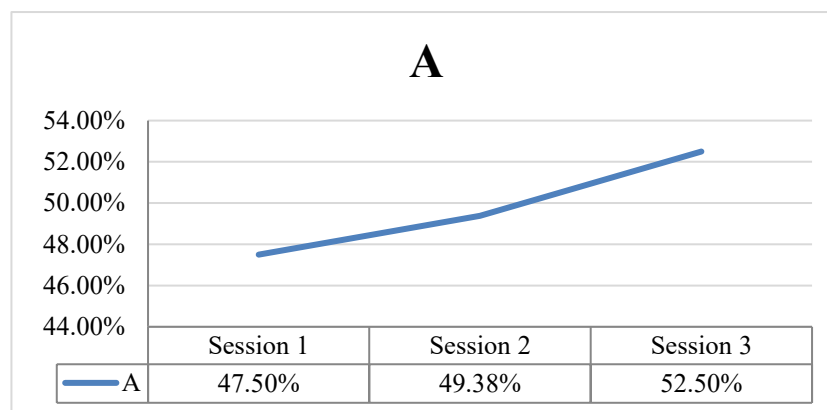


Figure 5: Ability of student 1 to initiate communication during treatment phase 1 in percentage The figure shows that student 1 scored 47.50% in the first session, 49.38% in the second session and 52.50% in the third session

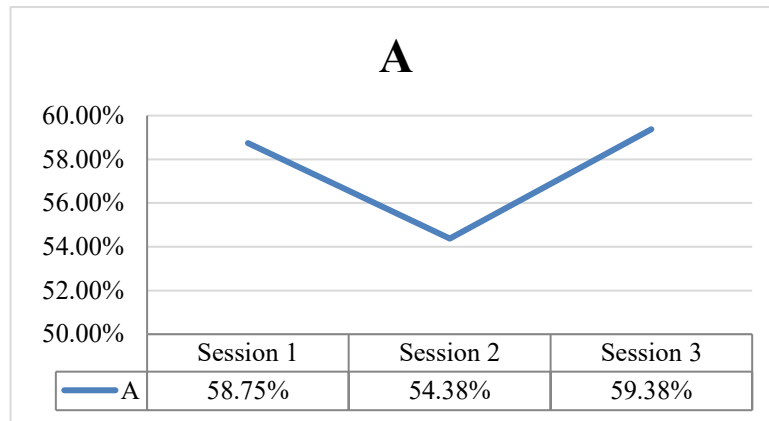


Figure 6: Ability of student 2 to initiate communication for treatment phase 1 in percentage. The figure shows that student 2 scored 58.75% in the first session, 54.38% in the second session and 59.38% in the third session

Treatment phase 2,

The data for the ability of student 1 and of student 2 to initiate communication in treatment phase 2, was presented as an average of treatment days 9-13 as a percentage shown in Figures 7 and 8 respectively, showing the changes in percentage over the three sessions.

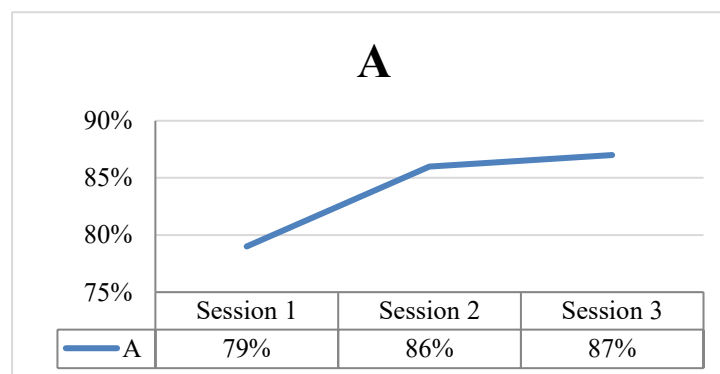


Figure 7: Ability of student 1 to initiate communication during treatment phase 2 in percentage. The figure shows that student 1 scored 79% in the first session, 86% in the second session and 87% in the third session.

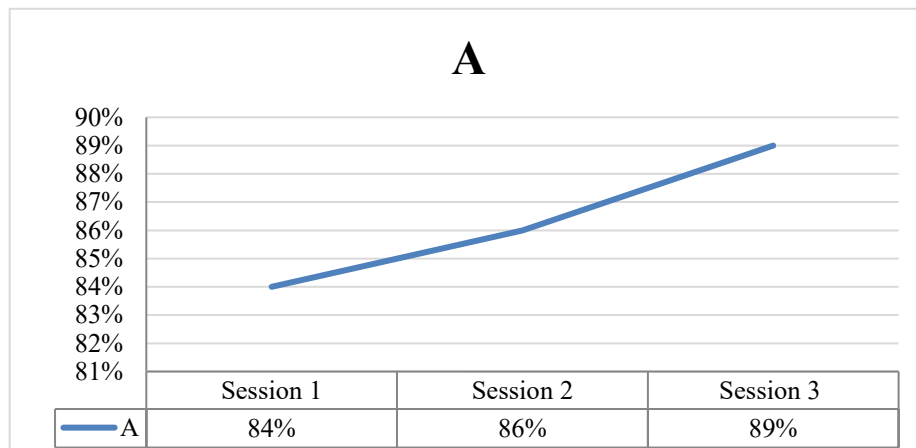


Figure 8: Ability of student 2 to initiate communication during treatment phase 2 in percentage. The figure shows that student 1 scored 84% in the first session, 86% in the second session and 89% in the third session.

Treatment phase 3(a).

The data for the ability of student 1 and of student 2 to initiate communication in treatment phase 3(a) was presented as an average of treatment days 14-16 as a percentage shown in Figures 9 and 10 respectively, to show the changes in percentage over the three sessions.

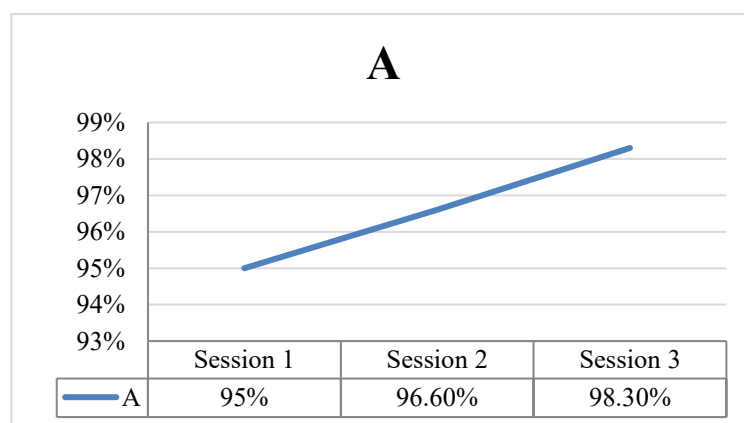


Figure 9: Ability of student 1 to initiate communication during treatment phase 3(a) in percentage. The figure shows that student 1 scored 95% in the first session, 96.6% in the second session and 98.3% in the third session

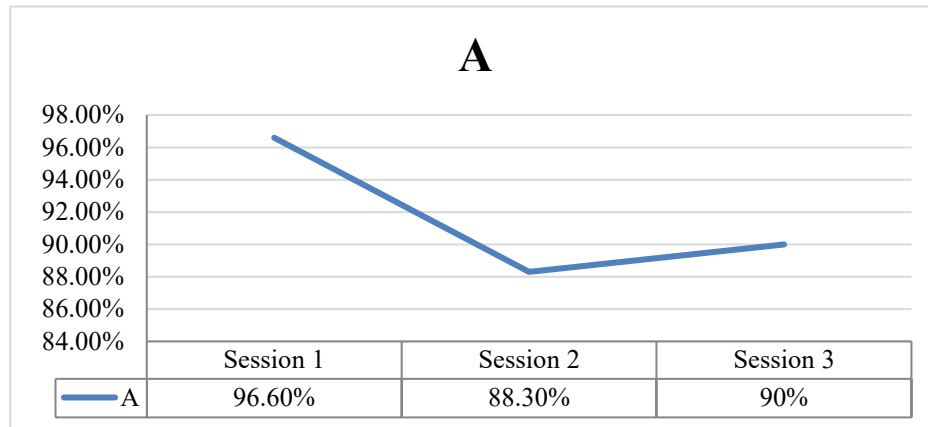


Figure 10: Ability of student 2 to initiate communication during treatment phase 3(a) in percentage. The figure shows that student 2 scored 96.6% in the first session, 88.3% in the second session and 90% in the third session

Treatment phase 3(b).

The data for the ability of student 1 and student 2 to initiate communication in treatment phase 3(b) was presented as an average of treatment days 17-19 as a percentage shown in Figures 11 and 12 respectively, to show the changes in percentage over the three sessions.

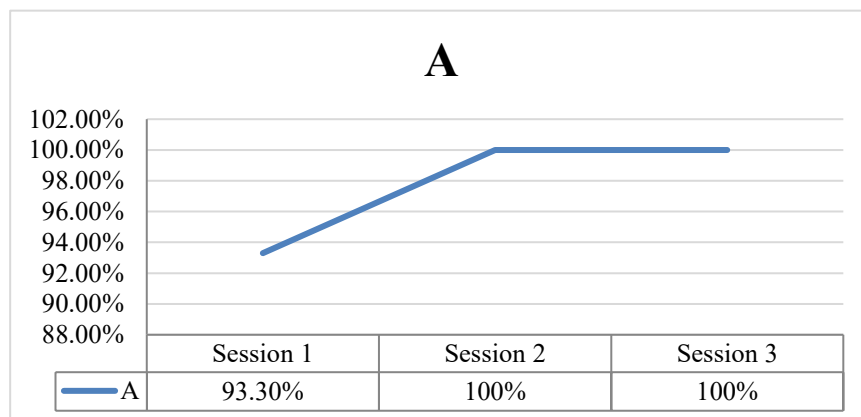


Figure 11: Ability of student 1 to initiate communication during treatment phase 3(b) in percentage. The figure shows that student 1 scored 93.3% in the first session, 100% in the second session and 100 % in the third session of initiating communication.

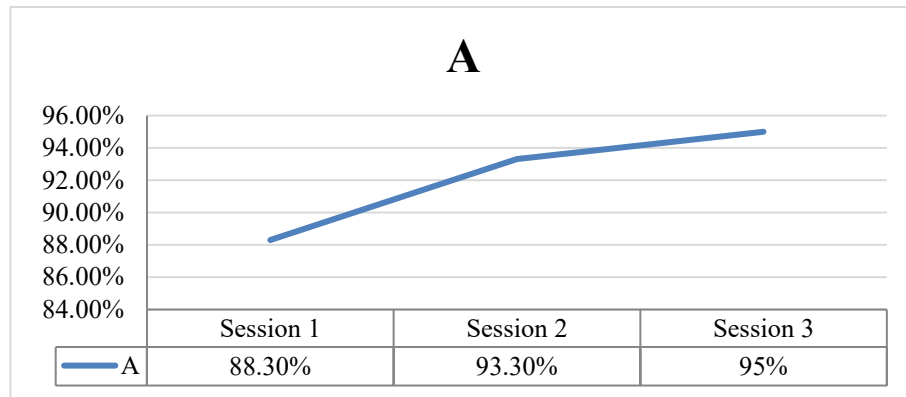


Figure 12: Ability of student 2 to initiate communication during treatment phase 3(b) in percentage. The figure shows that student 1 scored 88.3% in the first session, 93.3% in the second session and 95% in the third session

4.3.1.3 Findings

The findings for the ability of student 1 to initiate communication during baseline was 30% in session 1, 20% in session 2 and 15% in session 3. While for student 2, it was 15% in session 1, 10% in session 2 and 22.5% in session 3.

In the treatment phase 1, student 1 had 47.5% in session 1, 49.375% in session 2 and 52.5% in session 3. While student 2 had 58.75% in session 1, 54.375% in session 2 and 59.375% in session 3.

In the treatment phase 2, student 1 had 79% in session 1, 86% in session 2 and 87% in session 3. While student 2 had 84% in session 1, 86% in session 2 and 89% in session 3.

In the treatment phase 3(a), student 1 had 95% in session 1, 96.6% in session 2 and 98.3% in session 3. While student 2 had 96.6% in session 1, 88.3% in session 2 and 90% in session 3.

In the treatment phase 3(b), student 1 had 93.3% in session 1, 100% in session 2 and 100% in session 3. While student 2 had 88.3% in session 1, 93.3% in session 2 and 95% in session 3.

These findings show that there was a positive change from baseline to the treatment phases. During the baseline the scores ranged between 10% and 30%,

In the treatment phase 1, it ranged between 47.5% and 59.375%, in the treatment phase 2, it ranged between 79% and 89%. In the treatment phase 3(a), the score ranged between 88.3% and 98.3%. while in the treatment phase 3(b), the scores ranged between 88.3% and 100%. These were for both student 1 and 2. These results indicate a very clear increase in performance from baseline through to treatment phase 3(b).

Inter- observer Agreement

The inter observer Agreement was calculated as the degree to which two observers reported the same observed values after measuring the same events. In this case, the observation for student 1 was done by the researcher and teacher 1 also referred to as research assistant 1 ,while for student 2 it was done by the researcher and teacher 2 also referred to as research assistant 2. It was calculated as total number of agreements divided by total number of agreements plus disagreements multiplied by a hundred to get a percentage of the agreement. Agreements were counted as the number of times the values recorded by the researcher were similar to those of the research assistant for each student. While disagreements were counted as the number of times the values recorded by the researcher and those recorded by the research assistant differed for each student.

Student 1

The inter observer agreements for student 1 in the ability to initiate communication was thus worked out as; total agreements= 2, total disagreements= 19 hence, $2 \div 2+19=2 \div 21 \times 100= 9.5\%$. the inter observer agreement for student one in the ability to initiate communication was nine point five percent(9.5%).

Student 2

The inter observer agreement for student 2 in the ability to initiate communication was arrived at by having the total agreements =0, total disagreement =21, total agreements + total disagreements (0+21), $0 \div 21 \times 100= 0\%$.

The inter observer agreement for student 2 in the ability to initiate communication was zero percent(0%).

Standard Mean Difference (SMD)

The standard mean difference for objective 1, which shows the ability of student 1 and of student 2 to initiate communication was calculated as below.

$$SMD = \frac{\text{Mean of intervention Phase} - \text{Mean of Baseline}}{\text{Standard deviation of Baseline}}$$

The Mean of intervention phase for student 1 was found by adding up the percentages of sessions 1,2 & 3 of the treatment phase 1 in Figures 3 and 4, then divided by 3.the same was done for treatment phase 2, 3(a) and 3(b).these averages were then added together and divided by 4 to get the Mean of Intervention phase. The same process was done for student 2.

Student 1

Phase 1 (figure 5) $47.5+49.38+52.5=149.38 \div 3= 49.79\%$

Phase 2 (figure 7) $79+86+87=253 \div 3 = 84\%$

Phase 3(a) (figure 9) $95+96.6+98.3= 289.9 \div 3 = 96.63\%$

Phase 3(b) (figure 11) $93.3 + 100 + 100 = 293.3 \div 3 = 97.76\%$

Phase 1 (49.79%) + Phase 2 (84%) + Phase 3(a) (96.63%) + Phase 3(b) (97.76%) =
 $328.18 \div 4 = 82.045\%$

Mean of intervention phase for student 1 was 82.045%

Mean of Baseline, score of session 1 (30%) + score of session 2(20%) + score of session 3 (15%) divided by 3.

$30 + 20 + 15 = 65 \div 3 = 21.67\%$

Standard deviation of Baseline

Student 1. $69.3889 + 2.7889 + 44.4889 = 116.6667 \div 2 = 58.33335$

the SMD therefore was $82.045 - 21.67 \div 58.33335 = 1.034999704285798$, rounded to two decimal places was 1.04.

Student 2.

Phase 1(figure 6) $58.75 + 54.375 + 59.375 \div 3 = 172.5 \div 3 = 57.5\%$

Phase 2 (figure 8) $84 + 86 + 89 \div 3 = 259 \div 3 = 86.33\%$

Phase 3(a) (figure 10) $96.6 + 88.3 + 90 \div 3 = 274.9 \div 3 = 91.63\%$

Phase 3(b)(figure 12) $88.3 + 93.3 + 95 \div 3 = 276.6 \div 3 = 92.2\%$

Phase 1 (57.5%) + phase 2 (86.33%) + phase 3(a) (91.63%) + phase 3(b) (92.2%) =
 $327.66 \div 4 = 81.915\%$

The mean of intervention phase for student 2 was 81.915% rounded to two decimal places 81.92%

Mean of baseline for student 2 was $15 + 10 + 22.5 \div 3 = 47.5 \div 3 = 15.833333333$ rounded to two decimal places was 15.83%.

Standard deviation of baseline for student 2

$0.6889+33.9889+44.4889= 79.1667\div 2= 39.58335$, rounded to two decimal places was 39.58%

The SMD for student 2 was $81.92-15.83\div 39.58= 66.09\div 39.58= 1.66697827$, rounded to two decimal places was 1.67.%

According to Cohen (1988) a SMD of 0.8 and above indicate a large improvement in treatment effect. It therefore follows that both student 1 (1.04) and student 2 (1.67) improved immensely in the ability to initiate communication by use of pictures.

Percentage of Non-Overlapping Data(PND)

The procedure for finding the PND involved identifying the highest baseline point, counting the number of intervention points that exceed the highest baseline point(non-overlapping) then calculating the proportion of non-overlapping to the total number of intervention points using the formula,

$$PND = \frac{\text{No of intervention data exceeding the highest baseline data point} \times 100}{\text{Total No of data points in the intervention phase}}$$

The percentage of non-overlapping data for the ability of student 1 to initiate communication was thus calculated as below ;

Highest baseline point 30%, No of intervention points that exceeded highest baseline point(non-overlapping) was 12 and total number of intervention points were 12.

$PND = 12/12 \times 100 = 100\%$ which was the same for student 2, $12/12 \times 100 = 100\%$, this treatment results for student 1 and 2, according to Scruggs and Mastropieri,(2001), who offered general interpretational guidelines, indicated that PND above 70% was effective interventions.

4.3.2 Request for a desired item

The second objective of the study required that subjects are able to make request for a desired item using pictures. The indicator for making an independent request was to pick a picture, take it to communication partner without any prompt to receive the desired item. The data showed whether student 1 and student 2 were able(A) to make request for a desired item or was not able(NA) to. The score was counted as the number of times the subject was able to or not able to make request, out of the ten trials.

4.3.2.1 Baseline

The average for day 1 and day 2 was done to arrive to baseline data for requesting for a desired item. The data for the ability of the student 1 and student 2 to request for a desired item was presented as percentage as shown in Figures 13 and 14 respectively, to show the changes in percentage over the three sessions.

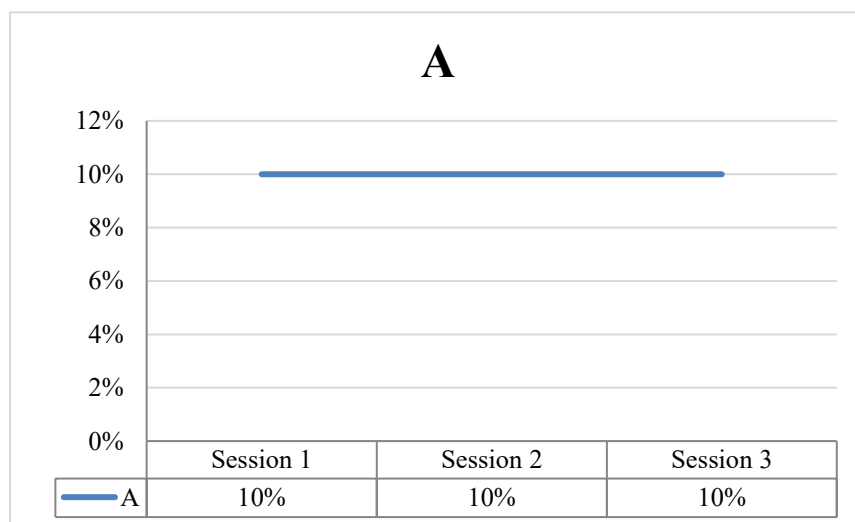


Figure 13: Ability of student 1 to request for a desired item during baseline in percentage. The figure shows that student 1 scored 10% in the first session, 10% in the second session and 10% in the third session.

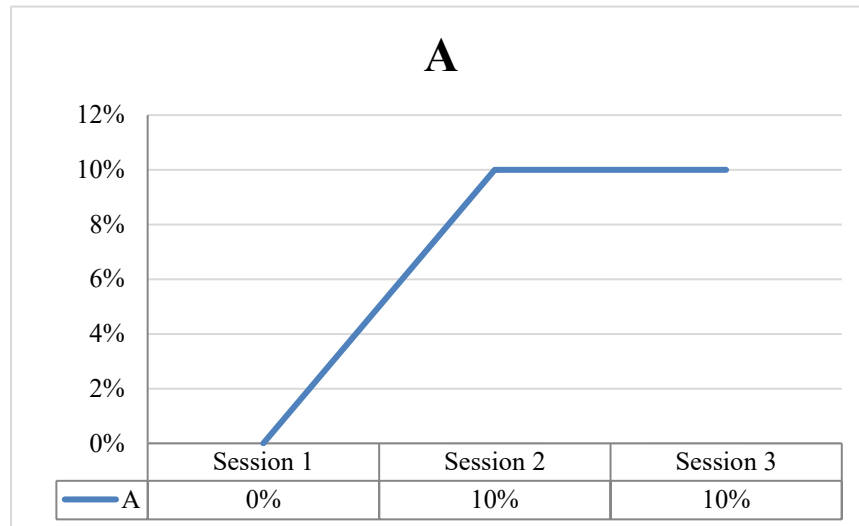


Figure 14: Ability of student 2 to request for a desired item during baseline in percentage. The figure shows that student 2 scored 0% in the first session, 10% in the second session and 10% in the third session

4.3.2.2 Treatment

To arrive to the data for treatment phase 1 on requesting for a desired item, an average for treatment days 1-8 was done, for treatment phase 2 an average of treatment days 9-13, for treatment phase 3(a) an average of treatment days 14-16 while for treatment phase 3(b) an average of treatment days 17-19 was done.

Treatment phase 1

The data for the ability of student 1 and student 2 to request for a desired item in treatment phase 1 was presented as an average of treatment days 1-8 and indicated as a percentage as shown in Figures 15 and 16 respectively, to show changes in percentage over the three sessions.

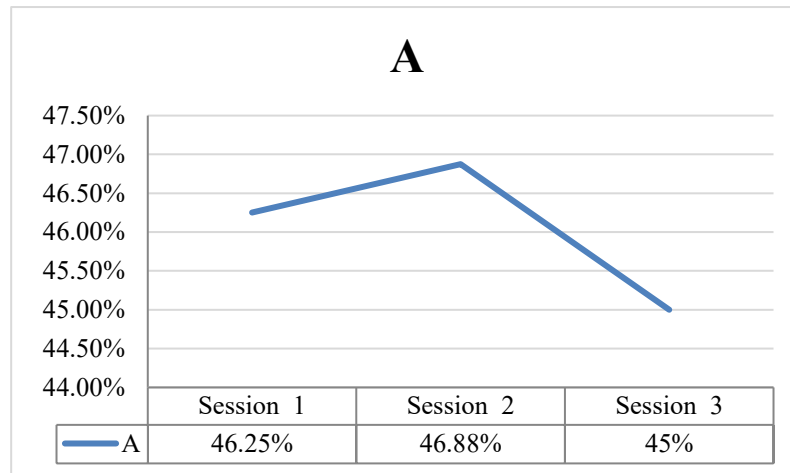


Figure 15: Ability of student 1 to request for a desired item during treatment phase 1 in percentage. The figure shows that student 1 scored 46.25% in the first session, 46.88% in the second session and 45% in the third session

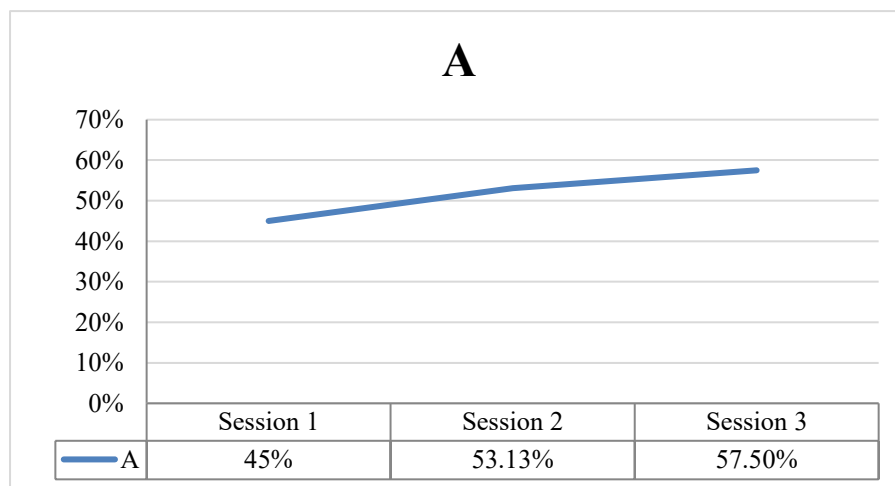


Figure 16: Ability of student 2 to request for a desired item during treatment phase 1 in percentage. The figure shows that student 2 scored 45% in the first session, 53.13% in the second session and 57.5% in the third session.

Treatment phase 2

The data for the ability of student 1 and student 2 to request for the desired item in treatment phase 2 was presented as an average of treatment days 9-13 shown as a percentages in Figures 17 and 18 respectively, to show the changes in percentages over the three sessions.

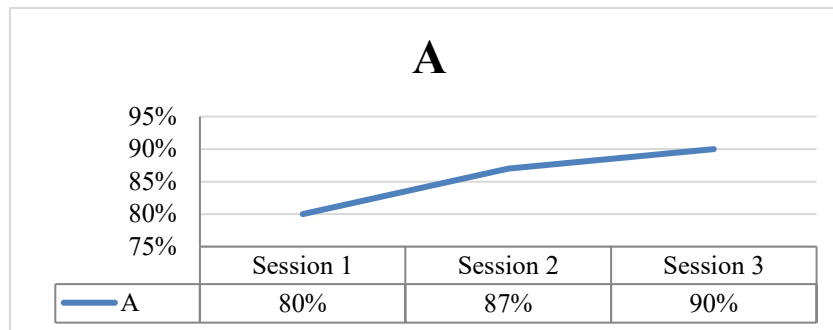


Figure 17: Ability of student 1 to request for a desired item during treatment phase 2 in percentage. The figure shows that student 1 scored 80% in the first session, 87% in the second session and 90% in the third session.

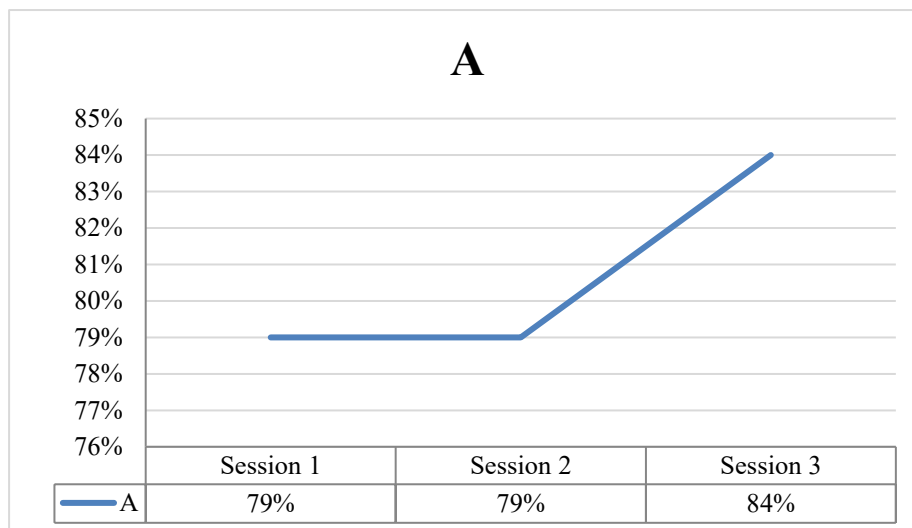


Figure 18: Ability of student 2 to request for a desired item during treatment phase 2 in percentage. The figure shows that student 2 scored 79% in the first session, 79% in the second session and 84% in the third session.

uTreatment phase 3(a)

The data for the ability of the student 1 and of student 2 to request for a desired item in treatment phase 3(a) was presented as an average of treatment days 14-16 shown as a percentage in Figures 19 and 20 respectively, to show the changes in percentages over the three sessions.

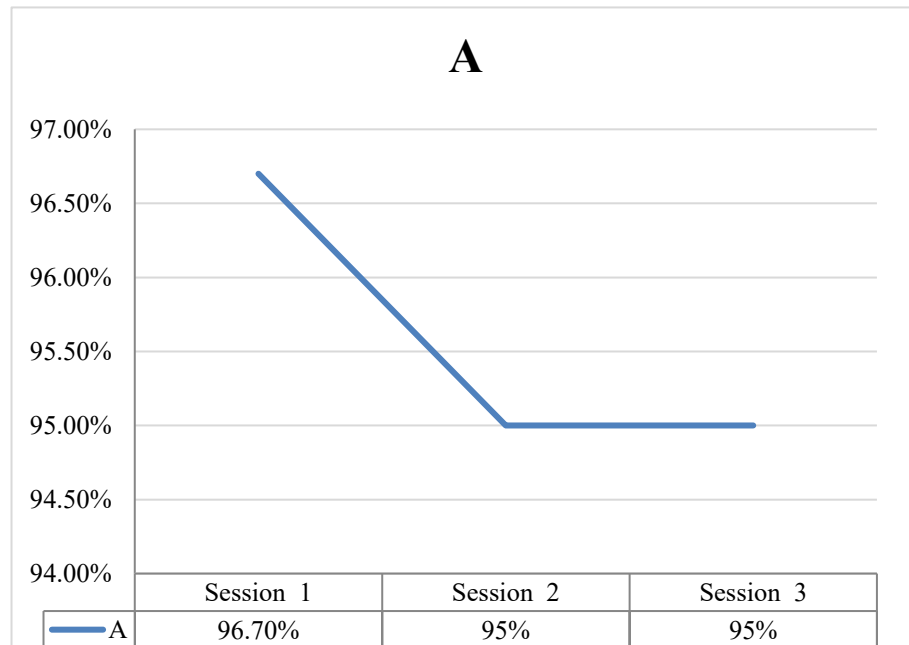


Figure 19: Ability of student 1 to request for a desired item during treatment phase 3(a) in percentage. The figure shows that student 1 scored 96.7% in the first session, 95% in the second session and 95% in the third session

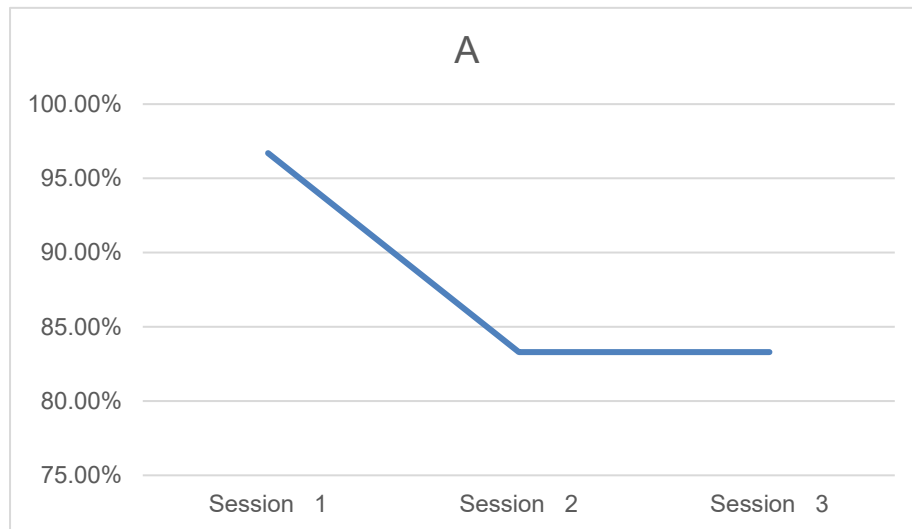


Figure 20: Ability of student 2 to request for a desired item during treatment phase 3(a) in percentage. The figure shows that student 2 scored 96.7% in the first session, 83.3% in the second session and 83.3% in the third session

Treatment phase 3(b)

The data for the ability of student 1 and student 2 to request for a desired item in treatment phase 3(b) was presented as an average of treatment days 17-19 as a percentage shown in Figure 21 and 22 respectively, to show the changes in percentages over the three sessions.

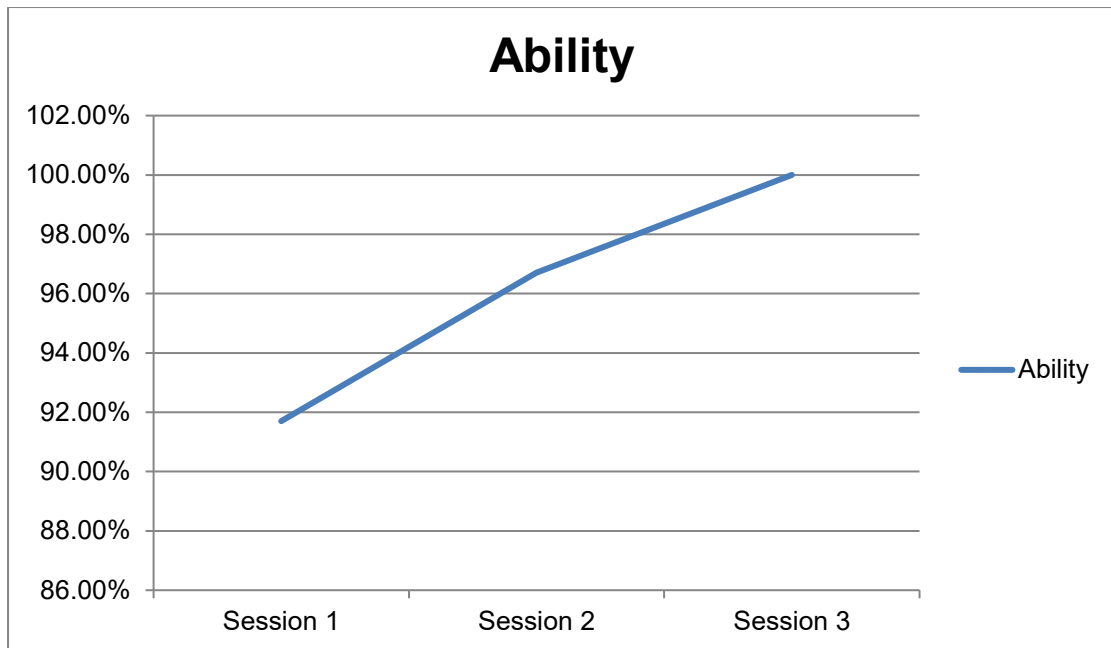


Figure 21: Ability of student 1 to request for a desired item during treatment phase 3(b) in percentage. The figure shows that student 1 scored 91.7% in the first session, 96.7% in the second session and 100% in the third session

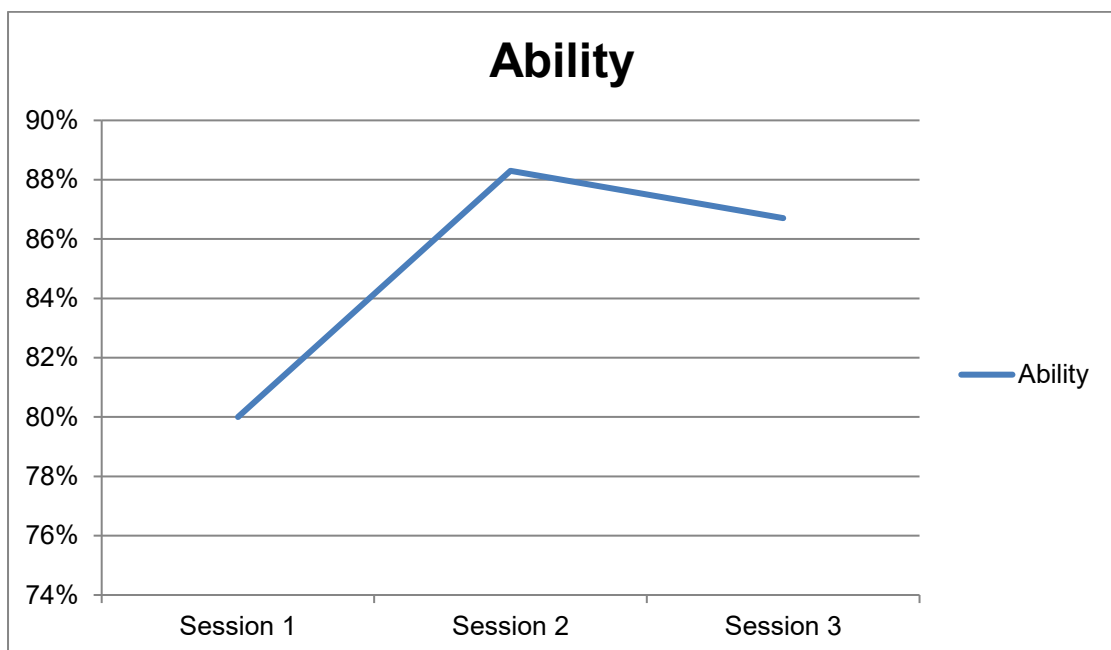


Figure 22: Ability of student 2 to request for a desired item during treatment phase 3(b) in percentage. . The figure shows that student 2 scored 80% in the first session, 88.3% in the second session and 86.7% in the third session

4.3.2.3 Findings

The findings for the ability of student 1 to request for a desired item during baseline was 10% in session 1, 10% in session 2 and 10% in session 3. While for student 2, it was 0% in session 1, 10% in session 2 and 10% in session 3.

In treatment phase 1, student 1 scored 46.25% in session 1, 46.875% in session 2 and 45% in session 3. while student 2 had 45% in session 1, 53.125% in session 2 and 57.5% in session 3.

In treatment phase 2, student 1 scored 80% in session 1, 87% in session 2 and 90% in session 3. While student 2 scored 79% in session 1, 79% in session 2 and 84% in session 3.

In treatment phase 3(a), student 1 had 96.7% in session 1, 95% in session 2 and 95% in session 3. While student 2 had 96.7% in session 1, 83.3% in session 2 and 83.3% in session 3.

In the treatment phase 3(b), student 1 scores were 91.7% in session 1, 96.7% in session 2 and 100% in session 3. While student 2 had 80% in session 1, 88.3% in session 2 and 86.7% in session 3.

The findings show that there was a positive change from baseline to the treatment phases. During the baseline the scores ranged between 0% and 10%,

Whereas in the treatment phase 1, it ranged between 45% and 57.5%, in the treatment phase 2, it ranged between 79% and 90%. In the treatment phase 3(a), the score ranged between 83.3% and 96.7%. while in the treatment phase 3(b), the scores ranged between 80% and 100%. These were for both student 1 and 2. These results

indicate a very clear increase in performance from baseline through to treatment phase 3(b).

Inter Observer Agreements

Student 1

The inter observer agreements for student 1 in the ability to request for a desired item was thus worked out as; total agreements= 3, total disagreements= 18 hence, $3 \div 3 + 18 = 3 \div 21 \times 100 = 14.3\%$. the inter observer agreement for student one in the ability to request for a desired item was fourteen point three percent(14.3%).

Student 2

The inter observer agreement for student 2 in the ability to request for a desired item was arrived at by having the total agreements =1, total disagreement =20, total agreements + total disagreements (1+20), $1 \div 21 \times 100 = 4.8\%$.

The inter observer agreement for student 2 in the ability to request for a desired item was four point eight percent(4.8%).

Standard Mean Difference (SMD)

The SMD for objective 2, which showed the ability of student 1 and of student 2 to request for a desired item was worked on as below;

Mean of intervention phase worked out by adding means of phases 1 +phase 2 + phase 3(a) and 3(b) then divided by 4.

Student 1

Mean of treatment phase 1 from figure 15; $46.25 + 46.875 + 45 \div 3 = 138.125 \div 3 = 46.0416666$, rounded to 2 decimal places 46.04%.

Mean of treatment phase 2 from figure 17; $80 + 87 + 90 \div 3 = 257 \div 3 = 85.6666....$, rounded to 2 decimal places 85.67%

Mean of treatment phase 3(a) from figure 19; $96.7+95+95\div3=286.7\div3 = 95.5666\dots$ rounded to 2 decimal places 95.57%.

Mean of treatment phase 3(b) from figure 21; $91.7+96.7+100\div3 = 288.4\div3=96.1333\dots$ rounded to 2 decimal places 96.13%

Mean of intervention phase $46.4+85.67+95.57+96.13\div4=323.41\div4=80.8525$ rounded to 2 decimal places 80.85%

Mean of baseline from figure 13; $10+10+10\div3=30\div3=10\%$,

Standard deviation of baseline =0

SMD for Objective 2 student 1, $80.85-10\div0= 70.85$

Student 2

Mean of treatment phase 1 from figure 16; $45+53.125+57.5\div3=155.625\div3=51.875$, round to 2 decimal place 51.88%

Mean of treatment phase 2 from figure 18; $79+79+84\div3=242\div3=80.6666\dots$ round to 2 decimal places 80.67%

Mean of treatment phase 3(a) from figure 20; $96.7+83.3+83.3\div3=263.3\div3 = 87.7666\dots$ round to 2 decimal place 87.77%

Mean of treatment phase 3(b) from figure 22; $80+88.3+86.7\div3=255\div3=85\%$

Mean of intervention phase $51.88+80.67+87.77+85\div4=305.32\div4=76.33\%$

Mean of Baseline from figure 14; $0+10+10\div3=20\div3=6.6666\dots$ round to 2 decimal place 6.67%

Standard deviation for baseline $44.4889+11.0889+11.0889=66.667\div2=33.3335$ round to 2 decimal places 33.33%

SMD for objective 2, student 2, $76.33-6.67\div33.33= 2.090009\dots$ round to 2 decimal place 2.09

Percentage of non-overlapping data (PND)

In the second objective of requesting for a desired item, the highest baseline point for student 1 was 10% and same to the student 2, the number of intervention points that exceeded highest baseline data point were 12 for student 1 and 12 for student 2. Total number of intervention points 12, thus $12/12 \times 100 = 100\%$. This was same for student 2.

Where the PND was 100% for both student 1 and for student 2. According to Scruggs and Mastropieri (2001), this was a highly effective treatment.

4.3.3 Spontaneous Speech

The third objective of the study required that subjects make spontaneous speech using the picture cards. The indicator for spontaneous speech was the ability to communicate any message of a need using the picture cards but without any support. The data showed whether student 1 and student 2 were able (A) or not able (NA) to make any spontaneous speech using pictures. The score was counted in terms of the number of times the subjects were able or not able to make spontaneous speech using pictures, without any assistance, out of the ten trials.

4.3.3.1 Baseline

The average for day 1 and day 2 data was done to arrive to baseline data for spontaneous speech. The ability of student 1 and student 2 to make any spontaneous speech was showing there was no change over the three sessions, it remained at 0 all through as indicated in figure 23. This was because it was the baseline and the subjects had no idea of PECS before, so they were meant to learn and hence the baseline; besides they were also coping with new researcher who they had not interacted with before.

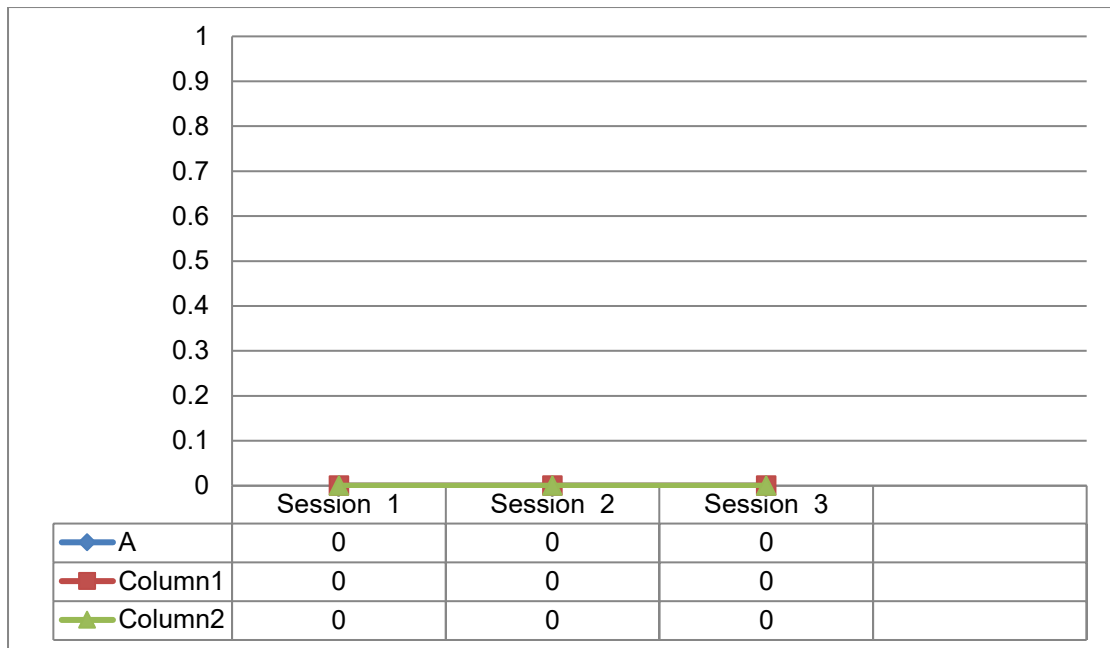


Figure 23: Ability of student 1 and 2 to make spontaneous speech during baseline in percentage

4.3.3.2 Treatment

To arrive to scores for treatment phase 1 on ability to make spontaneous speech using pictures, the average data for days 1-8 was done, to arrive to scores for treatment phase 2 the average for days 9-13 was done, to get scores for treatment phase 3(a) the average for days 14-16 was done while for treatment phase 3(b) the average for days 17-19 was done.

Treatment phase 1

The data for treatment phase 1, on the ability of student 1 and student 2 to make spontaneous speech using pictures was presented as an average of treatment days 1-8 as a percentage as shown in Figures 24 and 25 which includes line graphs. In both students there was no change in percentage over the three sessions.

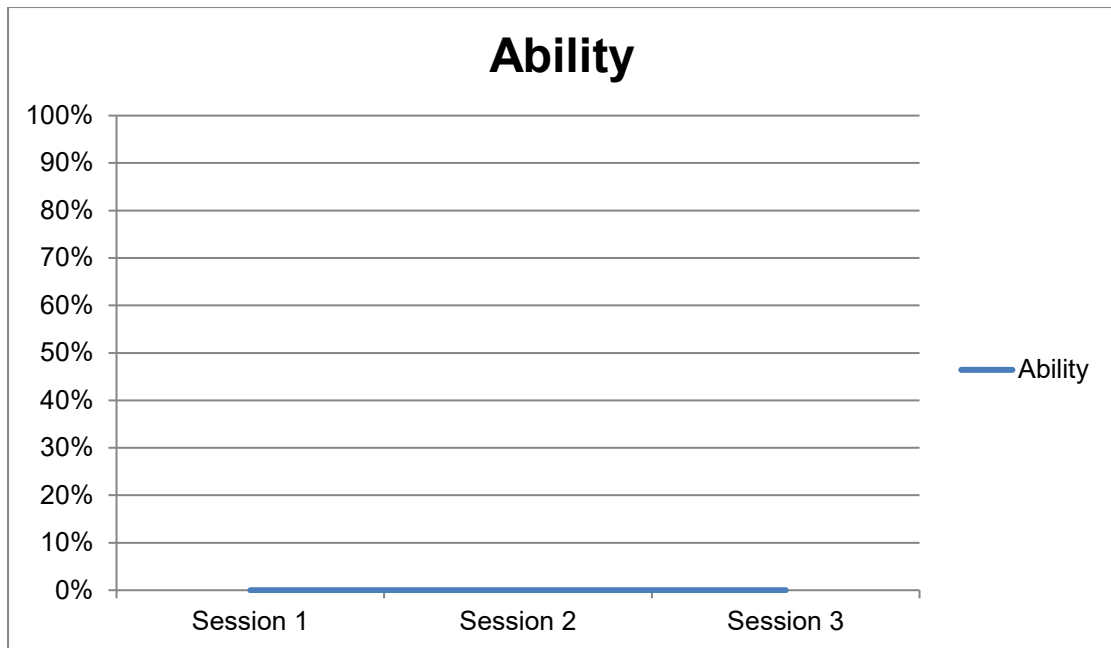


Figure 24: Ability of student 1 to make spontaneous speech during treatment phase 1 in percentage. . The figure shows that student 1 scored 0% in the first session, 0% in the second session and 0% in the third session

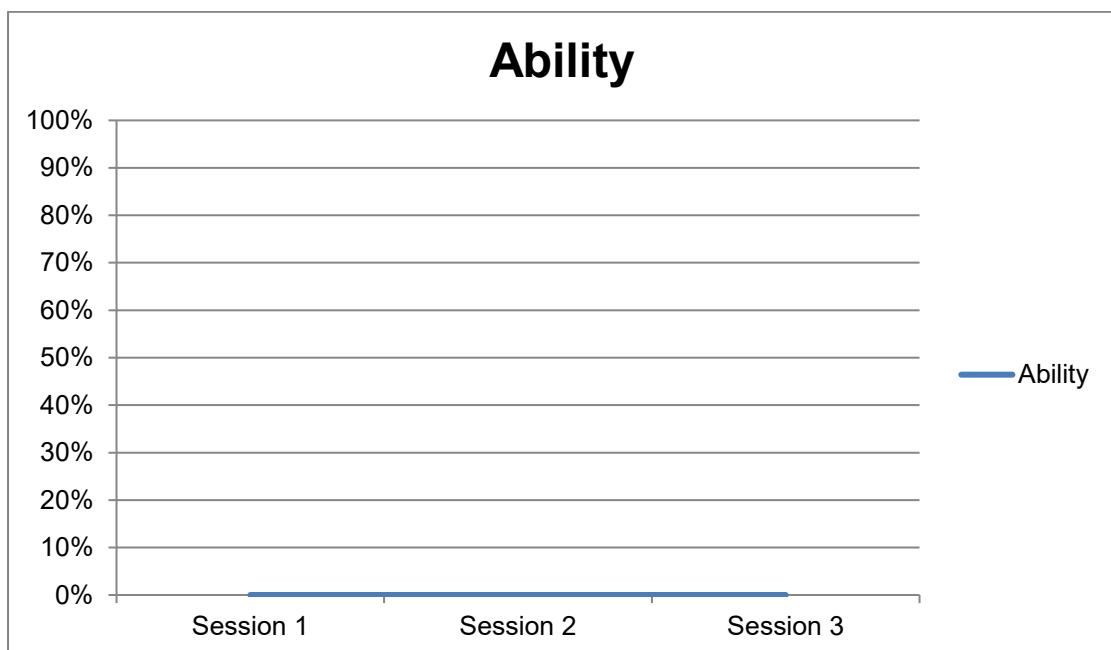


Figure 25: Ability of student 2 to make spontaneous speech using pictures during treatment phase 1 in percentage. . The figure shows that student 2 scored 0% in the first session, 0% in the second session and 0% in the third session

Treatment phase 2

The data for treatment phase 2, on the ability of student 1 and student 2 to make spontaneous speech using pictures was presented as an average of treatment days 9-13 as percentage as shown in Figures 26 and 27 including a line graph showing the changes in percentages over the three sessions.

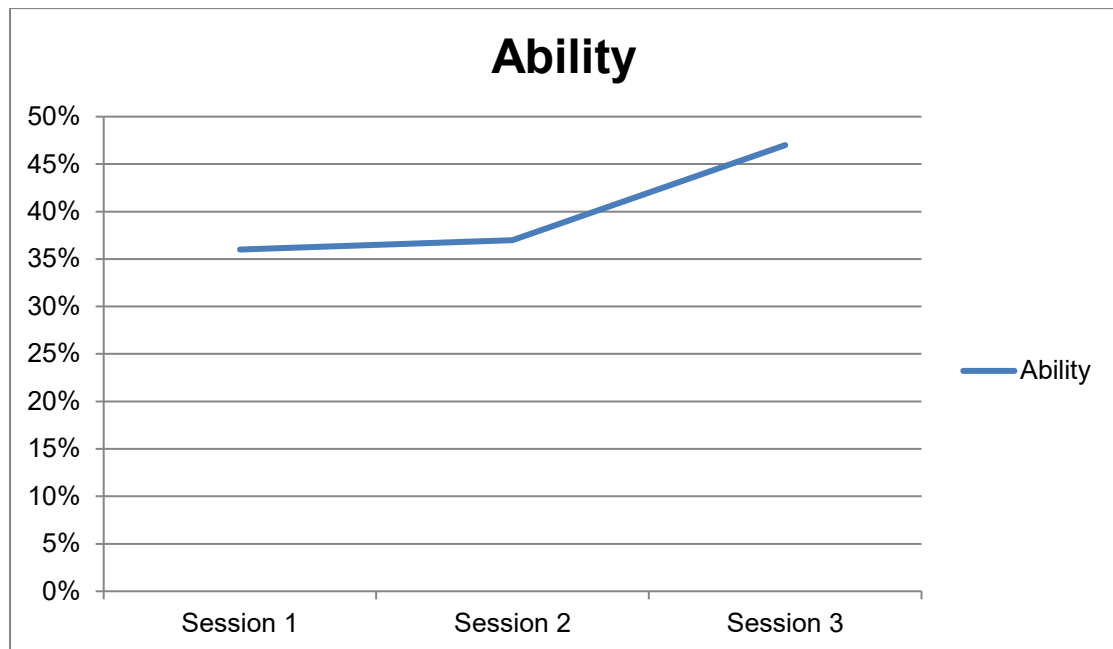


Figure 26: Ability of student 1 to make spontaneous speech using pictures during treatment phase 2 in percentage. . The figure shows that student 1 scored 36% in the first session, 37% in the second session and 47% in the third session

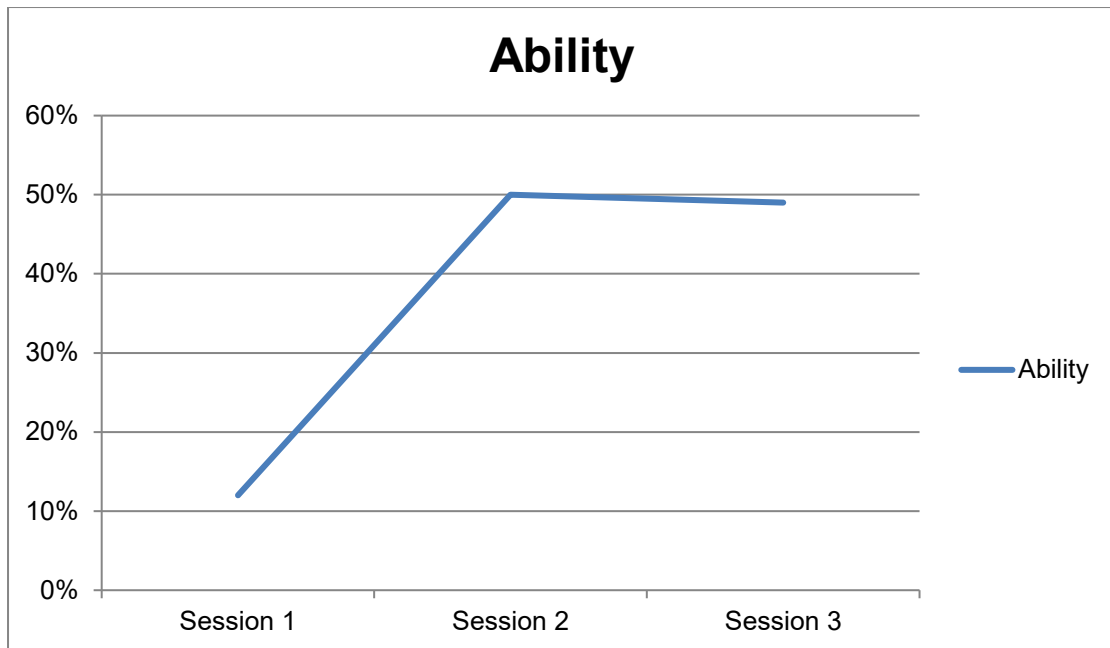


Figure 27: Ability of student 2 to make spontaneous speech using pictures during treatment phase 2 in percentage. . The figure shows that student 2 scored 12 % in the first session, 50% in the second session and 49% in the third session.

Treatment Phase 3(a)

The data for the ability of student 1 and of student 2 to make spontaneous speech using pictures in treatment phase 3(a) was presented as an average of treatment days 14-16 as a percentage as shown in Figures 27 and 28 respectively. They show the changes in percentages over the three sessions

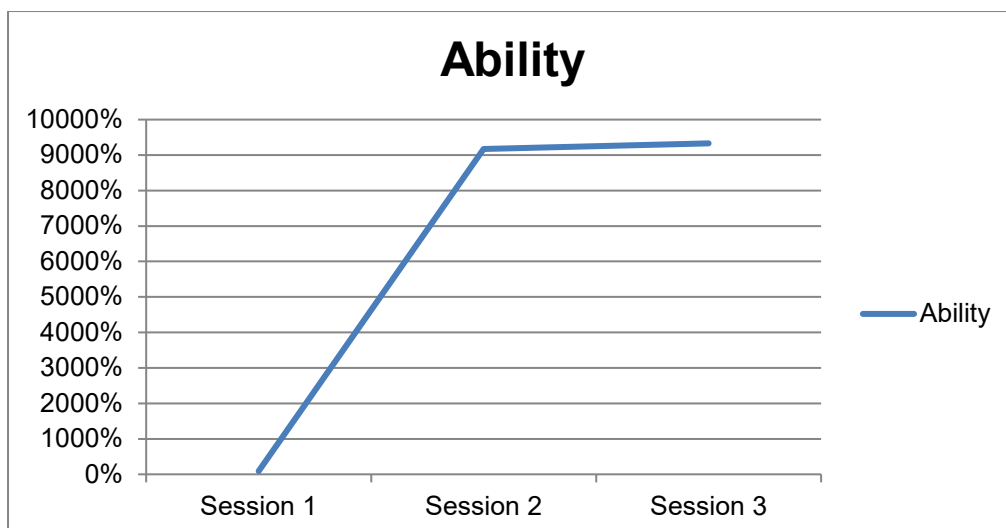


Figure 28: Ability of student 1 to make spontaneous speech using pictures during treatment phase 3(a) in percentage. . The figure shows that student 1 scored 90 % in the first session, 91.7% in the second session and 93.3% in the third session

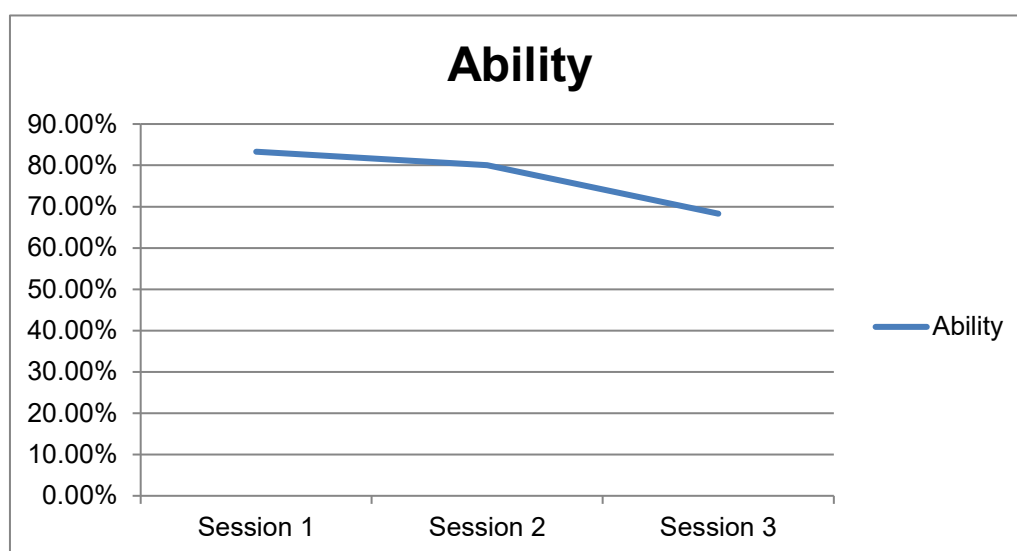


Figure 29: Ability of student 2 to make spontaneous speech using pictures during treatment phase 3(a) in percentage. The figure shows that student 2 scored 83.3 % in the first session, 80% in the second session and 68.3% in the third session

Treatment phase 3(b)

The data for the ability of student 1 and student 2 to make spontaneous speech using pictures in treatment phase 3(b) was presented as an average of treatment days 17-19

as a percentage as shown in Figures 30 and 31 respectively, to show the changes in percentages over the three sessions.

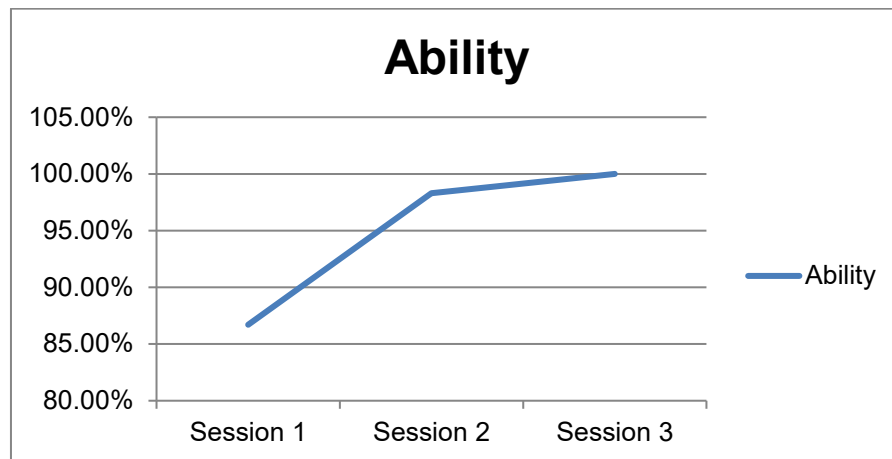


Figure 30: Ability of student 1 to make spontaneous speech using pictures during treatment phase 3(b) in percentage. The figure shows that student 1 scored 86.7 % in the first session, 98.3% in the second session and 100% in the third session.

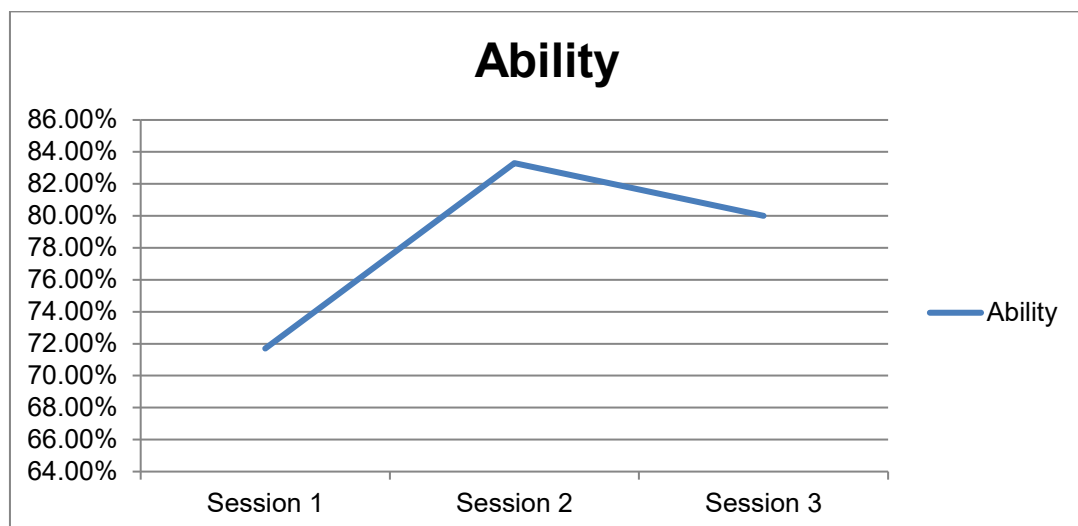


Figure 31: Ability of student 2 to make spontaneous speech using pictures during treatment phase 3(b) in percentage. The figure shows the scores of the first session as 71.7%, second session as 83.3% and the third session as 80%.

4.3.3.3 Findings

The findings for the ability of student 1 to make spontaneous speech using pictures during baseline was 0% in session 1, 0% in session 2 and 0% in session 3. While for student 2, it was 0% in session 1, 0% in session 2 and 0% in session 3.

In the treatment phase 1, student 1 scored 0% in session 1, 0% in session 2, and 0 % in session 3. While student 2 scored 0% in session 1, 0% in session 2 and 0% in session 3.

In the treatment phase 2, student 1 scored 36% in session 1, 46% in session 2 and 47% in session 3. While student 2 scored 12% in session 1, 31% in session 2 and 43% in session 3.

In treatment phase 3(a), student 1 had 90% in session 1, 91.7% in session 2 and 95% in session 3. While student 2 had 83.3% in session 1, 80% in session 2 and 68.3% in session 3.

In treatment phase 3(b), student 1 had 93.3% in session 1, 98.3% in session 2 and 100% in session 3. While student 2, had 71.7% in session 1, 83.3% in session 2 and 80% in session 3.

The findings show that there was a positive change from baseline to the treatment phases. During the baseline the scores were at 0% in all sessions.

While in the treatment phase 1, the scores were still at 0% in all sessions, in the treatment phase 2, it ranged between 12% and 47%. In the treatment phase 3(a), the score ranged between 68.3% and 95%, while in the treatment phase 3(b), the scores ranged between 71.7% and 100%. These were for both student 1 and student 2. These

results indicated a very clear increase in performance from baseline through to treatment phase 3(b).

Inter Observer Agreement

Student 1

The inter observer agreements for student 1 in the ability to make spontaneous speech was thus worked out as; total agreements= 15, total disagreements= 6 hence, $15 \div 15 + 6 = 15 \div 21 \times 100 = 71.4\%$. the inter observer agreement for student one in the ability to make spontaneous speech was seventy one point four percent(71.4%).

Student 2

The inter observer agreement for student 2 in the ability to make spontaneous speech was arrived at by having the total agreements =11, total disagreement =10, total agreements + total disagreements (11+10), $11 \div 21 \times 100 = 52.4\%$.

The inter observer agreement for student 2 in the ability to make spontaneous speech was fifty two point four percent(52.4%).

Standard Mean Difference(SMD)

Student 1

Mean of treatment phase 1 from Figure 21; $0 + 0 + 0 \div 3 = 0\%$

Mean of treatment phase 2 from Figure 23; $36 + 46 + 47 \div 3 = 129 \div 3 = 43\%$

Mean of treatment phase 3(a) from Figure 25; $90 + 91.7 + 95 \div 3 = 276.7 \div 3 = 92.23\%$

Mean of treatment phase 3(b) from Figure 27; $93.3 + 98.3 + 100 \div 3 = 291.6 \div 3 = 97.2\%$

Mean of intervention phase , $0 + 43 + 92.23 + 97.2 \div 4 = 232.43 \div 4 = 58.11\%$

Mean of baseline was 0%

Standard deviation for baseline was thus 0%.

It followed that the SMD for student 1 in spontaneous speech was $58.11-0\div0=58.11\%$

Student 2

Mean of treatment phase 1 from Figure 22; $0+0+0\div3=0$

Mean of treatment phase 2 from Figure 24; $12+31+43\div3=86\div3=28.67\%$

Mean of treatment phase 3(a) from Figure 26; $83.3+80+68.3\div3=231.6\div3=77.2\%$

Mean of treatment phase 3(b) from Figure 28; $71.7+83.3+80\div3=235\div3=78.33\%$

Mean of intervention phase $0+28.67+77.2+78.33\div4=184.2\div4=46.05\%$

Mean of baseline is 0, standard deviation for baseline was 0%.

So then, the SMD for student 2 in Spontaneous speech was $46.05-0\div0=46.05\%$

Percentage of non-overlapping data(PND)

The percentage of non overlapping data for the ability of the student 1 to make spontaneous speech was;

- highest baseline point =0,
- number of intervention points exceeding the highest baseline point =9,
- total number of intervention points= 12.
- PND was $9/12\times100=75\%$, this was also same as for student 2.

Scruggs and Mastropieri (2001), described results like this(70%-89) in their study as a clear and effective treatment. The outcome of this study indeed proved the same.

4.4 Discussion of the Findings

The section on discussion of the findings elaborates on the findings along the study objectives: initiating communication, request for a desired item and spontaneous speech. It also proceeds to clarify some aspects of methods, Kenya setting and replication.

The findings of the study indicated that PECS can indeed be useful to non-verbal learners who are living with Autism and possibly other developmental disorders. Looking at the variables, it was very clear that PECS training phases 1-3(b) which was the independent variable, impacted on the dependent variables of initiating communication, requesting for a desired item and spontaneous speech, since the scores kept going up as the treatment progressed.

4.4.1 Initiating communication

In the first objective, initiating communication, the data indicated that there was an improvement from a range of 10%-30% during baseline to a range of 47.5% -100% during the treatment phases. This indicated an improvement on the students ability to initiate communication by use of photo cards.

The Inter Observer agreement for initiating communication for student 1 was 9.5% and student 2 was 4.8%, even though Foster, et al (1988), had postulated that the most common method of assessing the reliability and validity of observational data is via Inter Observer Agreement, this did not quite appear visible in the study, as the inter observer agreements were incoherent. This may have been as a result of variations in the way the raters recorded their independent observations, possibly due to the short period that was used in the training of the raters who were also doubled as the communication partners in the experiment.

The Standard Mean Difference according to the data was 1.04 for student 1 and 1.67 for student 2, which according to Cohen (1988) was a large improvement. Whereas the Percentage of Non-Overlapping data was 100% for both student 1 and student 2. This indicated that it was very effective treatment as it was postulated by Scruggs and Mastropieri(2001), that scores above 90% was described as very effective.

4.4.2 Requesting for a desired item

In the second objective, requesting for a desired item, there was an improvement too from the range of 0 - 10% during baseline to a range of 45%-100% during the treatment phases. The inter-observer agreement for student 1 was 14.3% while for student 2 it was 4.8%.

The Standard Mean Difference for student 1 was 70.85% while for the student 2 it was 2.09%. The Percentage of Non-overlapping Data stood at 100% for both students.

4.4.3 Spontaneous speech

In the third and last objective, Spontaneous Speech, the baseline was 0% in all the sessions while the treatment phases ranged from 0-100%. The inter observer agreement was 71.4% for student 1 and 52.4% for student 2. The Standard Mean Difference was 58.11% for student 1 and 46.05% for student 2.

The Percentage of Non Overlapping Data was 75% for student 1 and also 75% for student 2.

From these findings, the impact of PECS training on spontaneous speech was realized at the 10th treatment day for student 1 and 11th day for student 2, this agreed with research by Chiang and Carter (2008) and Koegell (2000), who reported that spontaneity was often problematic in individuals with autism, which concurred quite well with the research findings. Further, this findings were quite close for both students.

The findings for Percentage of Non Overlapping Data for both students 1 and 2 in the three study objectives were above 75%, showing that the study was effective as was posited by Scruggs and Mastropieri(2001). Earlier researchers, Kazdin,1978 and

1982; Tawney and Gast, 1984 had also agreed that PND is a primary consideration in evaluating single participant research.

Generally, as regards the IOA, there were poor results across all the three objectives and this could be due to the variations among the raters as they did not get enough time for training on their roles but also due to doubling up as the communication partner. Furthermore, Lopetegui, et al (2013) had posited that, “reporting of inter-observer agreement is often incomplete and inadequate as there is rarely a perfect agreement”. Achieving perfect inter-observer agreements in a single-subject changing criterion study is extremely rare and can be challenging due to various factors such as subjectivity, complexity of behaviors, and differences in observer interpretation, there are inherent variability in human perception and interpretation. Even with extensive training and standardized procedures, there may still be differences in how observers perceive and categorize behaviors.

The findings, indicated that the study subjects were able to communicate by the use of pictures to express themselves by initiating communication, requesting for a desired item and though they used the picture cards to spontaneously communicate, their feelings, wants and desires to their teachers, mothers and significant others, spontaneous communication was rather a challenge to attain.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings, conclusions and recommendations of the study. The study was based on three objectives, 1) Probe extent to which PECS contribute to a child's ability to initiate communication. 2) Investigate the extent to which PECS contribute to a child's ability to request for a desired item and, 3) Find out the extent to which PECS contribute to spontaneity in communication using picture cards.

5.2 Summary

The study findings indicated that there was a significant change in the subjects as the independent variables (PECS phases 1-3(b)) impacted on the dependent variables of initiating communication, requesting for a desired item and spontaneous speech.

This was evident in the improvement in scores of ability, which kept rising phase after phase and students' ability to use picture cards to convey their feelings, wants and desires.

The study began with the baseline phase, which basically indicated that the subjects did not have a functional method of communication as the scores were at zero levels, in regard to the ability to initiate communication, request for a desired item and produce spontaneous speech. This was then followed by intervention phase, here student 1 and student 2 were trained to use photo to initiate communication, request for a desired item and ultimately develop spontaneous speech. The data was collected based on these three dependent variables, looking at the frequency, the accuracy of communication attempts and the level of independence in the use of PECS. The

outcome of the study showed improvement mainly in the ability to initiate communication and request for a desired item; however the third dependent variable was not well attained as it appeared to be a difficult level to achieve given the time limitation, but also various studies have indicated the difficulty in attaining that level among such participants.

5.3 Conclusions

This research study indeed proved that the use of PECS can be an alternative and in some instances augmentative to speech. Both student 1 and student 2 were able to use pictures to communicate their feelings and wants. There were a lot of improvement between the baseline and through the treatment phases. It was also evident that whereas they could achieve the ability to initiate communication and request for a desired item fairly fast, it took longer and yet did not achieve spontaneity. This indicates that future experiments in the use of PECS may require more time to enhance spontaneity and perfect the use of icons to communicate.

5.4 Recommendations

As a result of the findings of this study, the researcher made the following recommendations:- The use of PECS will not only promote communication but also raise their curiosity to learn as most of these learners are highly visual, hence a lot of visual supports will be required. Teachers of learners with ASD and other developmental disorders in Kenya, should be trained on how to use PECS, so that they may use it to train communication for these category of learners. This may be a call to the Ministry of Education(MOE) and other state Agencies like Kenya Institute for Curriculum Development(KICD) to adopt PECS as one of the media of communication for this population. Starting a centre for Augmentative and Alternative communication in Kenya is highly recommended, this will give an

opportunity for various people who need AAC like PECS to be trained and hence make them enjoy their social life through interaction and communication. Further research to ensure all the six stages of PECS are covered and that teachers and parents master how to use it, in an expanded study that may cover several schools in one or two counties of Kenya. In this case the research assistants (prompters', raters, video recorders, parents and teachers) would all go through a thorough training to understand fully their roles in the study. Clearer operational definitions of behaviors will be done and an ongoing monitoring and feedback mechanisms. Future studies should include video recording, pictures taken, communication partners who will be different from the raters and adequate training done for all participants to understand their roles well. Also use of other non-toy items such as food items, which may not be necessarily in the room but away, for the subject to reach out to them. It may also be prudent for future research to examine the effects of PECS training on secondary outcomes such as verbal expression, challenging behavior and academics. Funding of research projects by NACOSTI and other organizations, government and non-government should also be promoted as this will make research more intensive and the findings more authentic, valid and reliable.

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APPENDICES

Appendix 1- Raw data

Table 1: Baseline raw data for student 1 day 1

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	2	8	1	9	0	10
Session 2	1.5	8.5	0.5	9.5	0	10
Session 3	1	9	1	9	0	10

Table 2: Baseline raw data for student 2 day 1

	Initiate communication		Request for a desired item		Spontaneous speech	
	A	NA	A	NA	A	NA
Session 1	1	9	0	10	0	10
Session 2	1	9	0.5	9.5	0	10
Session 3	1.5	8.5	1	9	0	10

Table 3: Baseline raw data for student 1 day 2

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	4	6	1	9	0	10
Session 2	2.5	7.5	1.5	8.5	0	10
Session 3	2	8	1	9	0	10

Table 4: Baseline raw data for Student 2 day 2

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	2	8	0	10	0	10
Session 2	1	9	1.5	8.5	0	10
Session 3	3	7	1	9	0	10

Table 5 Treatment Phase 1, raw data for Student 1 day 1

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	2	8	1.5	8.5	0	10
Session 2	2	8	0.5	9.5	0	10
Session 3	0.5	9.5	0.5	9.5	0	10

Table 6 Treatment Phase 1, raw data for Student 2 day 1

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	2	8	1	9	0	10
Session 2	2.5	7.5	1.5	8.5	0	10
Session 3	3	7	1.5	8.5	0	10

Table 7 Treatment Phase 1, raw data for Student 1 day 2

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	0.5	9.5	0.5	9.5	0	10
Session 2	0	10	0	10	0	10
Session 3	0.5	9.5	0	10	0	10

Table 8 Treatment Phase 1, raw data for Student 2 day 2

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	3.5	6.5	2	8	0	10
Session 2	5	5	0	10	0	10
Session 3	3	7	1.5	8.5	0	10

Table 9 Treatment Phase 1, raw data for Student 1 day 3

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	1	9	0	10	0	10
Session 2	1.5	8.5	1	9	0	10
Session 3	1	9	1	9	0	10

Table 10 Treatment Phase 1, raw data for Student 2 day 3

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	4.5	5.5	3.5	6.5	0	10
Session 2	3	7	4	6	0	10
Session 3	3.5	6.5	3.5	6.5	0	10

Table 11 Treatment Phase 1, raw data for Student 1 day 4

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	4.5	5.5	3	7	0	10
Session 2	3.5	6.5	2.5	7.5	0	10
Session 3	5	5	2	8	0	10

Table 12 Treatment Phase 1, raw data for Student 2 day 4

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	5.5	4.5	2.5	7.5	0	10
Session 2	5.5	4.5	6.5	3.5	0	10
Session 3	4	6	7	3	0	10

Table 13 Treatment Phase 1, raw data for Student 1 day 5

	Initiating communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	5	5	7	3	0	10
Session 2	6.5	3.5	8.5	1.5	0	10
Session 3	8.5	1.5	8	2	0	10

Table 14 Treatment Phase 1, raw data for Student 2 day 5

	Initiating communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	7.5	2.5	8	2	0	10
Session 2	7.5	2.5	8	2	0	10
Session 3	8.5	1.5	8.5	1.5	0	10

Table 15 Treatment Phase 1, raw data for Student 1 day 6

	Initiating communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	8	2	7.5	2.5	0	10
Session 2	7	3	7.5	2.5	0	10
Session 3	8	2	7	3	0	10

Table 16 Treatment Phase 1, raw data for Student 2 day 6

	Initiating communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	7.5	2.5	7	3	0	10
Session 2	8	2	9	1	0	10
Session 3	9	1	8	2	0	10

Table 17 Treatment Phase 1, raw data for Student 1 day 7

	Initiating communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	7.5	2.5	8	2	0	10
Session 2	10	0	10	0	0	10
Session 3	9.5	0.5	9.5	0.5	0	10

Table 18 Treatment Phase 1, raw data for Student 2 day 7

	Initiating communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	7.5	2.5	5	5	0	10
Session 2	8.5	1.5	7.5	2.5	0	10
Session 3	8	2	7	3	0	10

Table 19 Treatment Phase 1, raw data for Student 1 day 8

	Initiating communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	9.5	0.5	9.5	0.5	0	10
Session 2	9	1	7.5	2.5	0	10
Session 3	9	1	8	2	0	10

Table 20 Treatment Phase 1, raw data for Student 2 day 8

	Initiating communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	8	2	7	3	0	10
Session 2	7.5	2.5	6	4	0	10
Session 3	8.5	1.5	9	1	0	10

Table 21 Treatment Phase 2, raw data for Student 1 day 9

	Initiating communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	6	4	6.5	3.5	0	10
Session 2	7.5	2.5	7.5	2.5	0	10
Session 3	7	3	9	1	0	10

Table 22 Treatment Phase 2, raw data for Student 2 day 9

	Initiating communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	8	2	8.5	1.5	0	10
Session 2	8.5	1.5	8.5	1.5	0	10
Session 3	9	1	7.5	2.5	0	10

Table 23 Treatment Phase 2, raw data for Student 1 day 10

	Initiating communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	6.5	3.5	6	4	1	9
Session 2	7.5	2.5	7.5	2.5	5	5
Session 3	7.5	2.5	7	3	5	5

Table 24 Treatment Phase 2, raw data for Student 2 day 10

	Initiating communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	9	1	6.5	3.5	0	10
Session 2	8.5	1.5	7	3	0	10
Session 3	8.5	1.5	9	1	2	8

Table 25 Treatment Phase 2, raw data for Student 1 day 11

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	8.5	1.5	8.5	1.5	3.5	6.5
Session 2	8	2	8.5	1.5	3.5	6.5
Session 3	9.5	0.5	9.5	0.5	4.5	5.5

Table 26 Treatment Phase 2, raw data for Student 2 day 11

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	8.5	1.5	7.5	2.5	2	8
Session 2	8.5	1.5	7	3	3.5	6.5
Session 3	8.5	1.5	8	2	6.5	3.5

Table 27 Treatment Phase 2, raw data for Student 1 day 12

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	9	1	9	1	3.5	6.5
Session 2	10	0	10	0	4.5	5.5
Session 3	9.5	0.5	9.5	0.5	4	6

Table 28 Treatment Phase 2, raw data for Student 2 day 12

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	8.5	1.5	9.5	0.5	2	8
Session 2	8.5	1.5	8.5	1.5	6.5	3.5
Session 3	9.5	0.5	9	1	9	1

Table 29 Treatment Phase 2, raw data for Student 1 day 13

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	9.5	0.5	10	0	10	0
Session 2	10	0	10	0	10	0
Session 3	10	0	10	0	10	0

Table 30 Treatment Phase 2, raw data for Student 2 day 13

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	8	2	7.5	2.5	2	8
Session 2	9	1	8.5	1.5	5.5	4.5
Session 3	9	1	8.5	1.5	7	3

Table 31 Treatment Phase 3(a), raw data for Student 1 day 14

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	9	1	9	1	7	3
Session 2	9	1	8.5	1.5	8.5	1.5
Session 3	9.5	0.5	8.5	1.5	8	2

Table 32 Treatment, Phase 3(a), raw data for Student 2 day 14

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	9.5	0.5	10	0	8.5	1.5
Session 2	8.5	1.5	9	1	8.5	1.5
Session 3	8.5	1.5	8.5	1.5	7	3

Table 33 Treatment Phase 3(a), raw data for Student 1 day 15

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	9.5	0.5	9.5	0.5	10	0
Session 2	10	0	10	0	9	1
Session 3	10	0	10	0	10	0

Table 34 Treatment Phase 3(a), raw data for Student 2 day 15

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	9.5	0.5	10	0	8	2
Session 2	9	1	8	2	7.5	2.5
Session 3	9	1	8	2	6	4

Table 35 Treatment Phase 3(a), raw data for Student 1 day 16

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	10	0	10	0	10	0
Session 2	10	0	10	0	10	0
Session 3	10	0	10	0	10	0

Table 36 Treatment Phase 3(a), raw data for Student 2 day 16

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	10	0	9	1	8.5	1.5
Session 2	9	1	8	2	8	2
Session 3	9.5	0.5	9	1	7.5	2.5

Table 37 Treatment Phase 3(b), raw data for Student 1 day 17

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	9	1	9	1	8	2
Session 2	10	0	9	1	9.5	0.5
Session 3	10	0	10	0	10	0

Table 38 Treatment Phase 3(b), raw data for Student 2 day 17

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	8	2	6.5	3.5	4	6
Session 2	9	1	9	1	9.5	0.5
Session 3	10	0	9.5	0.5	8.5	1.5

Table 39 Treatment Phase 3(b), raw data for Student 1 day 18

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	9	1	8.5	1.5	8	2
Session 2	10	0	10	0	10	0
Session 3	10	0	10	0	10	0

Table 40 Treatment Phase 3(b) raw data for Student 2 day 18

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	9.5	0.5	9	1	9	1
Session 2	9	1	8.5	1.5	6	4
Session 3	8.5	1.5	8	2	6.5	3.5

Table 41 Treatment Phase 3(b), raw data for Student 1 day 19

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	10	0	10	0	10	0
Session 2	10	0	10	0	10	0
Session 3	10	0	10	0	10	0

Table 42 Treatment Phase 3(b) raw data for Student 2 day 19

	Initiate communication		Request for a desired item		Spontaneous speech using pictures	
	A	NA	A	NA	A	NA
Session 1	9	1	8.5	1.5	8.5	1.5
Session 2	10	0	9	1	9.5	0.5
Session 3	10	0	8.5	1.5	9	1

Appendix 2: Reinforcer Assessment Form

REINFORCER ASSESSMENT FORM

Child's Name : Age..... Date.....

Completed By: Parent /Teacher

Instructions:

Please provide information regarding your Child's preferences in food items and toys.

Indicate the preferences in the spaces provided below in order of priority (i.e. 1-5 where 1- shall be the most preferred).

NB: The item you indicate should be readily available

1. What are your child's preferred food items?

i)

ii)

iii)

iv)

v)

2. What are your child's preferred toys/play items?

i)

ii)

iii)

iv)

v)

Maina Francis Gitau - Msc. Speech & Language Pathology

Appendix 3 Reinforcer Sampling Form

REINFORCER SAMPLING FORM

Child's Name : Age..... Date.....

Completed By:..... Researcher / Research Assistant

Indicate the most preferred food/ toy items in order of priority in space provided below:-

1. What are the Child's most preferred food items?

i)

ii)

iii)

iv)

v)

2. What are the child's most preferred toys / play items?

i)

ii)

iii)

iv)

v)

Appendix 4: Checklist for Number of times student initiated communication

NO. OF TIMES STUDENT INITIATE COMMUNICATION (*TICK AS APPROPRIATE*)

TRIALS	ABLE (A)	NOT ABLE (NA)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
TOTALS:		

COMMENTS:

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Maina Francis Gitau - Msc. Speech & Language Pathology
Student, Moi University, Eldoret – Kenya

Appendix 5: Checklist for number of independent requests made using pictures.

NO. OF INDEPENDENT REQUESTS (TICK AS APPROPRIATE)

TRIALS	ABLE (A)	NOT ABLE (NA)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
TOTALS:		

COMMENTS:.....

*Maina Francis Gitau - Msc. Speech & Language Pathology
 Student. Moi University. Eldoret – Kenya*

Appendix 6: Checklist for number of spontaneous speech made using pictures.

NO. OF SPONTANEOUS SPEECH MADE USING PICTURES
(TICK AS APPROPRIATE)

TRIALS	ABLE (A)	NOT ABLE (NA)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
TOTALS:		

COMMENTS:

.....

.....

.....

.....

.....

.....

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Maina Francis Gitau - Msc. Speech & Language Pathology
Student, Moi University, Eldoret – Kenya

Appendix 7: Photo cards



Appendix 8: Communication book

Appendix 9: NACOSTI Research Authorization Letter



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 3310571, 2219420
Fax: +254-20-318245, 318249
Email: dg@nacosti.go.ke
Website : www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No. **NACOSTI/P/19/84634/27665**

Date: **1st February, 2019**

Francis Gitau Maina
Moi University
P.O Box 3900-30100
ELDORET

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“Exploring the PECs approach to improving communication in children with autism spectrum disorders: Constraints and perspectives”* I am pleased to inform you that you have been authorized to undertake research in **Kiambu County** for the period ending **1st February, 2020**.

You are advised to report to **the County Commissioner and the County Director of Education, Kiambu County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Kiambu County.

The County Director of Education
Kiambu County.

Appendix 10: Research Authorization Letter from County Commissioner, Kiambu



OFFICE OF THE PRESIDENT

MINISTRY OF INTERIOR AND CO-ORDINATION OF NATIONAL GOVERNMENT
COUNTY COMMISSIONER, KIAMBU

Telephone: 066-2022709
Fax: 066-2022644
E-mail: countycommkiambu@yahoo.com
When replying please quote

P.O. Box 32-00900
KIAMBU

Ref. No: **ED.12 (A)/1/VOL II/97**

4th February, 2019

Francis Gitau Maina
Moi University
P.O. Box 39000- 30100
ELDORET

RE: RESEARCH AUTHORIZATION

Reference is made to National Commission for Science, Technology and Innovation letter Ref No. **NACOSTI/P/19/84634/276665** of **1st February, 2018**.

You have been authorized to conduct research on "*Exploring the PECs approach to improving ^{communication} community in children with autism spectrum disorder: Constrains and perspective*". The data collection will be carried out in **Kiambu County** for a period ending **1st February, 2020**.

You are requested to share your findings with the County Education Office upon completion of your research.

Festus Kimeu
For: County Commissioner
KIAMBU COUNTY

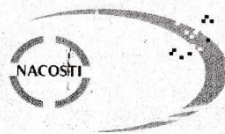
Cc National Commission for Science, Technology and Innovation
P.O. Box 30623-00100
NAIROBI

County Director of Education
KIAMBU COUNTY

All Deputy County Commissioner (For information and record purposes)
KIAMBU COUNTY

"Our Youth our Future. Join us for a Drug and Substance free County".

Appendix 11: Research Authorization Letter from County Director of Education, Kiambu



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 3310571, 2219420
Fax: +254-20-318245, 318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. **NACOSTI/P/19/84634/27665**

Date: **1st February, 2019**

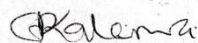
Francis Gitau Maina
Moi University
P.O Box 3900-30100
ELDORET

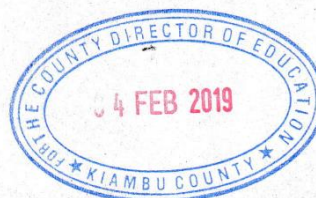
RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“Exploring the PECs approach to improving communication in children with autism spectrum disorders: Constraints and perspectives”* I am pleased to inform you that you have been authorized to undertake research in **Kiambu County** for the period ending **1st February, 2020**.

You are advised to report to **the County Commissioner and the County Director of Education, Kiambu County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.


GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO



Copy to:

The County Commissioner
Kiambu County.

The County Director of Education
Kiambu County.

Appendix 12: Sub-County Director of Education Thika West, Research Authorization

**MINISTRY OF EDUCATION
State Department of Early Learning & Basic Education**

Telephone (067) 31398 / 31272 (D.L)
FAX: (067) 31272
When Replying please quote



SUB COUNTY EDUCATION OFFICE
THIKA WEST
P.O. BOX 262,
THIKA

THK/ADM/259/VOL.I/48

5th February, 2019

The Headteacher
Mugumoini Primary school

RE: RESEARCH AUTHORIZATION – FRANCIS GITAU MAINA

Reference is made to the National Commission for Science, Technology and innovation letter Ref. No. NACOSTI/P/19/84634/27665 of 1st February 2019 and the County Commissioner, Kiambu letter Ref No. ED.12(A) 1/ VOL11/97 OF 4th February, 2019.

The person under reference has been authorized to conduct research on 'Exploring the PECs approach to improving communication with autism spectrum disorder: constraints and perspectives'.

Your school has been chosen for the exercise. You are requested to accord the officer the necessary support.

Thank you.

SHI
For Sub County
Director Of Education
P. O. Box 262
THIKA WEST

**SHIUNDU T.L
FOR: SUB-COUNTY DIRECTOR OF EDUCATION
THIKA WEST**

Appendix 13: Research Authorization Letter from Headteacher Mugumuini

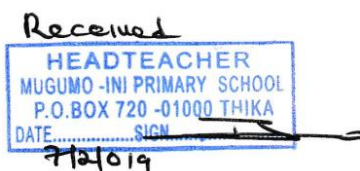
School



MOI UNIVERSITY

P.O. BOX 3900, ELDORET, KENYA

THE HEADTEACHER,
MUGUMOINI PRIMARY SCHOOL
THIKA



Dear Sir,

RE: REQUEST FOR PERMISSION TO CONDUCT A RESEARCH PROJECT

I am a Master's student at the department of Linguistics and Foreign Languages, Moi University. Additionally, I am CSO-SNE Kikuyu & Kabete, mainly doing Assessment work for children with special needs in education.

The aim of this study is to explore the Picture Exchange Communication System (PECS) approach to improving communication in children with Autism Spectrum Disorders.

I would like to conduct this research in the Special Unit for children with ASD in your school.

Two students, their two parents and two teachers will be involved in this experiment. The experiment shall be done for about 30 minutes thrice a day for two days per week in twelve weeks.

I promise to avoid disrupting the school program and to keep all information collected confidential using it only for the purpose of this study.

I will be glad to share the research findings with you and with parents in the areas that may be of interest and beneficial to your school.

If you have further questions, feel free to contact me through 0723490376.

Thank you.

Yours faithfully,

[Signature] 7/2/2019.

Maina, Francis Gitau

Msc. Speech and Language Pathology Student

Appendix 14: Research Authorization Letter from Moi University.



MOI UNIVERSITY
(ISO 9001:2015 CERTIFIED INSTITUTION)

SCHOOL OF ARTS & SOCIAL SCIENCES

Tel: (053) 43093
(053) 43620 Ext 2515
Fax: (053) 43047
E-mail: deanarts@mu.ac.ke

P.O Box 3900
ELDORET
KENYA

11th December, 2018

NACOSTI (National Commission for Science, Technology and Innovation),
P.O. Box 30623
Utalii Hse,
NAIROBI.

Dear Sir/Madam,

RE: MAINA, Francis Giteu - SASS/PGSLP/01/2017

This is to certify that the above named is a bonafide student at Moi University, School of Arts and Social Sciences. He is a Master of Science student undertaking Speech and Language Pathology.

He has completed his coursework component and proposal and has now embarked on Thesis writing.

His Thesis is entitled: **“Exploring the Pecs Approach to Improving Communication in Children with Autism Spectrum Disorders: Constraints and Perspectives”**

Any assistance accorded to him will be appreciated.

PROF. P.T. SIMATEI
DEAN, SCHOOL OF ARTS AND SOCIAL SCIENCES

Appendix 15: Teachers' Consent Form**MOI UNIVERSITY**

P.O. BOX 3900, ELDORET, KENYA

Dear Teacher,

I am a Master's Degree student at Moi University. The head teacher has allowed me to conduct a research Project at the school. You will be a participant by training one child in communication using PECS; you will be trained in advance on your roles. This will take about 30 minutes three times a day two days a week for twelve weeks.

All information shall be handled in confidence and only used for the purpose of this study.

If you consent, please sign the attached consent form and fill the reinforce assessment form.

I will be glad to share the research findings at your request.

Yours faithfully,

Maina , Francis Gitau

Msc. Speech and Language Pathology Student

Appendix 16 Parents' consent form**MOI UNIVERSITY**

P.O. BOX 3900, ELDORET, KENYA

Dear Parent/ Guardian,

I am a Master's Degree student at Moi University. The school head teacher has allowed me to conduct a research Project at the school. I will be conducting Research in the area of communication by use of Picture Exchange communication System (PECS) for children who are living with Autism Spectrum Disorder (ASD). In this Research you and your child will be involved as participants.

I will use about 30 minutes three times a day two days per week for twelve weeks.

A video recording of the sessions shall be done. All the information collected will be kept confidential and used only for the purpose of this study. If you consent, please sign the attached consent form. Then fill in the attached Reinforcer Assessment form.

I will gladly share the findings of the study at your request.

Yours faithfully,

Maina , Francis Gitau

Msc. Speech and Language Pathology Student



MOI UNIVERSITY

P.O. BOX 3900, ELDORET, KENYA

CONSENT FORM

Child's Name:.....

Parent /Guardian's name.....

I accept my child and I to be participants in the study on PECS for children with ASD of ages 6-8 years.

Would you like a summary of the findings? ☐ YES ☐ NO

Parent / guardian's signature..... Date.....

Appendix 17 M-CHAT



www.m-chat.org

Child's name _____ Date _____

Age _____ Relationship to child _____

M-CHAT-R™ (Modified Checklist for Autism in Toddlers Revised)

Please answer these questions about your child. Keep in mind how your child usually behaves. If you have seen your child do the behavior a few times, but he or she does not usually do it, then please answer **no**. Please circle **yes** or **no** for every question. Thank you very much.

1. If you point at something across the room, does your child look at it? (FOR EXAMPLE , if you point at a toy or an animal, does your child look at the toy or animal?)	Yes	No
2. Have you ever wondered if your child might be deaf?	Yes	No
3. Does your child play pretend or make-believe? (FOR EXAMPLE , pretend to drink from an empty cup, pretend to talk on a phone, or pretend to feed a doll or stuffed animal?)	Yes	No
4. Does your child like climbing on things? (FOR EXAMPLE , furniture, playground equipment, or stairs)	Yes	No
5. Does your child make <u>unusual</u> finger movements near his or her eyes? (FOR EXAMPLE , does your child wiggle his or her fingers close to his or her eyes?)	Yes	No
6. Does your child point with one finger to ask for something or to get help? (FOR EXAMPLE , pointing to a snack or toy that is out of reach)	Yes	No
7. Does your child point with one finger to show you something interesting? (FOR EXAMPLE , pointing to an airplane in the sky or a big truck in the road)	Yes	No
8. Is your child interested in other children? (FOR EXAMPLE , does your child watch other children, smile at them, or go to them?)	Yes	No
9. Does your child show you things by bringing them to you or holding them up for you to see – not to get help, but just to share? (FOR EXAMPLE , showing you a flower, a stuffed animal, or a toy truck)	Yes	No
10. Does your child respond when you call his or her name? (FOR EXAMPLE , does he or she look up, talk or babble, or stop what he or she is doing when you call his or her name?)	Yes	No
11. When you smile at your child, does he or she smile back at you?	Yes	No
12. Does your child get upset by everyday noises? (FOR EXAMPLE , does your child scream or cry to noise such as a vacuum cleaner or loud music?)	Yes	No
13. Does your child walk?	Yes	No
14. Does your child look you in the eye when you are talking to him or her, playing with him or her, or dressing him or her?	Yes	No
15. Does your child try to copy what you do? (FOR EXAMPLE , wave bye-bye, clap, or make a funny noise when you do)	Yes	No
16. If you turn your head to look at something, does your child look around to see what you are looking at?	Yes	No
17. Does your child try to get you to watch him or her? (FOR EXAMPLE , does your child look at you for praise, or say "look" or "watch me"?)	Yes	No
18. Does your child understand when you tell him or her to do something? (FOR EXAMPLE , if you don't point, can your child understand "put the book on the chair" or "bring me the blanket"?)	Yes	No
19. If something new happens, does your child look at your face to see how you feel about it? (FOR EXAMPLE , if he or she hears a strange or funny noise, or sees a new toy, will he or she look at your face?)	Yes	No
20. Does your child like movement activities? (FOR EXAMPLE , being swung or bounced on your knee)	Yes	No

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Appendix 18: Plagiarism Awareness Certificate



SR725

ISO 9001:2019 Certified Institution

THESIS WRITING COURSE

PLAGIARISM AWARENESS CERTIFICATE

This certificate is awarded to

MAINA, FRANCIS GITAU

SASS/PGSLP/01/2017

In recognition for passing the University's plagiarism

Awareness test for Thesis entitled: **EXPLORING THE PECS APPROACH TO IMPROVING COMMUNICATION IN CHILDREN WITH AUTISM SPECTRUM DISORDERS; CONSTRAINTS AND PERSPECTIVES** similarity index of 2% and striving to maintain academic integrity.

Word count: 23663

Awarded by

Prof. Anne Syomwene Kisilu

CERM-ESA Project Leader Date: 07/10/2024