

Research article



EFFECTIVENESS OF MULTISENSORY INSTRUCTION IN ENHANCING THE SPELLING OF CVC WORDS OF A CHILD WITH LEARNING DIFFICULTY

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Abstract

Children with all kinds of disabilities can learn if they have extra support in the form of educational instruction, aides, use of assistive technology, and an accessible environment. This study is undertaken to extend support using multisensory instruction to teach spelling to a child with learning difficulty. The research is single case study design with focus on a child of fourth grade having severe learning difficulties. The sample of the case study is a single child in a pull-out setting and the three teachers teaching in SEN unit to children with special needs. It followed qualitative approach with pre-test, post-test, document analysis (IEP) and structured interview questionnaire. Data were collected in three phases (baseline, intervention and maintenance). Baseline data was obtained on four sessions with pre-test. The child was taught using multisensory instruction followed by visual (flashcards), auditory (whisper phone) and the tactile aids (sand tray) throughout the period of intervention for seven sessions. Post-test was carried out after the intervention for maintenance phase. Analysis of data was done through comparison of pre-test and post-test score and generating themes from the interview responses. The findings showed the significant improvement in child's ability to spell after the intervention. Further it was supported by the teacher's responses stating that the multisensory instruction is effective. Discussions were highlighted to reveal why the child was not able to perform well on the pre-test and better in the post-test. Finally, the study sensitized the readers on its limitations and provided with recommendations to strengthen the future research.

Key terms: Case study, Learning difficulty, Spelling, Multisensory instruction

Introduction

The fundamental human right to education for all, enshrined in the 1948 Universal Declaration of Human Rights, serves as the foundation for inclusion. Article 24 of the UN Convention on the Rights of Persons with Disabilities (CRPD), which requires States parties to improve their educational systems and take other steps to ensure that people with disabilities have access to high-quality inclusive education, contributed to the global movement toward inclusion.

Disability is defined based on the social model of disability in the National Policy for Persons with Disabilities (2019). The policy is anchored on five main principles: non-discrimination, inclusiveness, disability mainstreaming in all aspects of development, participation and gross national happiness. It reinforces the country's promise to provide education for all including children with disabilities and seeks to eliminate environmental, attitudinal and institutional barriers to education.

In Bhutan there are around 754 students living with various disabilities in 30 schools with Special education program (SEN report, 2021). As per the statistics from ‘Two-Stage Child Disability Study’ report, Bhutan has 11.9% of school going children, ranging from 5 to 9 years of age with cognitive difficulties associated with learning to read, write and spell (NSB, 2012). Out of these there are 147 boys and 103 girls with learning difficulties in the schools. An average size of the classroom strength ranges from 30 to 35 children, wherein we find children with different special needs. There are many children demonstrating difficulty in spelling of words of their grade level text in the general education setting. The children with learning disabilities in the mainstream classroom are deprived of proper interventions to meet their needs. Therefore, it is imperative to teach children with learning difficulties to acquire spelling skills which is the foundation to literacy learning.

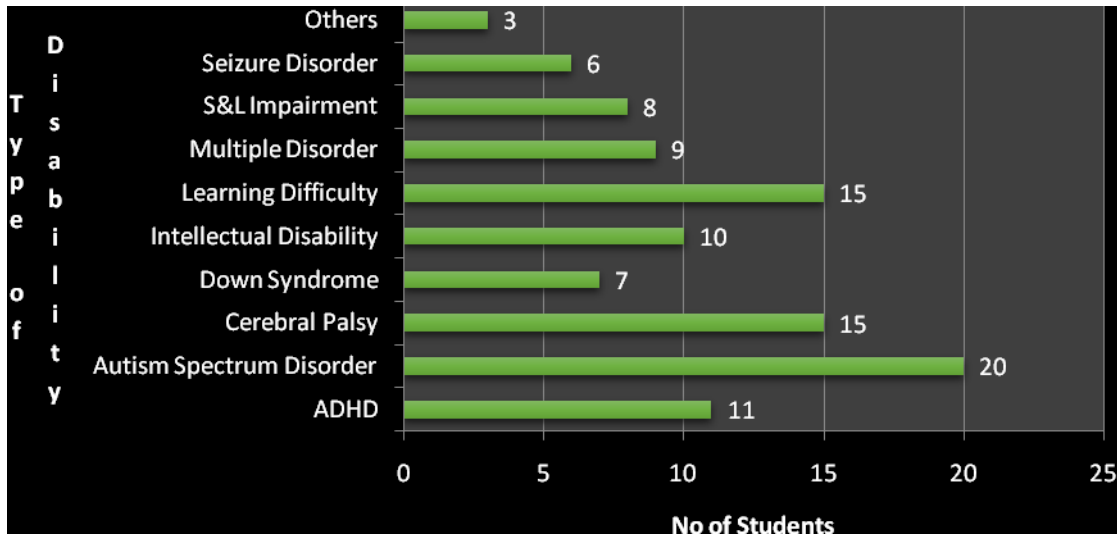


Figure 1: Bar graph shows the number of children with different disabilities in the school
 Source: CMSS, 2022

Learners are expected to fail if they are exposed to a difficult task if they are not provided with successful educational experiences or therapeutic intervention appropriate to overcome their learning difficulty (Alenizi, 2019). Inaccurate spelling can have range of consequences in literacy development. It is difficult to teach children with learning difficulties in mainstream classroom when there is large number of children. A child with learning disabilities has to be specifically taught the spelling skill, so that it supports their reading and writing which are crucial aspects of literacy learning in Primary education. Learning to spell requires students to develop the knowledge about oral sounds and written patterns in language (Hammond & Kooi, 2020).

As per the teachers informal observation in the classrooms there are 3 to 4 children in each grade who has one form or other learning difficulties. Due to the increase in strength of children every year it is difficult for the teachers to properly assess and hence provide appropriate and timely intervention. Learning to spell is a foundation to literacy in primary education. Children with all kinds of disabilities can learn if they have extra support in the form of educational instruction, aides, use of assistive technology, and an accessible environment. Hence, if the children are provided with appropriate learning opportunities he or she can overcome the learning difficulties up to certain extent.

Literature Review

A system of inclusive education for all children is a priority for the Royal Government of Bhutan (RGoB). Bhutan signed the CRPD in 2010 after ratifying the UN Convention on the Rights of the Child in 1990. Even though the idea of inclusive education is still relatively new and the government has not yet ratified the CRPD or passed a national education law, significant policy changes have been made in recent years to ensure that all children, including those with disabilities, have equal access to learning opportunities.

The lack of schools and facilities that can accommodate them, the restricted ability of teachers to instruct successfully in inclusive environments, and other factors make it difficult for children with disabilities to participate in education. Children

with disabilities continue to be one of the most neglected groups, notwithstanding general improvements in educational attainment around the world. Compared to peers without disabilities, they are less likely to participate in and finish their schooling. Disability inclusion in education is consistently reinforced in the main domestic policies on disability and education.

National Policy on Special Educational Needs (2012) advocates the right of children with disabilities to education on an equal basis with others, from early childhood to vocational/ technical and tertiary education without any form of discrimination. It demands the mainstreaming or integration of children with mild to moderate disabilities in regular schools with appropriate facilities and support services.

The Standards for Inclusive Education (2017) is a significant step in operationalizing the inclusion agenda, especially at the school level. The standards recognize inclusive education as encompassing all learners and define it as a “process valuing, accepting and supporting diversity in schools and ensuring that every child has equal opportunity to learn”.

The Ministry of Education (MoE) is implementing the Ten-Year Roadmap for Inclusive and Special Education in Bhutan 2018–2028, a comprehensive strategic plan aimed at improving access to and quality of education and addressing necessary system reforms to support all learners with disabilities in reaching their full potential.

In Bhutan, the prevalence of children with disabilities is evident from the Disability Assessment Report, 2011 which reveals that at least 21.7 % of children aged two to nine years have mild to severe disability (MoE, 2012). To analyze the stated figure, Population and Housing Census of Bhutan 2017, reveals that there are 131 children with disabilities aged 3-5 years in Thimphu District and 19.28 percent of these children are in Thimphu town only (Kuensel, November 12, 2022). Further, the statistics from ‘Two-Stage Child Disability Study’, alarms the reader on the prevalence of 11.9% of school going children, ranging from 5 to 9 years of age with cognitive difficulties associated with learning (NSB, 2012). Therefore, it is imperative to address the issue so that children with such disabilities benefit in significant way by developing their learning skills.

To mention about the average size of the classroom strength, it ranges from 30 to 35 children, wherein we find children with different special needs. In every classroom, we come across children facing difficulties in learning specific skills such as reading, writing, spelling, and mathematics. The children need to be explicitly taught to develop their skills in these areas.

In a study, Sariah (2008) assumes that many students with LD are left to struggle in the mainstream classes due to lack of support from the education system and are at risk of becoming academic failures or labeled as low achieving students. It is due to the teacher not having in depth knowledge of supporting the children with LD in the classroom. And having to attend large number of children in the class, teachers often ignore children with LDs. But few are of the opinion that they give accommodation with provision of extra time to help them in reading and handwriting problem.

Amongst other different disabilities, learning difficulties stood as the most prominent special needs in the schools. It is evident from the Special Education Need Reports (2021), that there are 147 boys and 103 girls with learning difficulty in various schools with SEN program. There is increased population of this group as the school lacks proper assessment tool to identify the issue. Many children in the mainstream classroom have children with learning difficulty which are yet to be diagnosed. Without the proper assessment done, schools just considered many children having learning difficulties.

However, the Bhutan Education Blueprint 2014–2024 considers inclusion, equity and access to education as integral to quality education. It includes strategies for identifying and integrating students with mild to moderate disabilities into mainstream schools and increasing the number of Special Educational Needs (SEN) schools to accommodate more children with special needs. The data from SEN division reveals that there are 28 schools with SEN program and 754 children with different special needs where learning difficulty is the highest amongst other disabilities. Also there are 301 teachers in the SEN unit in the country (SEN report, 2021).

The Individuals with Disabilities Education Act (IDEA, 1997) mandated that all students, including students with disabilities, have access to evidence-based instruction that is aligned to grade level standards and make progress in the general education setting. Specifically, multisensory learning is a process that consists of learning a new subject through the use of two or more senses, which may include visual, auditory, tactile or kinesthetic, olfactory, and gustatory sensation. Teaching with a multisensory approach provides additional ways of receiving information into students’ cognitive system by stimulating hearing, vision, touch, speech, taste, movement and action, helping students to link new information to prior knowledge and to understand the relationships between concepts.

Multisensory learning techniques are designed while considering that every child is different and using the same teaching strategy is not going to help every individual student. Using a multi-sensory instruction approach and activities is a simple remedy that can provide different teaching strategies to teach the majority of subjects to every student with multiple ways to learn (Labat et al., 2014). Multisensory teaching techniques are essential for providing equal opportunities to every child so that they can meet and exceed expectations. As learning doesn't just happen all alone in our heads, provision of more opportunities to students to use their hands, voices and minds are crucial.

According to the whole brain learning theory, all brain functions are interconnected for this reason (Esplendori, Kobayashi & Puschel, 2022). We remember how to do things best when the directions we're given engage multiple senses. Most teaching techniques are done using either sight or hearing (visual or auditory). The child's sight is used in reading information, looking at text, pictures or reading information based from the board. The hearing sense is used to listen to what the teacher says. The child's vision may be affected by difficulties with tracking or visual processing. Sometimes the child's auditory processing may be weak. The solution for these difficulties is to involve the use of more of the child's senses, especially the use of touch (tactile) and movement (kinesthetic). This will help the child's brain to develop tactile and kinesthetic memories to hang on to, as well as the auditory and visual ones.

Arruan et al. (2014) states on the emergence of literacy skill that multisensory learning can help teach is connecting print letters with the oral alphabet. Educational researchers have found that multisensory activities can teach students to associate letters or words with sounds faster. As mentioned earlier, this is one of the foundational reading skills to nurture in young students, in order to promote strong emergent literacy.

Various authors (Arnold, 2021; Bowers & Bowers, 2017; Alenzi, 2019; Ngong, 2019; Robinson & Hammond, 2020; Staden & Purcell, 2016) on the subject have come up with different set of multisensory approach to enhance the spelling skills. While most of the multisensory instructions advocated by authors are similar, there are some differences in its application. Many strategies were suggested as part of multisensory instruction in order to develop the spelling skill of the children.

Highlighting the importance of multisensory instruction as evidence-based, many approaches to learning spelling are suggested in the literature. As per the studies from various researchers, application of multisensory instruction is found effective to benefit the children developing their spelling skill (Alenzi, 2019; Arnold, 2021; Bowers & Bowers, 2017; Ngong, 2019; Robinson & Hammond, 2020; Staden & Purcell, 2016).

There are several studies which mentioned the effectiveness of using multisensory techniques when conducted in a small group setting (Alenzi, 2019; Beyer, 2022; Ngong, 2019). It was conducted to provide interventions in two settings: experimental and control group (Alenzi, 2019; Ngong, 2019). It has proved its efficacy while applied in such environment. This provides an intensive intervention when the children are closely observed and monitored on the outcome of using multisensory instruction. A small group setting has advantage where the learners do not have to sit and wait for long periods to be actively engaged as they would have to be in a whole group setting.

It is confirmed in a study that teaching spelling through word study, which is one way to learn and apply patterns found within words revealed the efficacy when used only in small groups (Fuchs, 2020). On the other hand, there is not much research on the application of this strategy in the mainstream classroom with a greater number of students except for one study (Robinson & Hammond, 2020). Although teaching spelling through word study seems appealing, it can be practiced with the aid of multisensory strengths both with small groups and whole class instruction.

Interestingly project approach to enhance the overall development of child's learning using visual representations such as clay works and model making were applied with whole class children (Brooks & Wangmo, 2011). This approach seems to connect with multisensory learning as children engaged in visuals, auditory and tactile process while understanding the concept.

Regarding the gathering of data through various tools, most studies have used pre-test and post-test in the different setting. Notably, in a study Ashbaugh (2016) mentioned on the use of pre and post-assessment spelling inventories before and after the intervention. Pre-assessment was done by introducing new words for spelling and provided lot of practice. Post-assessment was conducted to test the children on the effect of intervention. The current research follows the similar method of pre-test and post-test design to collect the data from the child's learning of spelling words.

Highlighting the use of different multisensory materials explored, in a study conducted by Beyer (2022), there were varied multisensory materials used to teach letter names and sounds during the intervention phase. It really helped children to learn the targeted letters and its corresponding sound. In contrast to this study many studies (Alenzi, 2019; Arnold, 2021; Bowers & Bowers, 2017; Ngong, 2019; Robinson & Hammond, 2020; Staden & Purcell, 2016) have not mentioned about the use of different multisensory materials in detail.

It is affirmed that teaching students via multisensory method requires using a variety of props and equipment, they can make use of materials such as sandboxes; three dimensional numbers, letters, and symbols; audio and visual representations, and or any other kind of material that supports the topic the students are learning (Alwaqassi, 2017). In contrast to the variety of materials explored which in fact would excite the children, in this study consistently only a set of visual (flashcard), auditory (whisper phone) and tactile (sand tray) materials are used. It would have been more effective to teachers to use variety of multisensory instruction in their lesson and also be aware of the ways to implement it.

Concerning the use of different materials and its implementation, several studies mentioned about the duration of multisensory intervention which was undertaken for a period of minimum four weeks to six months in different setting

(Ngong, 2019; Robinson & Hammond, 2020; Staden & Purcell, 2016). It is likely that the length of intervention depends on the degree of learning disability of a child. Longer the duration of the intervention the higher the impact of learning for children with special needs. Unfortunately, this study has shorter period of intervention for about 4 weeks in pull-out session.

The Draft National Education Policy (2019) commits the government to provide free quality and inclusive basic education and institute measures to facilitate equitable access and participation in school for all children, including those with disabilities. This includes specialized support, appropriate educational services and facilities, including trained personnel. However, it is yet to materialize in reality and there are schools with SEN program without the basic amenities to support the children with disabilities.

Although there are the claims on the success of using multisensory instruction, Ngong (2019) suggested the need for training of personnel using the multisensory learning approach. As an instructional intervention, the development of the spelling skills in learners with special needs is crucial. However, without the teacher being trained sufficiently the use of intervention may not be effective. Most studies did not discuss about the training of the teachers on using multisensory approach. To support the need for trained teacher, a study did mention about the resource needed for the intervention and incurring fund to carry out the intervention (Alwaqassi, 2017). Training the teachers on implementing multisensory instruction in the school may be an initial step to address the learning needs of diverse learners. Due to lack of professionals in the field of special education the children with disabilities often remain unnoticed. Our schools in Bhutan required skilled teacher in the areas of special education. Of late the education ministry is training many teachers in this field providing two years Master degree in Inclusive Education (MOE, 2019).

On the other hand, besides the need of resources and trained personnel, the observation on student engagement, types of sensory materials or methods being used, the classroom arrangement, the students' spaces, the students' movements, student's understandings in relation to the intervention, and the teachers' explanations of the lesson's materials, to gather the information also needs to be considered (Alwaqassi, 2017). It seems to be important in order to make the children learn effectively.

When teaching is combined with multisensory practice, learning is cemented into long-term memory. Since the students with dyslexia have poor attention and memory, this practice is very useful to improve their academic outcomes. Although, multisensory strategy is targeted to the population from varying levels of children with and without disabilities its most beneficial for the children with dyslexia having difficulties in reading and spelling as affirmed in the study (Bowers & Bowers, 2017; Ngong, 2019; Robinson & Hammond, 2020). Not only these students but also the students with poor reading habits also reap the benefits of this instruction when practiced in a mainstream educational setting (Viji & Raja, 2017).

Also, a multisensory approach can be applied to early childhood, and to all children with special needs including mentally retarded (Suryaratri, Prayitno & Wuryani, 2019). Further, multisensory learning can be very helpful for children with learning and attention problems who may experience problems with visual or auditory processing.

Notably, it is interesting to explore the use of multisensory instruction in children who have severe disabilities in the classroom. There would be many challenges a teacher would encounter while teaching to these group of learners.

Methodology

Truly stated, the basis of any studies is the research beliefs or paradigms. Social constructivism is the understanding of the reality in which people live and work (Creswell & Creswell, 2018). Constructivist paradigm endeavor to understand the subjective world of human experience. It is crucial to understand the individual in the study undertaken rather than universal laws (Kivunja & Kuyini, 2017). To relate, when the children is taught through different modalities, their sense of visuals, hear, touch and movement is activated. The knowledge is socially created through the interaction with the prior learning and the new environment which the child experiences. Thus, my study is inclined to constructivist theory where the children with learning disabilities interact with the environment to get the new knowledge. According to Yin (2018), the research design is "a logical plan for getting from here to there, where here may be defined as the set of questions to be addressed, and there can be some set of conclusions regarding these questions" (p.60). The research design is a single case study with the application of pre-test and post-test method and the structured interview questions following the qualitative approach of the study. The pre-test was given to find the prior knowledge of the child on the spelling of ten words. The intervention was applied using visual, auditory and tactile aids to enhance the spelling skill of the child. The post-test was conducted to find the number of words child could spell after the period of four weeks intervention. And the structured interview was carried out with three teacher participants.

Participants of the study

The participant of this study is the single child who has significant learning difficulty and the three teachers teaching literacy and numeracy to children with learning difficulties in the pull-out classroom. The child is 11 years old in pull-out class who cannot even identify all the 26 alphabets in English. He also has problems in reading and spelling of CVC (consonant vowel consonant) word.

Case child of the study: Karma (name changed) is from Trashiyangtse, Bumdeling but was born in Phuntsholing hospital on 19th March, 2011. During that time he was with his parents but after a few months of his birth the parents got divorced. Later, his mother took him to the village where his grandmother lived. His mother was there only for few months with him and rest of his childhood he spent with his grandmother. Not so long after, at around the age of 8 months he was brought to live with his mother's younger sister (aunt) in Thimphu. He was looked after by his aunt and grandmother. He was closer to his grandmother and was taken with her wherever she went, especially when they used to go and stay in their village. He was bottle fed and was given lactogen and cerelacs until he started eating solid food. During his toddlerhood, he used to play with the friends in the neighborhood. His gross and fine motor developed like any other typical child but he started to speak at the age of 5 years only. He seemed to have delayed speech.

In 2017, he was admitted to class PP upon attaining 6 years of age. Though he was not initially enrolled under the Special Education Need (SEN) program, the child had difficulty coping and performing at par with the peers of his age. Later he had to be referred for SEN services as he could not cope with the grade level curriculum unlike other peers in the mainstream classroom. Currently he receives Functional Learning Curriculum (FLC) lessons with tailoring skills as pre-vocational lessons in FLC IV.

In his relationship circle, he just has an aunt and a cousin, Choethso Yuden whom he shares his time with. He speaks fluent Dzongkha and has difficulty in learning English. About his preferences, he likes green and red color, likes eating apples, fries and plays Minecraft games. He also likes cooking and doing kitchen chores which he can do independently such as preparing basic meals. As opposed to his interest, he doesn't like it when he is left alone without friends, watching peppa pig and petting cats and dogs.

The child's IEP was referred to collect the above information which would further provide rich data for the research study.

Teacher participants: Teacher A has been thirty years teaching to children with special needs in different schools with SEN program. She is 53 years old and nearing to superannuation in the service. She had rich experiences both professional and personal teaching children with varied disabilities. Prior to her placement at the current school, she was in Muenselling School for the blind at Khaling in Eastern part of Bhutan.

Teacher B has been in teaching profession for the past 14 years where she spent nine years with children with special needs. Recently she graduated from Paro college of Education with degree in Master's in Inclusive Education. She is passionate about teaching children with different disabilities. Currently she teaches functional literacy and numeracy skill to children with special needs in the pull-out classroom.

Teacher C also had been around fourteen years in teaching with just 5 years experience teaching children with special needs. She teaches functional literacy in English as well as Dzongkha (National language). She also has bachelor degree in primary education and holds Master's degree in Inclusive Education too.

Instruments

The following are the instruments used to collect data to answer the research questions:

Pre-test: The child was called in the pull-out session for four sessions. There are list of ten CVC words (refer appendix 5). The child was asked to write all the ten words. This information of the child's pre-test activity serves as one of the baseline data to understand the pre-knowledge of the child's ability to spell number of words given. During the pre-test the child could correctly spell only two words out of ten words.

Post-test: Similarly, the post-test was conducted after the period of intervention for about 7 sessions. The child was taught using visuals (flashcards), auditory (whisper phone) and tactile (sand tray) materials. Then, the child was asked to write the spelling of all the ten words (car, cow, mat, yak, van, leg, cat, dog, sun, pig) again. He could get nine words correct out of ten words. It was a wonderful performance as he improved a lot in spelling from the pre-test level.

Interview Questionnaire: The researcher employed structured interview questionnaire (refer appendix 4) to three teachers teaching both English and Math subject to the children with learning difficulties. It was mainly to answer the

research question to find out whether the multisensory techniques are effective or not in teaching children with special needs. The questionnaire was given and they wrote their responses in presence of the researcher. The interview participants felt comfortable to respond in the written form instead of oral expression. They took 15 minutes to complete the questions. It was conducted in the pull-out classroom.

Participant Observation: In this study the researcher acted as a participant when the intervention was implemented. Using visuals (flashcards), auditory (whisper phone) and tactile (sand tray) materials were used to carry out the intervention to teach the spelling of CVC words in the pull-out classroom. The researcher was involved literally for all the seven sessions in order to observe the child simultaneously while the intervention was being done. The use of multisensory instruction was carried out using flashcards, whisper phones and sand tray as an intervention (refer appendix 6) in the pull-out classroom. All the multisensory materials were improvised by the researcher.

Document analysis: The researcher collected the data from the Individual Education Plan (IEP) maintained by the class teacher where the priority needs of the child in different areas of social, cognitive, functional skill, literacy and numeracy are mentioned. He has poor literacy skill in terms of letter recognition, reading and word spelling. His IEP was well planned but not yet executed by the teacher. So it was referred to gather the data about his basic level of knowledge on literacy. Even his class note books were looked at, to further get the baseline information on the study.

Data collection procedure

The data were collected in the three phases as described below. Baseline phase entails child's IEP as document analysis, pre-test on upper and lower case letters and spelling of 10 CVC words. Intervention phase contains participant observation involving intervention process and the maintenance phase has post-test of spelling on 10 CVC words.

Baseline phase: Data for the baseline phase was collected from the child's IEP and through pre-test on four different sessions. Each session lasted for 30 minutes. All the four sessions were carried out in pull-out classroom. In first session the child was asked to write all the 26 English alphabets in upper case formats. In the second session he was asked to write the lower case letters. In the third session the researcher displayed the letter cards on the table and the child was made to identify the upper and lower case letters randomly. He was unable to identify some letters (e, g, l, m, n, r, u, v, w, y). In the last session the spelling test was conducted on ten CVC words. Even the child's IEP and his note books were referred as documents analysis to get the baseline information on his literacy skills. The table 1 shows the pre-test activity on four sessions for baseline data.

Number of sessions	Activity	Remarks
Session 1	Writing upper case letters A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z	Could write all the letters
Session 2	Writing lower case letters a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z	Could write most letters but had difficulty identifying some letters
Session 3	Ask to identify lower case letters	e, g, l, m, n, r, u, v, w, y
Session 4	Conduct spelling test on ten CVC words	car, cow, mat, yak, van, leg, cat, dog, sun, pig

Table 1: Pre-test Activity

The table 2 shows the pre-spelling test scores

CVC words	Correct word	Score
Cat	Cat	1
Cow		
Car		
Van		
Dog	Dog	1
Leg		
Mat		
Pot		
Sun		
Yak		
Total		2/10

Table 2: Pre-test Score (spelling test)

Intervention phase (Participant observation): Researcher collected data during intervention phase by being involved in the activity as the participant observer by observing the child while the intervention was carried out simultaneously. The child was called for 7 sessions in the pull-out classroom for intervention. From the first to the sixth sessions the child was taught the letter identification and its corresponding sounds as he had difficulty identifying some letters (e, g, l, m, n, r, u, v, w, y) too. It was found out from the baseline data collected. On each session the child was taught to spell one word along with two letters for 30 minutes every day. The child was made to revise the word learnt in previous session before the introduction of the new word. The intervention used was multisensory materials (flashcard, whisper phone and sand tray). On the seventh session he was asked to write down all the words learnt. The table 3 below shows the intervention phase where the child was taught with flashcards, whisper phone and sand tray.

Number of sessions	Letters learnt	Words spelt	Remarks
1	g, r	car	Used flashcards, whisper phone and sand tray
2	u, w	cow	Used flashcards, whisper phone and sand tray
3	m, e	mat	Used flashcards, whisper phone and sand tray
4	l, y	leg	Used flashcards, whisper phone and sand tray
5	v, n	van	Used flashcards, whisper phone and sand tray
6	w, y	yak	Repeated the letters as it was difficult to remember
7	Revision of all the letters learnt	car, cow, mat, yak, van, leg, cat, dog, sun, pig	Wrote the spelling of all the ten words

Table 3: Intervention Phase of Data Collection Procedure

Maintenance phase: For the maintenance phase, a post-test was conducted where the child had to spell 10 words provided in the list during the baseline and intervention phases. The child could score nine words correctly out of ten words. He could identify the letters as well.

The table 4 below shows the score of the post-test;

CVC words	Correct word	Score
Cat	cat	1
Cow	cow	1
Car	car	1
Van	van	1
Dog	dog	1
Leg	leg	1
Mat	mat	1
Pig	pig	1
Sun	sun	1
Yak		0
Total	9	9/10

Table 4: Post-Test Score

FINDINGS

Prior to intervention baseline data were collected from pre-test on writing upper case and lower case alphabets, letter recognition and spelling of 10 CVC words at four different sessions. All the sessions lasted for 30 minutes each in pull-out classroom. In the first session the child was asked to write all the 26 alphabets in upper case. He could write all the letters without an error. In the second session he was asked to write the lower case letters. He could not write all the 26 letters correctly. In the third session he was asked to identify letters randomly. He had difficulty identifying and writing some letters (e, g, l, m, n, r, u, v, w, y). In the fourth session the child was given 10 CVC words to spell. The child was able to spell only two words correctly out of the 10 words given.

Number of sessions	Activity	Task assigned	Result
Session 1	Writing upper case letters	A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z	Could correctly write all the letters
Session 2	Writing lower case letters	a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z	Could not write all the letters correctly

Session 3	Ask to identify letters		Had difficulty in identifying letters(e, g, l, m, n, r, u, v, w, y)
Session 4	Conduct spelling test on ten CVC words	cow, mat, yak, van, leg, cat, dog, sun, pig, car	Could spell only two words without an error (cat, dog)

Table 5: Findings of Baseline Data

The table 5 shows the findings of the baseline data on four sessions. The result of the spelling test is shown in the table below;

CVC words	Correct word	Score
cat	cat	1
cow		
pig		
van		
dog	dog	1
leg		
mat		
car		
sun		
yak		
Total		2/10

Table 6: Pre-test score

Intervention Phase: The second research question is responded by analysis of pre-test and post-test result of the child. The researcher initiated the intervention on using visual, auditory and tactile aids to teach letter sounds and word spelling of CVC words. At the time of intervention the researcher used flashcards, whisper phones and sand tray throughout teaching to spell the words.

Number of sessions	Letters learnt	Words spelt	Remarks
1	g, r	car	Used flashcards, whisper phone and sand tray
2	u, w	cow	Used flashcards, whisper phone and sand tray
3	m, e	mat	Used flashcards, whisper phone and sand tray
4	l, y	leg	Used flashcards, whisper phone and sand tray
5	v, n	van	Used flashcards, whisper phone and sand tray
6	w, y	yak	Repeated the letters 'w and y' as he

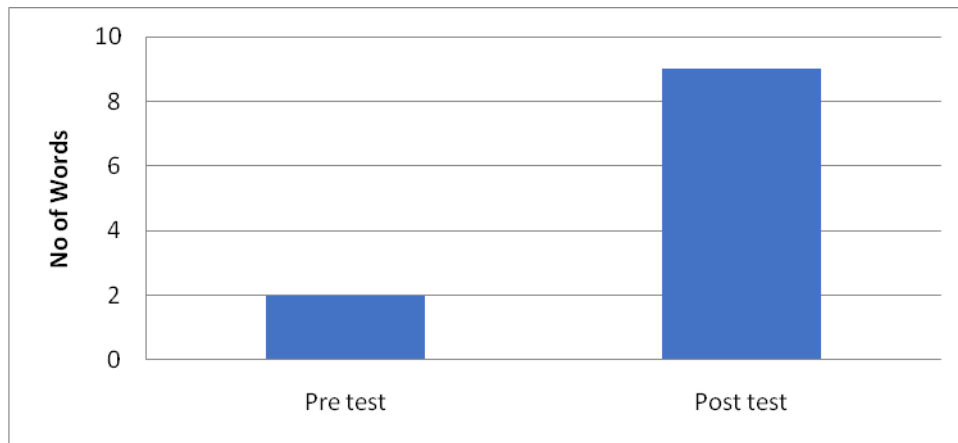
			found it difficult to remember
7	Revision of all the letters learnt	pig, cow, mat, yak, van, leg, cat, dog, sun, car	Wrote the spelling of all the ten words

Table 7: Intervention phase

The table above shows the letters and the corresponding words taught during the intervention phase using the multisensory instruction.

In the first session, the child was taught the letter recognition (g, r) using the multisensory instruction (visuals, auditory and tactile). Then he was taught to spell the word ‘car’. In the second session, the child was taught the letters (u, w) and the word ‘cow’. In the third session, he was taught the letters (m, e) and the word ‘mat’. In the fourth session, he was familiarized with letters (l, y) and the word ‘leg’. Similarly in the fifth session the child was taught the letters (v, n) and the word ‘van’. In the sixth session, the letters (w, y) are familiarized and the word ‘yak’ was taught. Finally in the seventh session he was given the revision on all the letters taught earlier. Also all the ten words were made to write with correct spelling.

After the intervention was applied for 7 sessions with duration of 30 minutes, the researcher conducted post-test on the same 10 words. And there is the comparison of both the scores in pre-test and post-test result of spelling the ten CVC words.



The graph above shows the comparison of child’s pre-test and post-test score.

The graph shows the score of both the pre-test and post-test of ten CVC words. Compared to the result of the pre-test, there is significant difference in child’s performance on the post-test. During the pre-test given on the ten CVC words the child scored 2 out of 10 words, whereas after the intervention the score was 9 out of 10 words. There is significant improvement in child’s spelling of words after the intervention.

Maintenance Phase: For the maintenance phase, a post-test was conducted where the child had to spell 10 words provided in the list during the baseline and intervention phases. It was found that there was a significant difference in the child’s ability to spell accurately after the intervention was applied. The scores of the post-test are shown below.

CVC words	Correct word	Score
Cat	cat	1
Cow	cow	1
Car	car	1
Van	van	1
Dog	dog	1
Leg	leg	1
Mat	mat	1
Pig	pig	1
Sun	sun	1
Yak		0
Total	9	9/10

Table 8: Post-test score

DISCUSSION

Research questions 1

How many words will the child with a learning difficulty able to spell prior to an intervention?

Lack of individual attention

Findings for this research question indicates the child's inability to spell CVC words and recognize some lower case letters during the pre-test. Learning to read and spell requires children to discover the alphabetic principle which, in turn, requires the ability to connect phonological and orthographic representations (Magnan et.al, 2013). In the pre-test he could spell only 2 words correctly when 10 words were given. The words he could spell were cat and dog. Since the child was enrolled in Pre-primary level he was first taught the animal cat and dog which are very common. Moreover, the teachers give more examples of these animals as they are found in their homes. So it is likely that the child could remember its name when they were repeatedly used.

There could be numerous reasons for the child's inability to spell the CVC words accurately. Since the child has severe learning disability he could not learn at par with other children in the mainstream classroom. With more number of children the teacher was not able to provide individual attention to support him in learning. Moreover there was no proper assessment on child's difficulty with literacy learning. There was lack of phonological awareness and letter identification which deterred his spelling ability to spell words at the foundational level. He was not taken care in previous grades which made him difficult to keep pace with current learning standards.

Owing to his poor performance in the mainstream classroom the child was moved into pull-out unit after the assessment by the SEN team. He was put along with other children with learning disabilities in the special classroom. The school SEN team prepared individual education plan (IEP) to find out his priority needs in different areas. His first priority in literacy was identified in aspects of reading, writing and spelling. Hence, the teacher focused his needs on spelling using different strategies. Prior to intervention the child had lots of difficulty with spelling. His poor ability to score only two words contributes to inappropriate intervention or individualized attention and poor home environment.

Physical health and Learning Environment at Home

Furthermore, he was staying with his aunt where there was lack of proper academic support and guidance. Upon discussion with his aunt about the academic performance she said that he studies on his own, does his homework and obeys them at home. They are unable to help him as she is the sole bread earner in the family and has to go for work. Referring his chronological age, the physical development of the child is below his age level peers in height and weight. He is just 120 cm in height and 23.80 kg in weight. As per the details found from the IEP, the child had delayed speech, only at 5 years of age. He is reared by his grandmother since he was six months old in the village. His parents were divorced and mother left him with her relatives. Then, he was brought to stay with his aunt and enrolled in the current school. Up to fourth standard he was in mainstream classroom till the age of 11 years. Until recently he was referred to SEN unit due to his learning difficulties in literacy and numeracy.

Learning difficulty and inappropriate intervention

Learning difficulties might arise from the fact that teaching strategies are typically unisensory. Most information is conveyed via visual means such as textbooks or whiteboard where vision is the predominant sense exploited in the classroom (Gori et.al, 2021). The development of new technology based on multisensory contingencies could help primary school children to foster their learning abilities. The teaching and learning process involving students in primary or pre-school should be conducted in a fun and inclusive manner with a variety of meaningful learning activities, to help stimulate cognitive domains and behavioral domains, as well as their affective domains, while helping students to control their own learning (Azid &Omar, 2022). From this statement it implies that the children should be exposed to variety of learning experiences from early age in order to perform better in schools. This proves that meaningful and enjoyable learning activities should occur during the teaching and learning process in the classroom.

Teachers need to be more flexible in implementing a variety of teaching methods as each student has different learning styles. The use of multisensory approaches is more effective than traditional teaching because students can actively participate in learning sessions. Teachers must therefore find new strategies to reach each and every student in the classroom and assist them in understanding and mastering new educational content (Delpont, 2021). To assist the child to overcome his difficulty the researcher has employed evidence based intervention using multisensory instruction focused on visuals, auditory and tactile modals.

Research question 2

Is there a significant difference in child's performance of spelling before and after the intervention?

Multisensory Intervention

The findings for this research question highlighted the increase in child's spelling ability after the intervention. The researcher carried out intervention using multisensory materials on visuals, auditory and tactile modal. The child was taught using flashcards, whisper phone and sand tray to enhance his spelling skill in the pull-out classroom everyday for 30 minutes. There were 10 CVC words given for spelling after the intervention where the child could spell 9 words correctly.

An improvement in the child's ability to spell after intervention could be provision of one to one attention consistently. It was carried out every day for 30 minutes from Monday till Friday for 4 weeks. The child was constantly taught with multisensory materials, first to identify letters then to spell the word associated with the letter taught. This multisensory approach is used so that he can learn actively to help him perform effectively.

Multisensory experiences enhance memory and help students to master spelling and reading skills especially when it involves two or more senses; visual, auditory, kinaesthetic. Some studies have shown students' improvement in spelling skills after a multisensory approach was adopted in their learning processes where they not only hear and see words or letters but also perceive the shape of the letters by tracing the letters on various media; paper, sand, or in the air (Omar &Azid, 2020). The use of multisensory approach can support the development of students' literacy as using more than one sense can help them keep the information learned in minds.

Literacy in particular is an inherently multisensory skill that benefits from differentiated reading instruction. This is because reading involves both recognizing written words and translating them into their corresponding letter sounds. For struggling students or those with reading disabilities, particularly dyslexia, multisensory learning can help them learn to use all of their senses while reading a book and rely on their strengths. Whether using it for classroom instruction or remedial assignments, multisensory learning can help all students develop or strengthen their literacy skills.

Reinforcement and Motivation

The idea that learning can be stimulated and enhanced through the use of rewards goes back at least as far as the educational practices of the ancient Greeks. In order for special needs students to benefit fully from learning opportunities in educational settings, reinforcement practices are crucial (Sen & Yıkıms, 2019). To further motivate the child, researcher carried out reinforcement survey to find out the reinforcement of his choice. From the survey on tangible reinforce, it was found out that he likes drawing activity and coloring pencils. As of the observation on several occasions it was noticed that he was fond of drawing and coloring pictures. So, providing coloring pencils and drawing book would motivate him to learn further. When the child was able to spell the given words the reinforcement was provided. It was given every week after he could correctly spell the assigned task. He was indeed encouraged to attend the intervention session regularly. Undeniably, it added value to his interest on learning to spell the words. In a special education classroom, more concrete reinforces such as edibles, tangibles, and activities were used, highlighting that students in special education classrooms may prefer more salient items or activities (Kim et al. 2021). Since children with disabilities need motivation to learn it is important to provide different reinforcement to aggravate them in learning.

Research question 3

How effective is multisensory materials in enhancing spelling skill of the child?

Positive view on Multisensory instruction

For this research question, three teachers teaching children with learning difficulties were interviewed. All of them had positive view about using multisensory instruction in the classroom. Although each teacher used multisensory strategy there was little variations on its implementation. Also the participants' different ideas with regard to multisensory teaching led to different practices in the three classrooms. That gives kind of flexibility. That was clear from the teachers' practices and the student engagement with the activities (Alwaqassi, 2017). All the findings from the three teachers were discussed based on themes derived from the interview: (a) types of multisensory materials used (b) how it is implemented in the classroom (c) effectiveness of its implementation and (d) challenges faced while using it.

Types of multisensory materials used

The result stated that using different multisensory materials to teach children with learning difficulties improves the overall learning. The teachers interviewed used mostly the visuals and auditory aids as it was easy to access it. Whereas the tactile materials were difficult to procure so they could not use it often. To get these materials it incurred money and support from the school administration. So teachers are quite reluctant to follow the protocols in order to buy the teaching aids.

Way of implementation

Apart from the difficulty in obtaining tactile materials, the teachers interviewed said that the multisensory aids were used to teach new concepts. It benefitted to teach concrete concepts where the real objects could be shown to make the children understand the lesson taught. They make the children see the objects, feel and name it. All the three senses are involved when the learners learns through visuals, auditory and tactile modals. It was stated that educators who effectively target more than one sense in every lesson are likely to have a greater percentage of student comprehension than educators who do not depend on the potential of multisensory teaching (Delport, 2021).

Moreover, there are multiple advantages of teaching through multisensory instruction as the varied learning styles of the children could be catered. The most prominent styles of children's learning are identified in the areas of visuals, auditory, tactile and kinesthetic. There is evidence that when the children are taught through activating different senses their long term memory is enhanced. When teaching is combined with multisensory practice, learning is cemented into long-term memory (Viji & Raja, 2017).

Effectiveness of Multisensory instruction

As per the three teachers' view on the effectiveness of using multisensory instruction, they shared similar thoughts on these. Both teacher A and B said that when the children are taught through multisensory techniques they remember the lesson for a longer duration. Also said that the children learn more when they see, hear and feel or touch as it caters to their different learning styles. Further, teacher C remarked saying that the multisensory aids are more useful to teach concrete concepts than to abstracts.

Challenges in using multisensory instruction

The teachers while practicing multisensory instruction have faced numerous issues in terms of limited time. It was difficult to manage the time as there are many children in the classroom with different special needs. When multisensory intervention is applied the teacher needs to give one to one service to each child, so having to cater to large number of children is really challenging. If there is lesser number of children the teacher holds the views of effective practice of multisensory instruction in the classroom.

Another challenge reviewed was the severity of child's disability. If the child has profound special needs the teacher would find very difficult to teach with the limited knowledge they have. This hinders the effective implementation of multisensory learning for this group of children. There was a view from one teacher that multisensory teaching is challenging to teach abstract concepts. It is difficult to show the models when the concept like dream has to be taught. However, there is need to explore other possibilities to teach abstract concept with different modal of multisensory learning.

It was concluded from the teacher interviewed that there need to be enough resources and trained teachers for the effective implementation of the multisensory instruction to teach children with special needs. The empirical study concludes that a multisensory approach can be effective in whole class teaching, but only when teachers are trained to deliver this approach (Boardman, 2019). If the children have to be taught using the multisensory technique the teachers should be professionally trained and need access to different tactile materials to implement it. There is no denial that teaching through activating multiple senses has more advantage on the children's learning if the teacher is prepared in all necessary aspects.

Recommendation for future research

At the onset of teaching spelling of words it is important to know the previous knowledge of the child on the letters and phonological awareness. It is highly recommended to teach the identification of letters before teaching to spell the words. It was found out that the child has difficulty recognizing all the 26 alphabets. It would have been effective to teach the identification of letters and sounds before moving on to spelling. There was need for one to one support to the child for intervention. But owing to the limited time confined to 4 weeks, only little could be done. There was limited time to teach phonemic awareness and subsequently provide appropriate intervention for spelling issues.

In continuation to the above recommendation, multisensory instruction can be used as differentiated instruction. The lessons can be differentiated based on children's learning style for visual, auditory and kinesthetic or tactile learners. It can be used in the mainstream classroom in order to cater to the needs of different learners. Adopting multisensory strategy enhances the spelling skill of the learners by catering to their specific learning styles. Thus, it creates a platform to practice differentiated instruction while attending to the needs of different learners with varied learning styles.

Provision of trained teachers to implement multisensory instruction is proposed further. Lack of trained teachers is also a major hindrance to effective teaching of spelling using multisensory instruction. Furthermore, the teacher should be passionate and enthusiastic to support the child beyond the school hours. At the same time there is need for proper and systematic instruction to teach spelling to the children with learning difficulties.

In this study only one set of multisensory aids were used like flashcards, whisper phone and sand tray. But if different materials were explored further it would have been more enriching and the learner would be motivated much. When the child is taught only through one same material the activity would be monotonous where the child may lose interest. To make the learning excited and create varieties in teaching lesson through multisensory instruction, it is important to explore and apply different materials. It is suggested to include other multisensory aids and also explore computer assisted devices to further enhance the child's learning.

It is crucial to ensure that the support is extended from school to the home as to maintain the continuity of what the child has learnt. From the initial stage of the child's ability to spell only two words out of ten words there was drastic change in the performance of the child after the intervention. The use of multisensory instruction was effective when the researcher provided one to one service to the child. It can be enhanced further if the parents or guardian can provide the similar services at home.

As emphasized in the studies that multisensory instruction is an evidence based approach to teach children different concepts using multiple senses, there are further avenues for educators to innovate new ideas. In addition, the teachers teaching the children with special needs may explore ways to incorporate multisensory techniques that best suits the child's need in the classroom. Further, there is room to probe into other subjects to intertwined multisensory instruction to teach the children with different special needs beyond literacy and numeracy concepts. To establish multisensory instruction as an evidence based approach in learning, there is need to delve deeper into this technique and present innovative ideas to benefit

all the children with varied disabilities not limiting to learning difficulties. And recommend how challenges can be confronted in its application for children with severe disabilities.

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