Designing interventions to help Engage parents and children with special needs.

Project 3

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Table Of Contents

1. Introduction

Special children that show signs of low motor abilities and movement, delayed mental and speech development; usually, have an IQ between the range of 40-55, These children are children with moderate intellectual disabilities (MID). The learning curve varies from child to child as they have very specific interests, most children that are part of special centers or schools have an independent learning plan for each child. But access to these centers, resources along with the financial strain; caring for these children greatly impact the quality of life of the parents falling in the low socioeconomic status. From discussion with field workers, this reduces the engagement of the parents with the child as they start caring for the child and reduce engaging in any form of activities with them. Most of these activities available for these children are not available at home and usually found in special schools or centers where caregivers usually engage in activities with the child. Relatives of such families lack awareness of activities of play with these children to stimulate social interaction. The direction of this project is towards designing interventions for families and support groups to engage children with special needs (MID).

The Initial Part of the report discusses the Field probes at the centers and the Parent-Child relationship and the network of interactions that influences their socio-economic construct. Followed by background research into existing work, toys and other related interventions in this area. Section 5 and 6 talk about the design approach of the project and the context of the interventions, with special considerations while designing for these children. This is followed by the design concepts and the final design with feedback from experts in the field.

Figure 1: Child engaged in his activity of interest

As part of this project, I worked alongside two special schools. After the initial probe, caregivers engage with the children through objects of play as well as activities that help these children develop basic self-help skills. These objects are basic toys that used to stimulate their senses through touch, sound, and sight. At home, the time spent after school is watching television along with the parents in a single room while playing with objects, these objects do not sustain engagement with the child and consequently, they develop an aversion to these objects. These children rely on parents for all the basic self-help skills that consist of but not limited to; waking up, having a bath, dressing up, eating and drinking. These skills are taught at special schools but children do not recall a task if it is not repetitive, as most of them lack motivation for a task. Caring for a child here is not felt like a responsibility, but a demand. [1]. In a low socioeconomic context, relatives and support groups are contributors in these situations by helping them meet some demands.

At Centers, the parents and child have developed a sense of a safe haven, where they can let their child play, explore and engage in activities in any way they wish to. But these activities in these places have become monotonous and teachers have developed adaptive ways to integrate learning into the repetitive task by stimulating their senses. But again they feel that the limitation of using a newer flash card isn't going to engage a child as it does not motivate them to perform a task. While there is a large amount of research that showcases the use of adaptive toys, sensory learning through storybooks and other activities. Less work is explored in the area of sensory integration in a digital medium for children with special needs. There exists a possibility to explore an intervention in this area, where it could help motivate the children to participate and engage longer in such activities. Parents and caregivers do not solely seek developmental goals that are too high that requires a longer duration to be accomplished, They would also prefer to engage in activities with the child where small levels of accomplishments are seen or felt.

"Sensory-based interventions have shown to enhance the perception of objects, followed by an increase in cognitive functioning; this, in turn, helps children with MID engage in task-based activities [2]"

The interventions seek to explore activities for engagement between the relationships (Parent-Child-Caregiver-Support group), that are affordable and have a low cognitive load. The direction of this project is targeted towards sensory stimulation through a digital medium .

2. Field Probe

For the purpose of this project two special schools were identified, one in the urban context of the city and another in a district about 90km from each other. The Initial probe spanned over seven days. A follow-up visit was scheduled after developing design concepts to discuss the ideas and obtain feedback for possible future directions from both the schools.

1. CSI Puthuir Special School, Perambur, Chennai
2. Mahimai illam Special School, Chengalpattu

The basis of selecting these clinics was based on the recommendation of social workers, availability of teachers and caregivers. A formal letter was submitted to the authorities indicating the purpose of the visit. Permission was granted to take pictures and recordings with discussions in both the schools. The primary mode of recording was a field book where discussions were transcribed and pictures for activities that they engage in.

The Mode of inquiry was semi-structured interviews with teachers, caregivers, parents and social workers and observations of student activities within the school. The questions were related to:

Socio-economic conditions of families
Activities for students
Modes of teaching
Availability of resources
Social interactions within the school
Assessment of the students
After school activities

Note: The discussion with parents and social workers are unstructured. There was no direct attempt to interact with the child without the presence of a social worker (figure 2).

Figure 2: Children engaged in their own activity of interests.

2.1 Socio-Economic Conditions

Parents | Income | Attitude

Parents work as day Labourers in small business and factories. Most time they spend with the child is limited to TV entertainment.

Most of them are unaware of the steps to take and fear the financial burden on the family as most centers are in major towns and cities.

The Men blame the wife for the condition of the child and refuse to take part in their growth.

Kids are taken care of by their Mother and Grandmother in most cases. Support group and relatives help in small demands.

Lack of awareness of early intervention programs to help their children, this leads to problems in later development years. Parents spend less time engaging with their child as they believe special school takes care of learning.

2.2 Special Schools and centers

Learning | Activities | Therapy

Students are asked to perform specific tasks and they are placed into the respective development plan.

Every student has their own plan. The Teacher works with the plan and records the progress.

Both the schools stick to imparting self-help skills first.

Flash cards (figure 3) are used as a primary mode of teaching children with a slightly higher learning capacity. These cards are also used to help them with basic tasks like grouping.

There are multiple repetitions of the task usually for three weeks minimum.

Figure 3: Activity cards in-use.

The students forget the task when they go back home for a longer vacation and come back to school. Even though the repetition of tasks is carried out, students show a reduced level of interest towards the task over a longer period of time.

Each Child has their own assigned tasks that they like to do, this is given based on the teacher's experience.

Once they lose concentration a new activity is given based on the same task.

Appreciation is given after each task and they are motivated by the teacher.

Teachers use custom made stencils to help them draw and improve Fine motor skills.

As part of the Madras developmental Program Syllabus, they are required to identify objects.

Students may not relate abstract to the real objects, when shown the video of an elephant (figure 4), they could not relate. This allows us to explore aiding the perception and cognition possibilities through designed interventions.

Coloring books of the kids are given to them as practice.

Colors are chosen by the child. Parents help the child at home to do simple tasks.

The child comes back to school and colors over the colors.

The child uses specific color sets. Indication of a preference or color sight deficiency?

Students could relate to the real, when asked to color the face, they color it brown. (Figure 5)
If the Child is actually Color Blind, how could we have known?

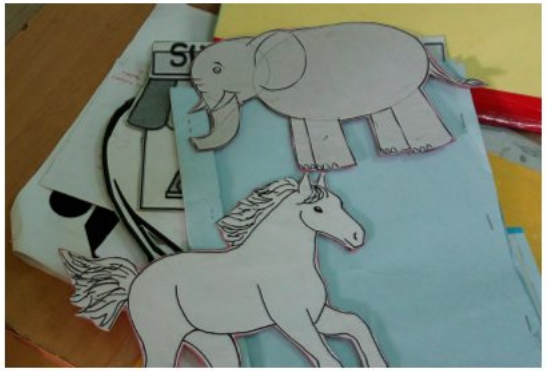


Figure 4: Elephant and the horse

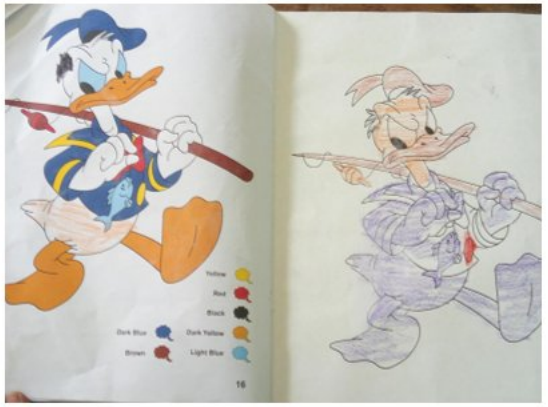


Figure 5: Child's coloring book, coloring the faces brown.

Basic Navigation exercises to create awareness of obstacles.

Motivation to complete a task is encouraged by other students.

A larger number of students help children engage in social interaction.

(Figure 8) Students are engaged when the task and activity are together. (figure 7) Navigating through obstacles are generally difficult for them, but when their classmates are participating the also give it a try.

Most therapy work is difficult in early intervention but effective.
Equipment is usually expensive and inadequate.
Uses phones as an alternative for music therapy whenever the child starts to scream (figure 6).
In the town school, gardening is used to impart skills and teach them about ownership.

Figure 6:: Child interacting with the phone for entertainment, keeps her occupied.

Figure 8: Class participation in a joke.

Figure 7: Navigating through obstacles.

Figure 9: Children communicate their emotions through gestures, A smile Hi-fi or a thumbs up.

Figure 10: Children participating in play activities outdoor inside the school grounds.

2.3 Social Interaction | Vocational Training

There are very few Livelihood options available for these students.
Most cases they do not want to leave school as they feel safe.
And also because of the Social relationship with other students (figure 10).
In one case, Teacher stopped teaching and started caring for the children.

Students use Hand gestures (figure 9) and signs along with vocal sounds while communicating within social groups to express interest or disinterest in the activity/Play.

2.4 Opportunities | Problem area

Help Children relate to the real: what they perceive vs the abstract that is taught. Students require a sensory integration into the things they learn, this might help them with better recall.

Explore tools to find color blindness in Children who have delayed development. Existing methods lack reliability due to low mental development and cognition.

Help parents understand possible ways to follow exercises at home through affordable interventions.

Create affordable tools to help kids increase concentration while performing a task. Most work is through art based, but the pencil/ art material might be difficult to grip, this might help strengthen fine motor skills.

The area of focus that this project would take will cater to design affordable interventions for families to engage children with special needs by focusing on the activities at home through sensory integration (figure 11).

Figure 11: Each child participating in their activity of interest.

3. Parent-Child relationship

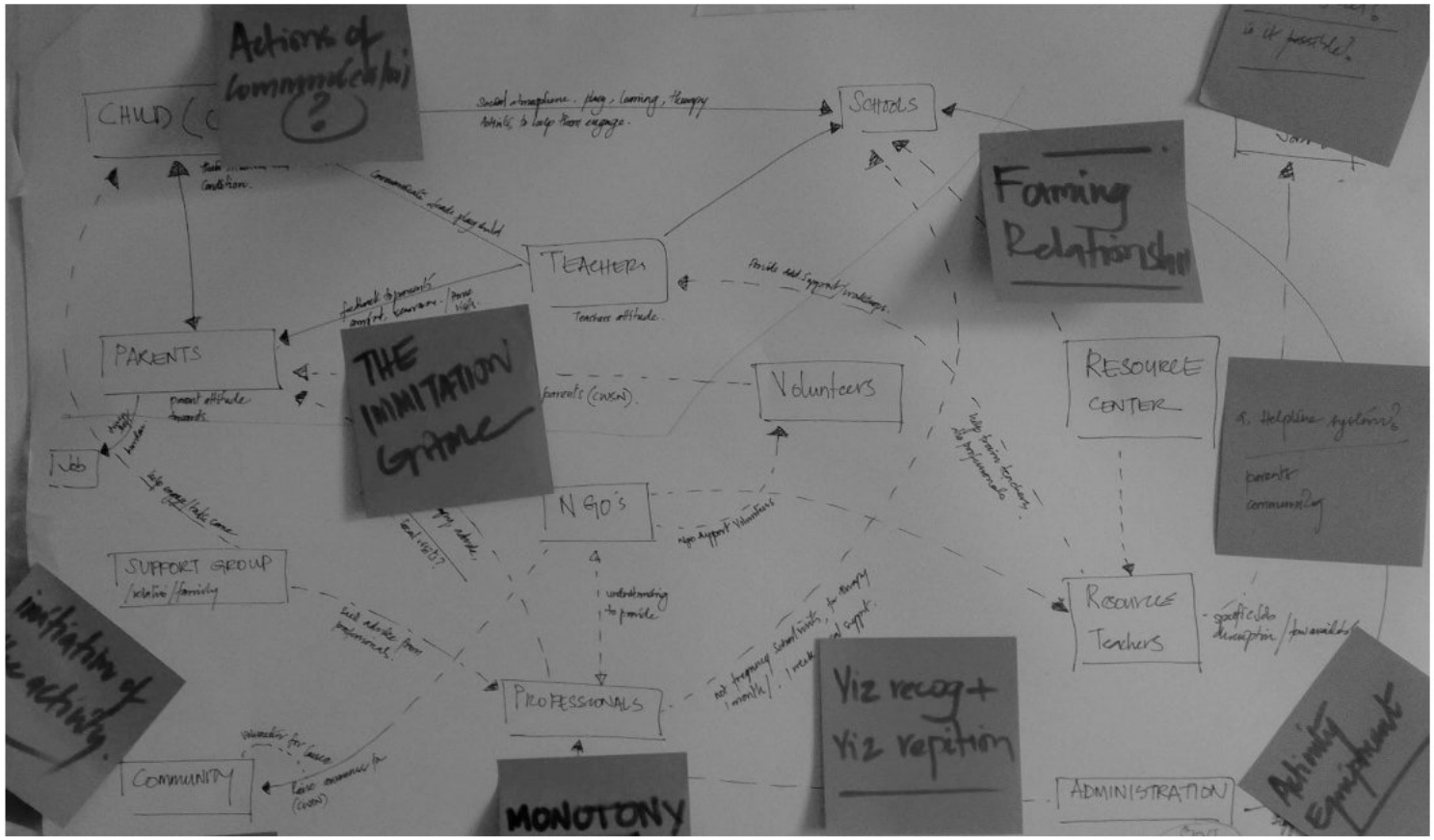
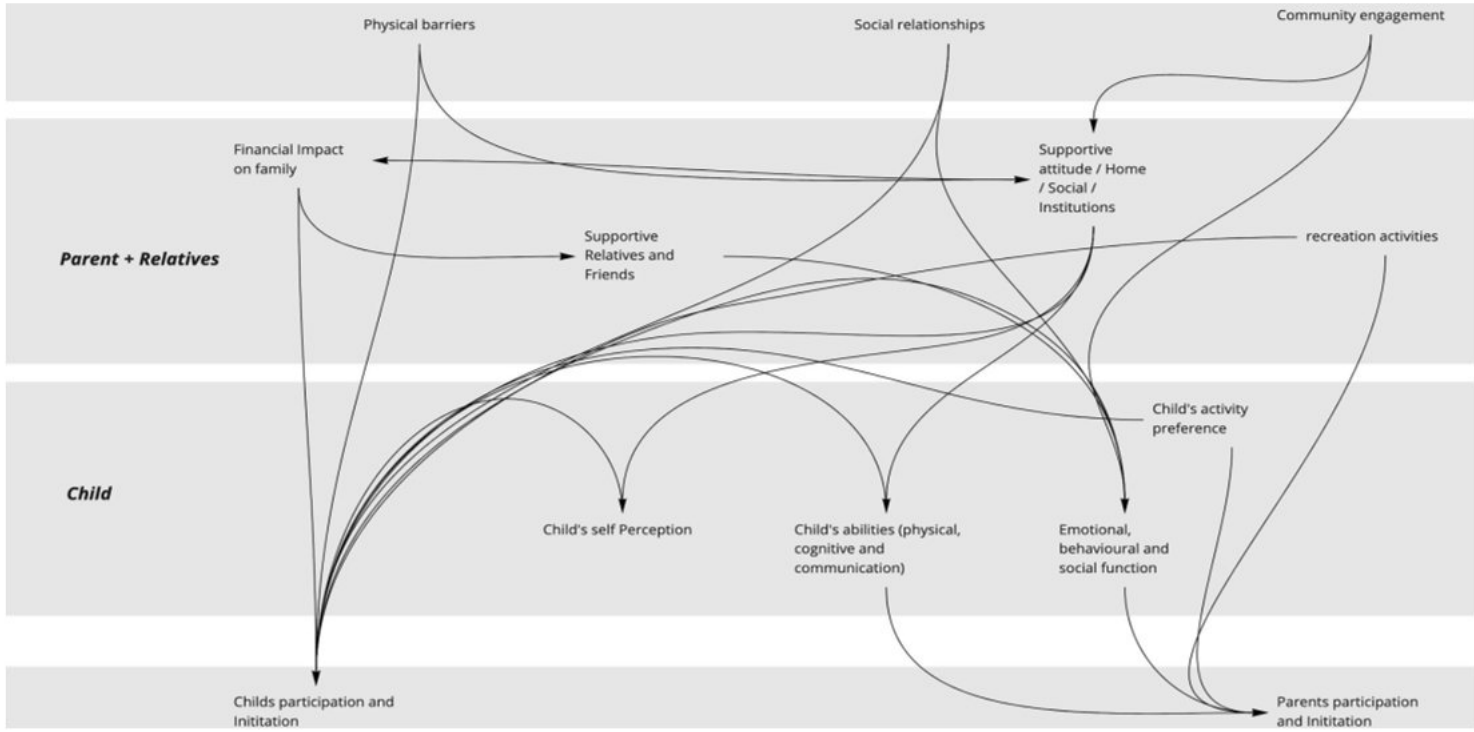


Figure 12: Plotting the parent child relationship

3.1 Parent-Child relationship Network

The participation of the parent and the child towards activities depends on major factors in figure 17. The studies have indicated that the low level of participation exists due to the factors present in (Figure 13) and the risk of the initiation of activities within this framework is lower within poorer socio-economic contexts [13].

Figure 13: Parent Child Relationship network



Dan Goodley et. al 2010, have identified that Parents in these context show a lack of participation as well as initiation due to the presence of developmental goals set by professionals. While they are aware of the reality of the child's situation, participation in leisure activities depends on the outcome of the activity. The parent being unable to understand the other ‘ways’ of playing feel the need to separate their children from participating in such activities. Schools and centers for the children are a safe haven for these parents as they are aware that the ways of playing is not limited to their earlier notion of participation. (figure 14) The earlier barrier of inclusion in play pushes aside parents as they look for subtle ways for their children to participate in the ‘normal activity’.

The sense of Joy by watching a child play promotes a healthy lifestyle and positive approach to the child. Parents do not seek high level developmental goals set aside for the child. “They would prefer to engage in activities where small levels of accomplishments are seen or felt.”

The design direction would aim to emancipate play activities for the child by focusing on helping the child engage in the idea of spontaneous play. This activity or play is to be intrinsically motivated not for the idea of any rewards or steps that need to be completed.

Figure 14: Each child have their own ways of engaging with the environment around them.

3.2 Emancipate - The playing child:

"If we teach children to play, are the children truly playing?" Researchers have studied therapeutic implementations of play in children with moderate intellectual disabilities. Play therapy claims that it helps few children control their emotions and provides a certain level of confidence while performing specific tasks (Vlaskamp, C. 2012, Dan Goodley & Katherine Runswick-Cole (2010) cited Porter et al. 2008) in their work they have cited few recurring discourses about the notion of play with children with MID, some of them include:

> *"A MID child can engage in activities only in a particular way. There is a need to correct the way they engage in activities and play (A normal way of playing) There is an unspoken idea of normality or standards while engaging in activities [12]."*

They argue that teaching a child to play or execute tasks that are based on the normative concepts of play isn't considered as playing. Instead they are labeled as pretending to play. So is the notion that children with MID follow 'improper play' vs proper play? Play, in major interventions are seen as a tool or therapy for the disabled child, which is taken upon by caregivers as a means to control the child and the family with regards to normalcy. (Dan Goodley et al 2010. cited Davis (1995)) Progressing towards this path, leads parents and caregivers who aren't aware of other possibilities, consider the basic therapy of developmental checklist goals that are structured activities as play or play intervention learning for the child. This approach does not give parents and children with MID the Joy and recreation of carefree play as they are under the subtle notion for the child to meet the developmental checklist goals that are given by professionals [12].

"As a designer our approach towards designing interventions for these children should not be based around the difference in them, but in-turn elevate the current possibilities by designing inclusive enabling approaches that are aligned to spontaneous play rather than a checklist of steps."

3.3 Social integration : Parent and support groups

While social toys could promote social interaction, Children with MID have varied interests and the existing toys available to those who have a low socioeconomic status does not promote interaction outside the school environment. This could be related to the lack of parent engagement in play activities at home with the children. (Figure 15) The subjective burden of these parents caring for children with MID have few literature that support engagement with children. Studies have indicated that parents contact the teacher of the school through telephonic and informal visits, But rarely for support plan and formal meeting. Mother's maintain constant follow-up sessions with professionals in regards to health and physical functioning [10].

While Sensory integration into activities of children with MID provides a positive feedback. Most of these occur in the environment of care centers or special schools rarely at home. Parents from low socioeconomic status remain unaware of the possibilities of sensory integration into learning. Parents engaging in activities with the child at home could help stimulate social interaction within support groups at an early stage [11]. But existing activities do not help the parents and relatives/support group to engage with the child. There exists a need to explore possibilities to help engage parents with MID children.

Figure 15: Parents and caregivers outside in the playground.

3.4 Sensory integration and the digital approach

Studies have indicated the positive effect of sensory feedback (touch, sight, taste and sound) with children with MID. (figure 16) While children learn through imitation, children with MID are less likely to be motivated by social interaction unless there is an expected reward in the task performed (sensory feedback) [14]. While studies have indicated a higher level of engagement with sensory based activities in typical children as well as children with special needs, there exists few research that talk about sensory integration into a digital platform. The initial work of (Bartoli et al.) using a kinect to explore the possibilities of touchless games did showcase some empirical evidence of the utilization of the digital platform but not into extensive multimodal sensory integration. While they worked with a specific group of children with ASD they explored the possible behaviours of autistic children with regards to the kinect application[14].

The fact is that most input methods for the digital platform seems like a barrier for these children as well as an expensive investment for the parent and the institution. Would this approach be appropriate for children with MID? Is a question that remains. This project would be an exploration into the field of sensory integration into a digital platform for kids with special needs. This would work towards sensory integration by incorporating custom gestures or sensory inputs to trigger events.

The degree of learning possibile is still uncertain, but the focus of this design would tend towards engaging the child in the activity of spontaneous play through sensory integration.

Figure 16: The class table and environment

4. Background research and related work

The background research would into certain aspects of sensory integration into the activities that engage the parent and the child with MID. The first area looked into would be sensory stories as most parents engage their children through colorful books, On discussion with a mother, they use the story books for the pictures and narrate their own story within their local context. The second would be the toys children engage with at the special schools and at home. These toys are termed as sensory toys as they help stimulate one or more senses in the child. Apart from these toys, adaptive toys exist as teachers and caregivers modify existing toys to suit a child's specific interest while engaging in an activity. While The first two areas look into the physical aspects of engaging the child; the third looks into the sensory activities available through a digital medium that help in triggering sensory experiences for children with MID.

As children with moderate intellectual disability interacts with objects, there is a possibility to integrate and enhance their sensory experience through either active or passive methods of learning and play. Sensory-based interventions have shown to enhance the perception of objects and followed by an increase in cognitive functioning; this, in turn, helps children with MID engage in task-based activities [2]. The reliability of the study based on success in an activity cannot be measured by a checklist; but, through the help of professionals who have constantly interacted with the children [16]. Children with moderate intellectual disability have an aversion towards participating and engaging in activities, this is due to their low cognitive function in most cases but also due to the fact that their interest lies elsewhere as studies have indicated ways to find preference of activities, in most schools/ centers teachers and caregivers, have an idea of their preference due to long term engagement with the child. This aversion or disinterest leads to low recognition and recall of specific repetitive tasks(for example, self-help while eating a small snack).

There exists a need to explore other ways to help these children increase their interest and motivation by engaging them through a sensory experience [3]. Though there may not be large empirical evidence to back up the effect of sensory integration on the overall development, few children have indicated a significant interest level towards particular activities. These activities that include sensory based therapy are often costly due to the resources used to implement them when scaled up into a classroom or a home based environment. Here exists a possibility for an Design intervention to explore affordable variations of the sensory experience devices in resource-constrained environments.

4.1 Sensory storytelling:

"It's not just about understanding or learning something from a story; It's the joy of someone engaging with you through their actions, their attention, the way they communicate to you, and much more...(Grove 1998) [4]."

Multi-sensory storytelling enhances the experience of storytelling by adding the five senses of visual, auditory, tactile, smell and taste into an activity that helps convey but not limited to learning, entertainment, and social sensitivity. There is a possibility to increase the motivation of individuals by listening to the storyteller and in turn help find experiences that trigger their senses. ten Brug et al. (2012) studied 49 multisensory storybooks and looked at them based on Promoting a more inclusive society guideline Fig.8

	Constructing a multisensory storytelling book	*Reading a multisensory storytelling book*
Book in general	A title is present The story has a clear end	DSP takes time to read the book (4–6 min)
Sentences	Sentences are written on a story script Maximum of two sentences per page Sentences are directly related to the stimuli	No additional text is used in addition to the original story script
Pages	One whiteboard per one or two sentences Whiteboards are present Maximum of eight pages	Whiteboards are used
Stimuli	Stimuli are attached to the whiteboards Maximum of one stimulus per page, which may address multiple senses	Stimuli are actively offered to the person

DSP, direct support professional; MSST, Multi-sensory storytelling.

Figure 17: PAMIS Guidelines for MSST [4].

The components of what constitutes an MSST book are detailed out with a case to case basis (figure 17). They gave an example of a book based on dinner and how a PIMD associates a spoon with eating. They probe into details about the observations one should make while creating an MMST book or going about reading one. The problem with MSST is that the way the story is being read impacts the listener, in most contexts the caregivers diverge from the content in the storybook or are unable to utilize the content efficiently. This greatly affects the quality of a Multisensory storytelling session with the children even though the content of the book might be good [4]. But the Children are not usually bothered by those aspects, for them, it is an opportunity to engage with the caregiver and participate in any form of activity that they respond to; with a certain level interest.

4.2 Sensory Toys and devices available in the online market:

Enablingdevices.com [7] and cheapdisabilityaids.co.uk [8] are two major online retailers for sensory toys for special needs children. These toys are not affordable for people that fall in the low socio-economic background. We Take a look at the toys and devices they offer for skill development through their catalog of enablingdevices [7].

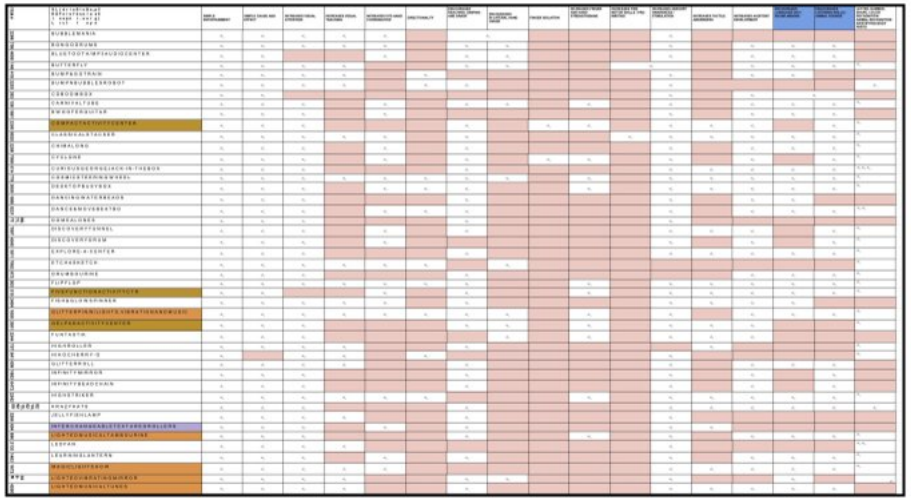


Figure 18: Skill development table vs items in the enablingdevices [7].

The devices (figure 18) listed are rated by checklist of the standard skill development chart that contains:

-Animal Recognition
-Auditory Development
-Bilateral Hand Usage
-Cause and Effect
-Color Recognition
-Directionality
-Entertainment
-Eye-Hand Coordination
-Fine Motor Skills
-Finger and Hand -Strengthening
-Finger Isolation.
-Identifying Body Parts
-Language Development
-Letter Recognition
-Listening Skills
-Number Recognition
-Pre-Writing Skills
-Reaching, Swiping and Grasp Sensory Awareness
-Sensory Stimulation
-Shape Recognition
-Sound Production
-Tactile Awareness
-Visual Attention
-Visual Tracking

A close look at the chart from the figure 9. it is clear that while the products satisfy some skill development, but most of them fail in Directionality, Bilateral Hand Usage, Finger and Hand Strengthening, Fine Motor Skills/ pre-writing. Though these products are expensive they do not provide an overall experience. To cope with the differences in experiences they stack them together as learning Kits which are not affordable. Designing sensory interventions for skill development should cater to the checklist. While there might not be a minimum rating based on the skill development chart, attaining the maximum possible should be a deliverable.

A study conducted looked into Modified ordinary toys into adaptive toys. They are designed to cater to the specific needs of the children, with respect to their individual disabilities and the toys they use; usually decided by the teacher and caregiver. They indicate a better response towards the adaptive toys vs the ordinary ones during play sessions with children with MID [5]. Children with MID responses have large variations based on the type and kind of toys. It is observed that an increase in social interaction is seen with the use of social-play toys; these include but are not limited to balls, blocks, soft toys, and toys with wheels [5]. This was also identified through the field visit at the two centers during the duration of this project.

Products	All	Only letter shape number	Reach grasp	Auditory-Lang-Listening
SIMPLE CAUSE AND EFFECT	98	62	78	54
INCREASES SENSORY AWARENESS / STIMULATION	94	58	74	51
INCREASES VISUAL ATTENTION	86	58	70	45
INCREASES AUDITORY DEVELOPMENT	80	52	64	54
ENCOURAGES REACHING, SWIPING AND GRASP	78	52	78	44
ENCOURAGES LISTENING SKILLS / ANIMAL SOUNDS	67	49	55	54
LETTER, NUMBER, SHAPE, COLOR RECOGNITION ANIMAL RECOGNITION IDENTIFYING BODY PARTS	63	63	52	40
ENCOURAGES LANGUAGE DEV / SOUND MAKING	60	42	47	54
INCREASES VISUAL TRACKING	53	36	41	30
INCREASES EYE-HAND COORDINATION	47	32	38	33
INCREASES TACTILE AWARENESS	43	29	39	23
INCREASES FINGER AND HAND STRENGTHENING	27	24	24	17
DIRECTIONALITY	23	20	16	13
ENCOURAGES BI-LATERAL HAND USAGE	15	9	13	8
INCREASES FINE MOTOR SKILLS / PRE-WRITING	12	9	10	8
FINGER ISOLATION	4	4	4	1

Figure 19: comparing the toys and devices available along with the enablingdevices [7] vs the individual category

4.2.1 Sensory enabling devices comparison with individual categories:

(Figure 19) The number of products listed is 98, the other existing products available in others marketplaces had similarity to the majority of the products present in the device catalog, hence this only looked at the majority of the product features listed in figure 10 which overlap the skill development chart.

While most toys showcase a simple cause and effect, with regards to individual categories of toys like letter, shape, and numbers vs. reach and grasp or auditory listening. It is evident in the lack of available toys and devices in the fields of visual tracking, hand-eye coordination, tactile awareness, fine motor, finger isolation, and directionality.(Figure 20) A closer look at the chart we identify places of interventions to explore in helping the child to develop skills relating to a particular task or activity. This observation is limited to the sample set and does not justify the total lack of toys or devices in particular areas. But instead used as an approach while designing interventions for both children and parents by looking at possible areas of interventions that are not explored in-depth. While looking at designing these toys or interventions in these areas, the socio-cultural context plays an important factor as in most cases the availability of these devices to most children is limited only therapy sessions. These sessions play a vital role in engaging the parent-child relationship with the help of professionals and caregivers.

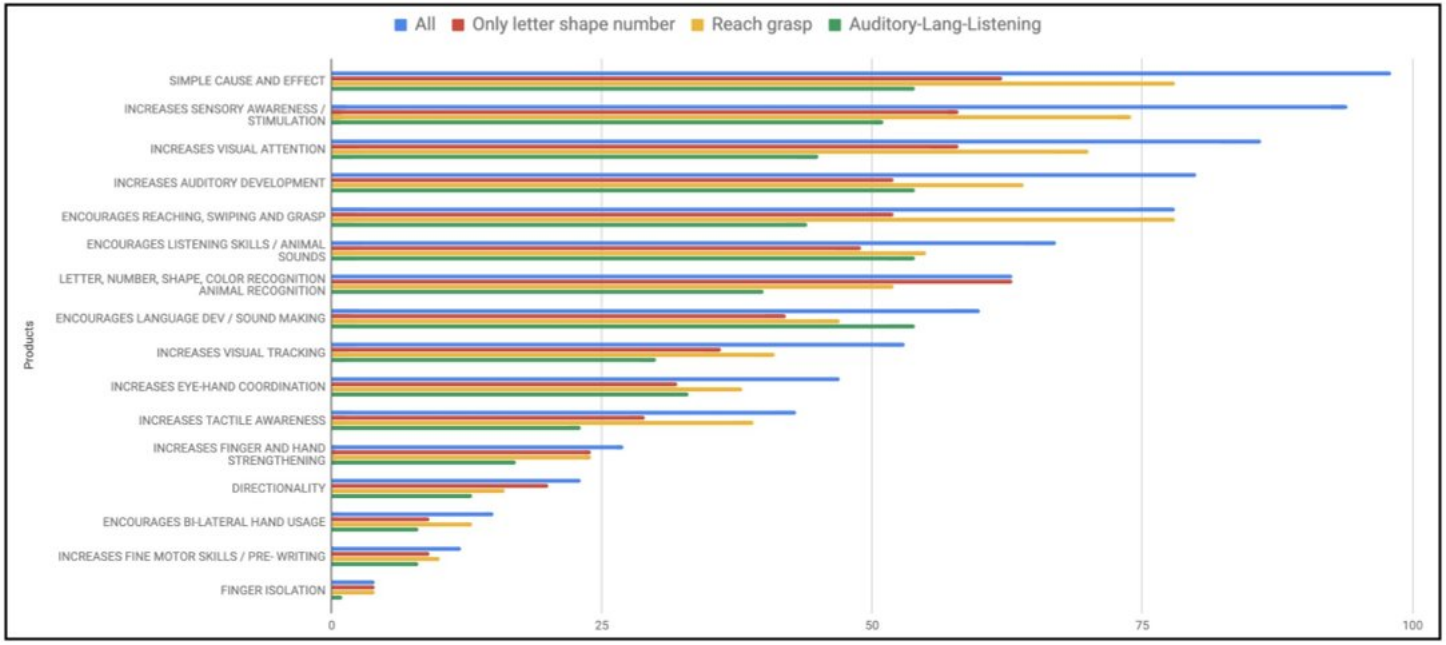


Figure 20: Comparison of the toys and devices available along with the enablingdevices [7] vs the individual categories.

4.3 Sensory toys in India

(Srinivasan, 2012) talks about the taxonomy of toys available for children with special needs in India; the need to educate parents to enhance the toy awareness while simultaneously efforts are needed to be taken up to make toys for affordable and accessible [9].

Age	Toy Examples
Babies	Handheld toys, musical toys, noise makers, unbreakable mirros, refelectig toys, sensory toys, socks and wrist rattles, contrast toys, wind chimes etc..
Infants	Activity toys, light weight rattles, noise makers, squeakers, rubber toys, stuffed animal toys, dolls, teethers, activity quilts and play mats, crib toys, teethers, strollers, car seat toys, cloth toys, squeeze toys, hanging toys, hand puppets moved by adults, audio-visual lullaby CDs to be played by adults, bath toys, wrist rattles, light and sound toys, texture toys, spinning toys, soft toys, etc
toddlers	Books, balls, houssehold items, wood and soft toys, moving toys, push toys, shape sorters, toy telephone, books, blocks, pail and shovel, stack and roll toys, filling and emptying toys, manipulating, pretending, splashing, stacking, pop-up toys, screwing-unscrewing, lock-key toys, role play toys, riding toys, masks, etc
pre scholers	Large building blocks, push and pull toys, sorting and nesting toys, climbing gym, balls, washable crayons and paper, ride-on vehicles, picture books, play house, toy instruments, puzzles, illustrated books or CDs, train sets, skip-hop toys, construction toys, creative toys, games, viewing instruments, hearing devices, carpentry sets, blowing-sucking toys, etc
primary school	Ride on toys, balls, art supplies, percussion instruments, dress up clothes, child size household articles, construction toys, puzzles and manipulatives, scribble boards, board games, model building, science and optical toys, collectibles, card and board games, etc

Figure 21:Taxonomy of toys in India.

4.4 Sensory Stimulation through digital mediums :

Sensory integration into physical toys have been explored in depth and have showcased the positive effect on these children. But studies regarding a digital medium is limited. Most exploration is looking at individual sensory input, such as touch, sound, and sight. Applications and products such as Kinect and openCV have opened up new possibilities to integrate other sensory modalities. (Franceli L. et al. 2017), designed 'bendable sound' where kids with autism could interact with a textured expandable cloth to explore sounds that are projected using a projector and a Kinect device(figure 22). Similar work using both a projector and the Kinect device is seen in (Sergi Jordà et al. 2007), reacTable a live music table that is used by professionals for table tangible interface for live music concerts, this again uses a Projector and a tool to capture the inputs using ReactVision(figure 22.1). This tool is complex and is meant for high functioning individuals with a higher IQ. The inputs are tracked through markers that in turn interpret the data, this in most cases is unreliable and restrists interacting with the objects in 2D. The Initial work of (Bartoli et al.2010) using a Kinect to explore the possibilities of touchless games has seen a great acceptance with kids with autism and a high level of participation. These initial explorations provide us with an opportunity to explore sensory integration into a digital medium to help children with MID engage and participate with such activities.

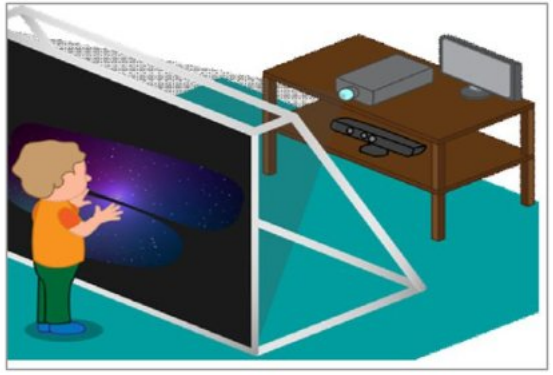


Figure 22: Bendable sound enviornment setup

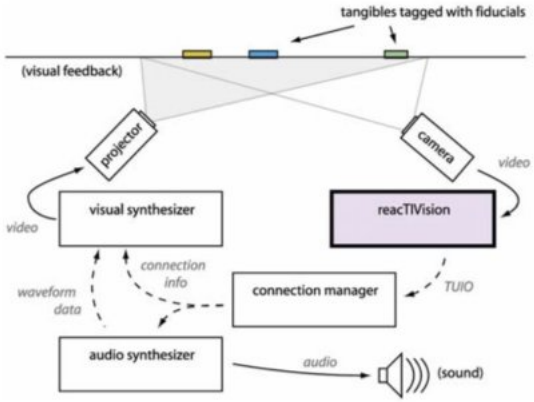


Figure 22.1 : ReacTable environment setup.

4.5 Problem with existing digital mediums and opportunity:

The Problem through with such explorations is that the cost of these devices are proven to be expensive and the setting up of such environments is time-consuming. Looking at more feasible solutions that could work in resource-constrained environments would be an approach to this design process. These devices only allow one modality of interaction with the interface. Hence, the design output would try to integrate a multimodal input for these children. As the existing devices function on single inputs, these children will not be able to interact with the system as every child in these resource constrained centers have different preferences and accessibility issues based on their condition. Integrating multimodal input into digital activities for these children might motivate them to participate; and have a longer engagement, with an enjoyable experience with the digital activity; as they are not constrained or limited to interact with the technology in a restricted way.

5. Design Approach

Placing the design in the context of the relationship between parent-child is considered crucial, initial ideas focused around interventions that cater to relationships within a home-based environment as well as during the travel to the school to engage the child. After Discussion with experts and initial ideation feedback, the chosen **place of intervention would be at the Centers or special schools.** This is primarily due to the fact that they are a safe haven for these parents as they are aware that the ways of playing is not limited to the notion of normal play.

5.1 Places of intervention : Child-Parent relationship

After Discussion with experts the chosen place of intervention would be at the Centers or special schools. This is primarily due to the fact that they are a safe haven for these parents as they are aware that the ways of playing is not limited to the notion of normal play. The Parent-child can engage in any activity without the worrying about the other participants. Teachers Believe that these centers provide opportunities for other parents to get together, as it helps community bonding.

5.2 Design concept directions:

The concept direction would wish to challenge generic preconceived notions that:

> *"A MID child can engage in activities only in a particular way.*
>
> *There is a need to correct the way they engage in activities and play (A normal way of playing)*
>
> *There is an unspoken idea of normality or standards while engaging in activities."*

The design direction would aim to emancipate play activities for the child by focusing on helping the child engage in spontaneous play through the sensory integration with digital mediums. (Figure 25) To work with this approach, the designed concepts look at the developmental parameters to consider for sensory integration.

Figure 25: Sorting and Deciding a design direction.

Initial Design Concepts

Below are the initial ideas that focused around interventions that cater to relationships within a home-based environment as well as during the travel to the school to engage the child. But Addressing the problem at core context level of home is problematic as parents have heavy burden of managing the family needs, Later finalised concepts cater to the context at special centers.

Initial Ideation

Initial C1 : Sensory activity in the Bus
Providing activities on the mobile bus to centers as a leisure activity for parents and children to build support communities in local districts and raise awareness. Most Special Schools are located away from sub-urban areas and parents travel with their child in public transport. Providing activities on the mobile bus to centers as a leisure activity for parents to engage their children. A rigid magnetic band which they can loop around objects in reach. Or create new ways of use eg Knots in the bus.

Initial C2 : Sharing Sensory Bands
Help teach basic learning concepts through parent-child engagement.
Could promote social interaction. Concept integrates touch into the learning process. The Bands are worn on both parent and Child. The Parent starts to help the child understand counting, grouping and sharing. By moving the bands from their hands to the child (figure 23).

Initial C3 : Sensory Work Pencil
Redesign of the pencil for Children with MID as existing add-ons will not help. As most parents help the child write in the initial stages.
Explore alternatives into Existing pencils/Stationery
Writing Ball to help children incorporate play into scribbling.

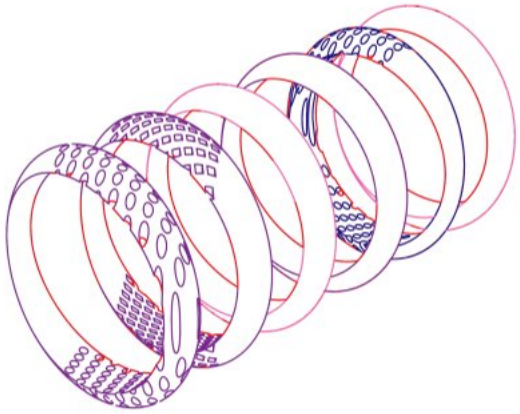


Figure 23: Sensory sharing bands

Initial C4: Sensory Phonebook

Parents Engage their kids while doing the exercise of coloring. By animating the 2d character vocally. But do kids imagine them the way we see them in the real world? Sensory Phone book is a flashcard aid to help parents while engaging their child (figure 24).

Using NFC Sensors integrated with learning cards to help parents and child engage in learning and discovery activities. These cards are simple to use and require low cognitive load while interacting.

Content of learning are Short Audio+Video Clips based on the card. The content is based of the Basic Skill development guide.

Alternative forms can be explored to develop fine motor skills. And make them more appealing to the kids. They can also be used as a communicator. Can also be incorporated into other objects like drawing stencils, objects etc . . .

Initial Ideation Feedback:

Designing complex activities around simple tasks would be difficult for the children. Though these activities (C1-C4) might be simple, they could play an integral part in the learning development of these children within the close relationship of the parent-child. But Addressing the problem at core context level of home is problematic as parents have heavy burden of managing the family needs. Spending additional time apart from taking care of the child would be seem as an additional burden. The approach could seek interventions at different places/areas within the context of their interaction.

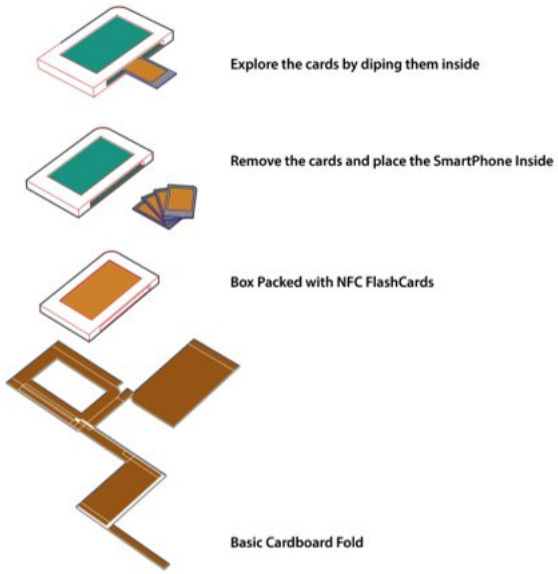


Figure 24: Sensoryphone book concept illustration

6. Design Concepts Development

While focusing on sensory integration it is essential to look at the development parameters one would choose to work with while going forward with the design decision. (figure 26) Most parameters are inter-connected, while designing one should be aware of the other factors that might promote positive experiences or prove to be a harmful experience.

Figure 26: Development skill chart for children with multiple intellectual disabilities.

6.1 Sensory checklist and concept development

Sensory stimulation through a digital platform would require objects that have developmental properties (figure 27), this checklist provides us with basic areas we could consider while designing.

Sensory exploration	
auditory	Bell, rattle, music, horn, whistle, speech
visual	Color, light, pattern, movement
tactile	Rough, smooth, hard, soft, furry
Motor skills	
strengthening	Increasing muscle power for functional movement
endurance	Increasing muscle tolerance for longer operation
range of emotion	Moving hand joints through full range of flexion, extension, opposition
finger dexterity	Dissociating one or more finger from others for in-hand manipulation
bilateral handuse	Using both hands together to play toys
eye-hand coordination	Visually monitoring hands for grasp, manipulation, and release
accommodation	Anticipating and shaping hands to the configuration of the object
cognitive procedure	
object permanence	Visually tracking a object, knowing it still exists when out of sight
Problem solving	Inventing ways to obtain desired events
Vocal imitation	Vocalizing and imitating sounds and words
Motor planning	Using simple and complex motor schemes to interact with objects
Operational causality	Attempting specific steps to get an interesting spectacles repeated
Practical characteristics	
Access considerations	How easy/hard the toy is to be used? Does it need modification for use?
Physical characteristics	Durability and safety should be incorporated into the design of the toy
Adjustability	Does it have adjustable height, volume, and level of difficulty?
Developmental considerations	Is it function and age appropriate? What types of toys can attract these clients?

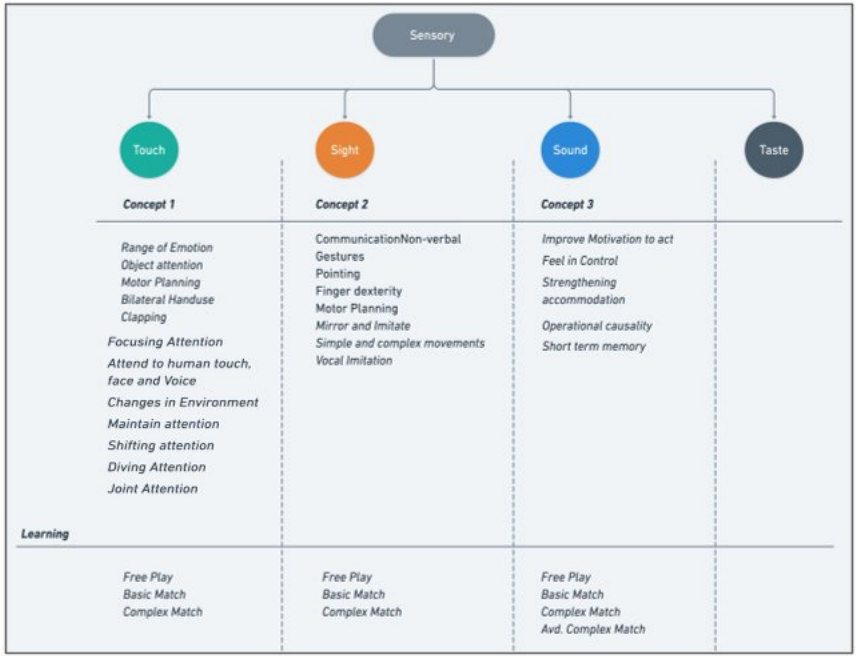


Figure 27: concept development checklist for parameters to consider while designing for children with MID

6.2 Digital activity design guidelines :

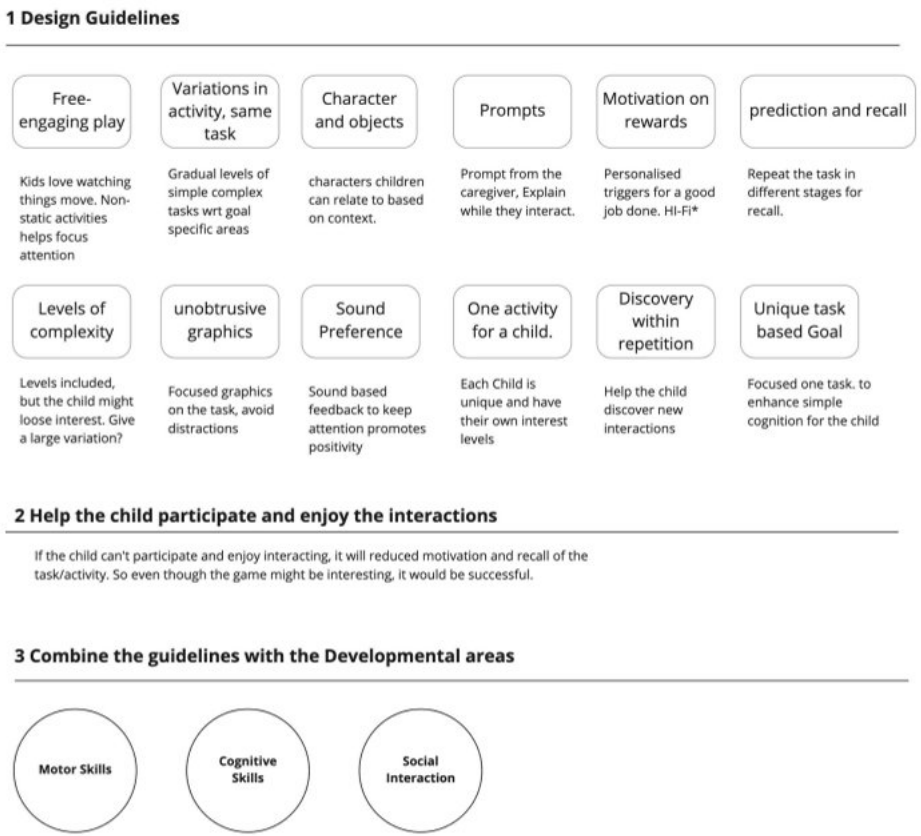


Figure 28: Modified approach to Laura Bartoli et al [19] designing games for autistic children.

Designing activities for children with MID follows a slight modified approach to Laura Bartoli et al [19] designing games for autistic children. Here we first look at the possibilities of engagement; this ensures that the user group or the type of disability we are designing for would prefer to participate in that particular method of interaction; followed by choosing an appropriate specific development area or a combination of both to aid the activity for the child (figure 28).

6.3 Sound preference among the children MID:

Franceli L. et [20] have identified preferences of music and sound with autistic children. This approach helps the designer to understand,integrate and make decisions towards specific type of instruments, pitch and sound to be incorporated into the designed intervention (figure 29).

"Context of these children play a crucial role while working with sounds. Some children may have never heard a particular instrument whereas others might have preferences of sounds. Incorporating both approaches into the designed outcome would improve participation from the children"

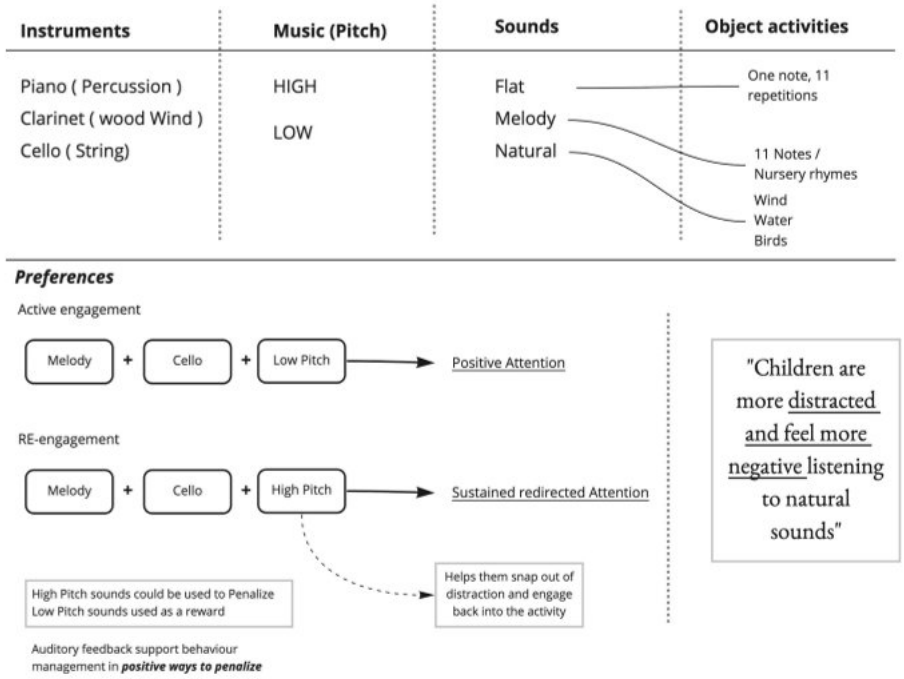


Figure 29: A general overview on the identification of sound preference of children based on the instruments, the pitch and the type of sound.

6.4 Learning theory and Sensory Integration:

Kristina T. et al [22] while designing for Neurodevelopmental differences have applied vygotsky's scaffolding learning theory into their work while working with special needs children. Using a similar approach we mapped out possible skill development concepts onto the scaffolding learning method (figure 30) and identified possibile learning modules that could be build upon one and another while developing concepts for sensory stimulation. Most schools in the visit follow a similar repetitive sequence of teaching skills but the activity during engagement is based off the child's interest to participate. Hence building on previous tasks require the task activity to grab the attention and participation of the child, where they can actively participate, engage and learn. while we explore concepts for sensory stimulation through a digital medium, Incorporating this approach can help these children actively engage in learning repetitive tasks that usually seems monotonous over a longer period of time.

Figure 30, showcases the increasing level of complexity that can be incorporated by starting with free play to non verbal communication play to verbal communication tasks such as spoken shape name.

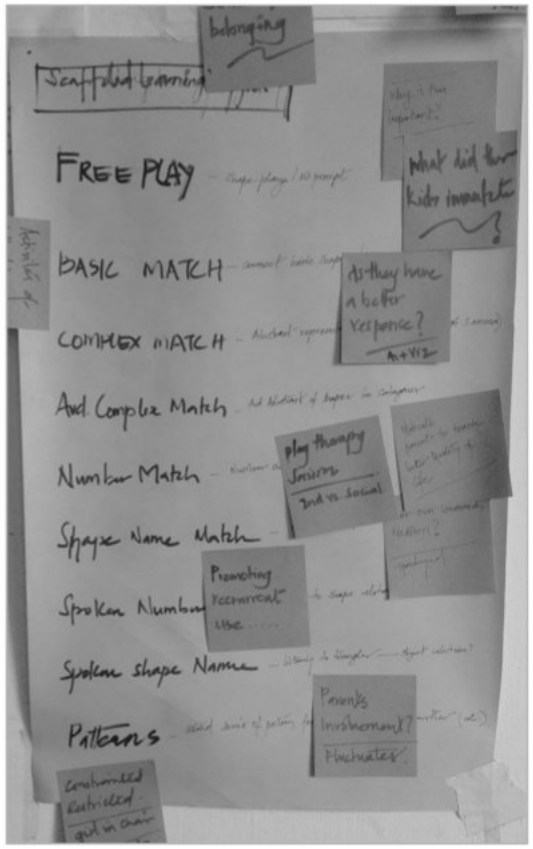


Figure 30: Vygotsky Scaffolding learning

6.4 Special Considerations while designing:

Environment and spatial awareness:

- ❑ The Child must feel a sense of familiarity with the space; interventions at places where the child can recognise the space, avoids putting the child under fear.
- ❑ Let the child engage in the activity with free play
- ❑ Try to help the child avoid distractions by hiding the intervention, this creates a sense of curiosity until it is revealed.
- ❑ Avoid directly playing loud sounds, certain children are hypersensitive to the noise. Freedom to choose their sounds might be beneficial

Prompts while engaging:

- ❑ Do not try to engage with the child without the help of the caregiver.
- ❑ Vocal and visual prompts are necessary as a majority of the children learn through imitation of the activity.
- ❑ Let the child engage in the activity in their own way first, follow up by prompting them if needed.

Repetition and recall:

- ❑ As studies have indicated, repetition aids learning for children with MID.
- ❑ Let the child and the caregiver interact with the intervention together.
- ❑ Always reward the child for while engaging, they recognize gestural appreciation.
- ❑ Let the child be distracted with other activities, they usually do not have a long sustained attention, bring them back to engage with the intervention only if they are interested. Do not force them, they will retaliate.

Interaction

- ❑ Free play through the intervention encourages sustained attention.
- ❑ Increase the complexity of the game if possible
- ❑ If Negative behaviours are observed during interaction with the child or between children seen care from the caregivers. Do not try to engage them with the activity, we must not be obtrusive.

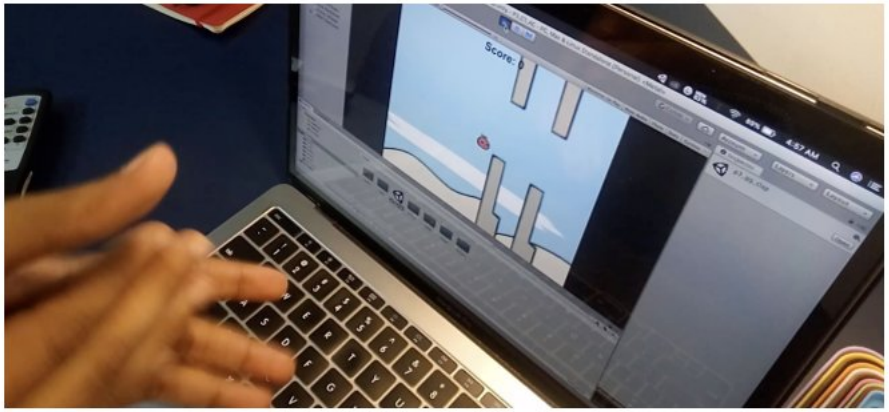
These have been identified by Sudha M. Srinivasan et al. and other similar studies [19][20][21]. They help in framing and planning design concepts while making decisions on the interactions of the outcomes by the participants.

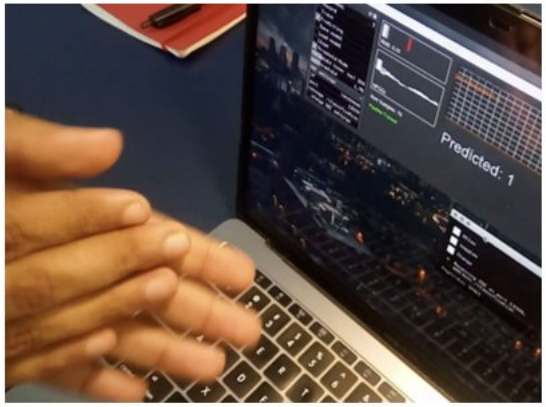
6.1 Design Concepts

6.1.1 Concept 1:
Sensory: Touch+Sound+vocal.

Sensory based Input is the Clapping sound that controls the object as it passes through the obstacles. This helps the Child follow the object and co-ordinated hand use (figure 31). Another application in progress is using sound to control the object, this helps children control their loudness while they express themselves. The Input of Play here is both the sound generated by clapping or by Vocal Imitation.

Learning concepts: Free Play + Basic Match
Tools used: ML5.js Library, Wekinator, AudioClassification, Kadenze - ML, Unity - Assets





Note: The Initial Prototype is to test the proof of concept, and the game designed is based off simple known game concepts. Iterations on new game activities will be explored.

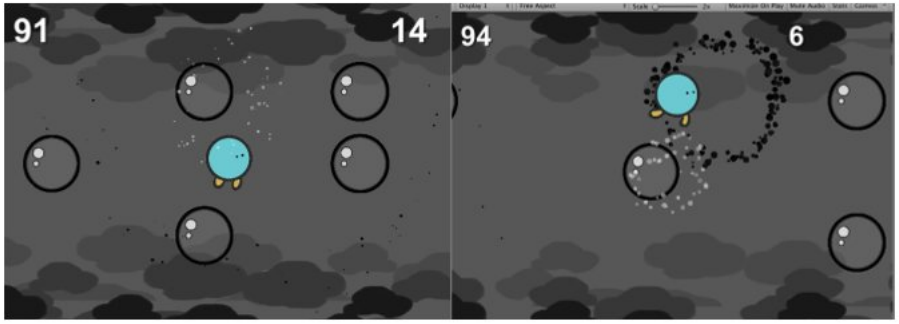
Figure 31: Vocal and touch input as input for digital activities.

6.1.2 Concept 2:

Sensory: Sight+Touch.

Sensory feedback on object imitation [14] showcases the child's ability to adapt learning by imitation, this concept seeks to help children engage in play activities by using custom gestures as inputs. The details of the kind of gesture is related to the activity of play. This could possibly help improve finger dexterity as well as other motor functions. Combinations of tactile objects as sensory input is possible to aid other developmental skills. This is possible with new open source tools to programme ML datasets to interpret the input accordingly (figure 32).

Learning concepts: Free Play + Basic Match
Tools used: ML5.js Library, Wekinator, Convnetclassification, Kadenze - ML, Unity Assets



Note: The Initial Prototype is to test the proof of concept, and the game designed is based off simple known game concepts. Iterations on new game activities will be explored.

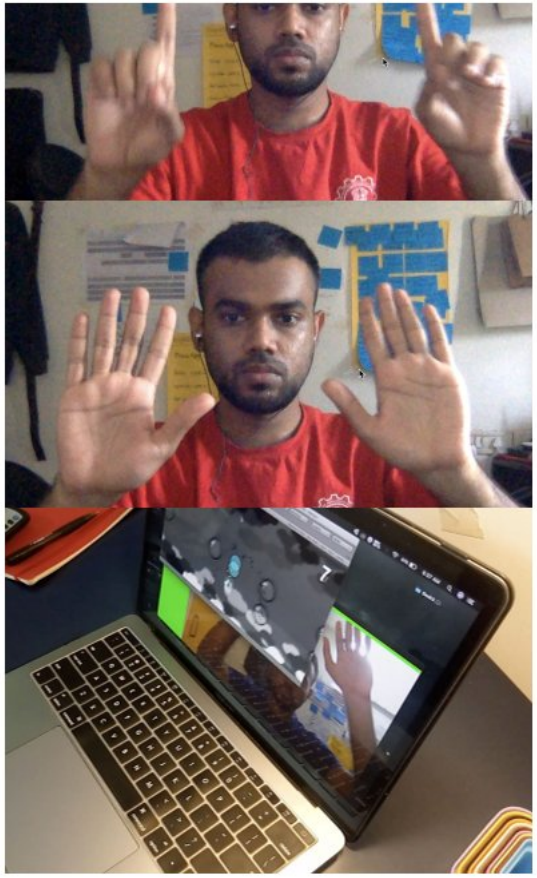


Figure 32: Initial Interaction to control characters on the left

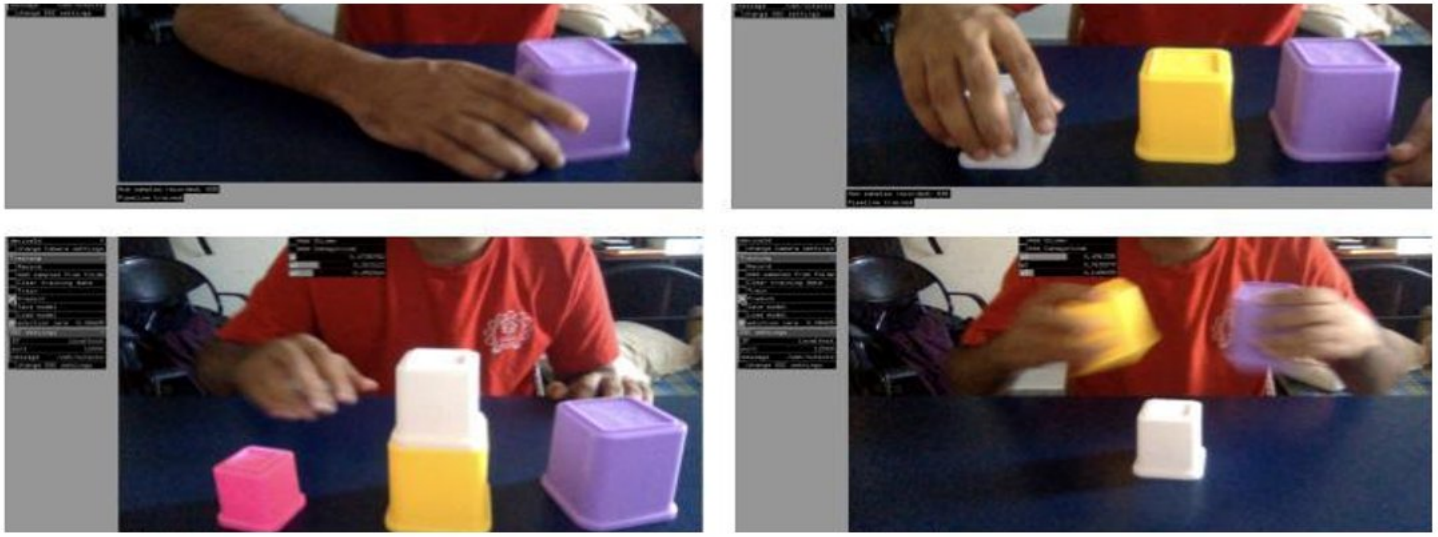
6.1.3 Concept 3:

Sensory : Sound + Touch

Sound is an integral part of the sensory input as well as therapeutic in nature, but children with MID have little to less opportunities to engage in sound making activities. This concept seeks to help children explore sounds and make music while playing with objects (figure 33). This concept emphasises is on free play, where the outcome of the music is based on their combination of the objects. Note: the prototype below used off the self objects to test the concept. (concepts of stacking and hierarchy to trigger different sounds).

Learning concepts: Free Play + Basic Match + Avd. Match + Memory
Tools used:ML5.js Library, Audiosynthesizer, Convnetclassification, Kadenze - ML, Unity-Assets

Figure 33: Free play with music making blocks



6.2 Concepts FeedBack: Expert Opinion

Field re-visit

The develop prototypes were taken back to the two centers in field visit to obtain expert feedback and opinion (Figure: 34). This session with both centers was spent in discussing possible design directions (Figure: 35) and expected level of engagement from the children after interacting with the prototypes; a field notebook was maintained to record the discussion. The session was semi-structured; the expert view and the protocol on the develop prototypes are present in Appendix A. The feedback was incorporated into the final designed concepts present in the following section 7.

Figure 34: Discussion on the develop concepts

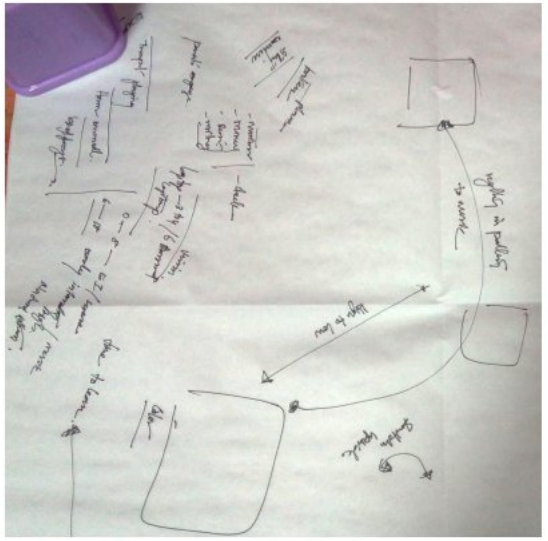
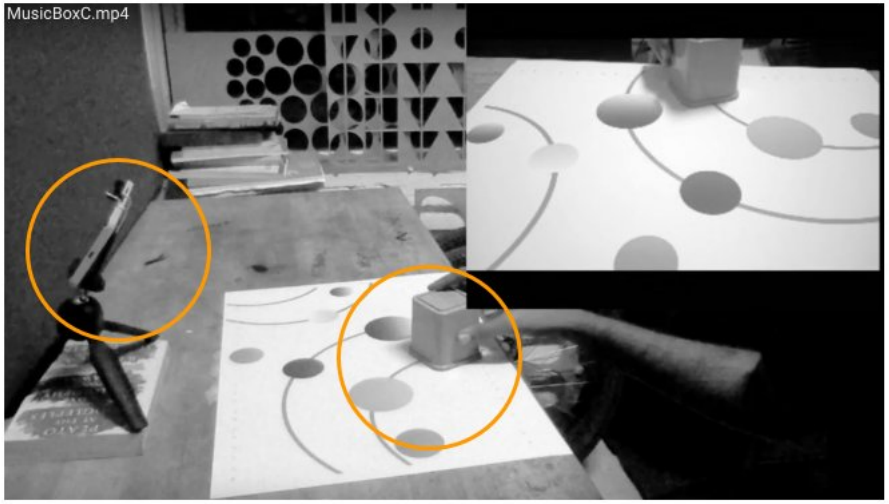


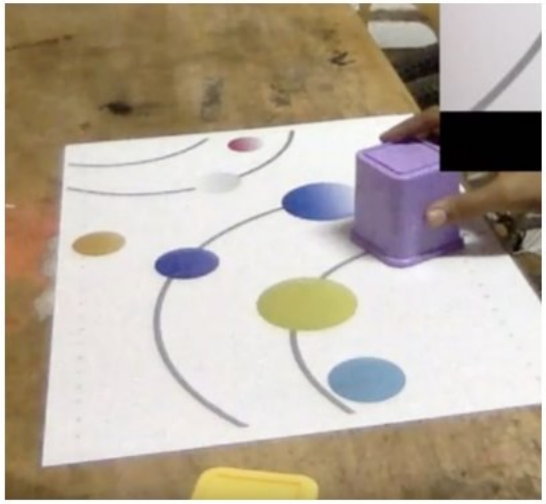
Figure 35: iterating possible variations of the activity with the in-charge of the special school

7. Final Design Concepts

Final Concept 1: Tosco BLocks
Sound + Touch

After discussion and feedback from the field the refined concept, helps the children to discover music as well as interact and make combination of sounds through free play. The mat in figure 36 serves as a visual guide to encourage students to Cap the dots on the mat. The mapping of the dots and color depends on the intensity and type of music. This prototype is built using wekinator and a syphon camera to take live feed data from the smartphone to the computer for processing (figure 36). It is then trained and mapped to an audio synth tool where we can add different sounds to their activity.





Learning concepts: Free Play + Basic Match
Tools used: ML5.js Library, Wekinator, AudioClassification, Kadenze - ML, Unity - Assets

Figure 36:(left) prototype setup and interaction (right) Game Mat and blocks

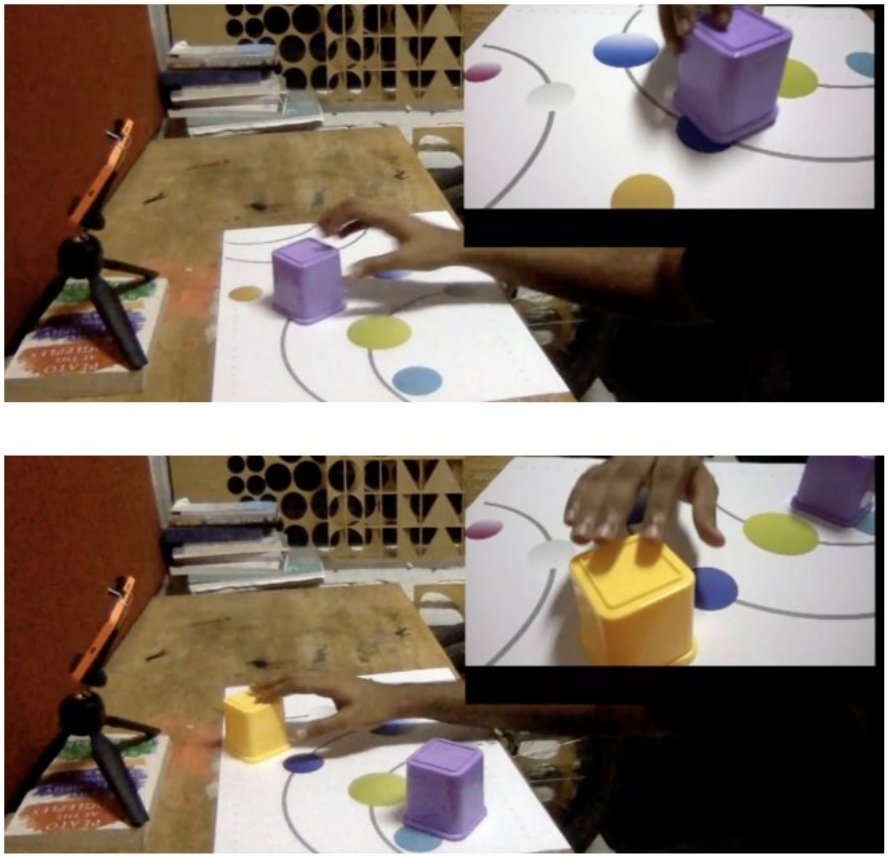


Figure 37 : Prototype setup (above), interaction with blocks (below.)

Learning concepts: Free Play + Basic Match
Tools used: ML5.js Library, Wekinator, AudioClassification, Kadenze - ML, Unity - Assets

The first part of the interaction helps the child discover sounds.

The intensity of the sound varies with the proximity to a desired sound the child would want to hear (Figure 37).

The Initial Sound Last only for a few seconds if left unattended. This could help maintain prolonged interaction with the play blocks. This will not be an annoyance if left unattended.

This break in the interaction of the blocks diverts the child enjoy free play with plain blocks. Changing the pattern of the mat encourages the child to remember the sounds and locate the shape or the other way around.

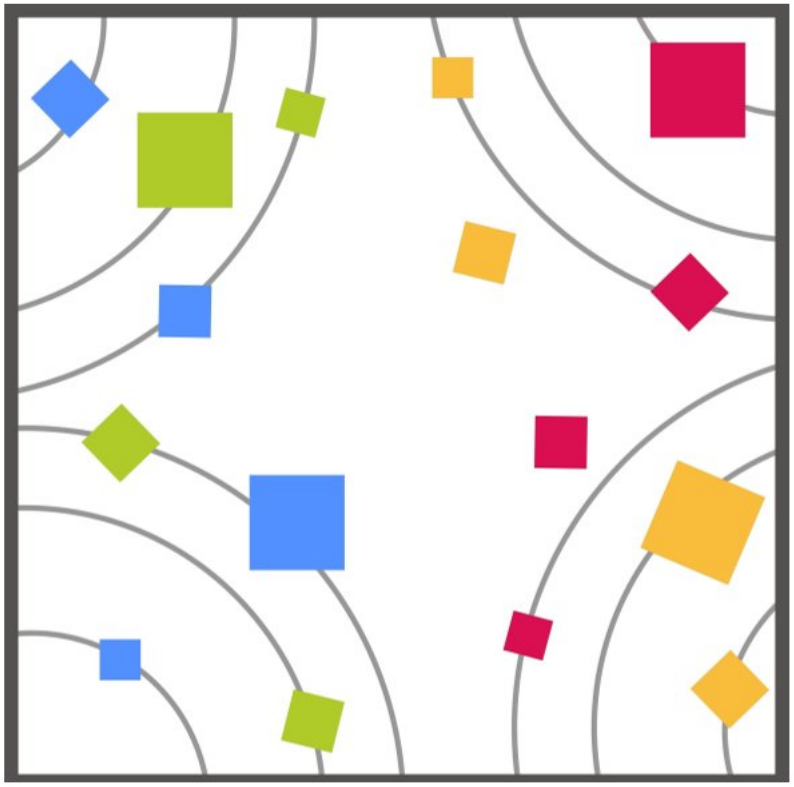


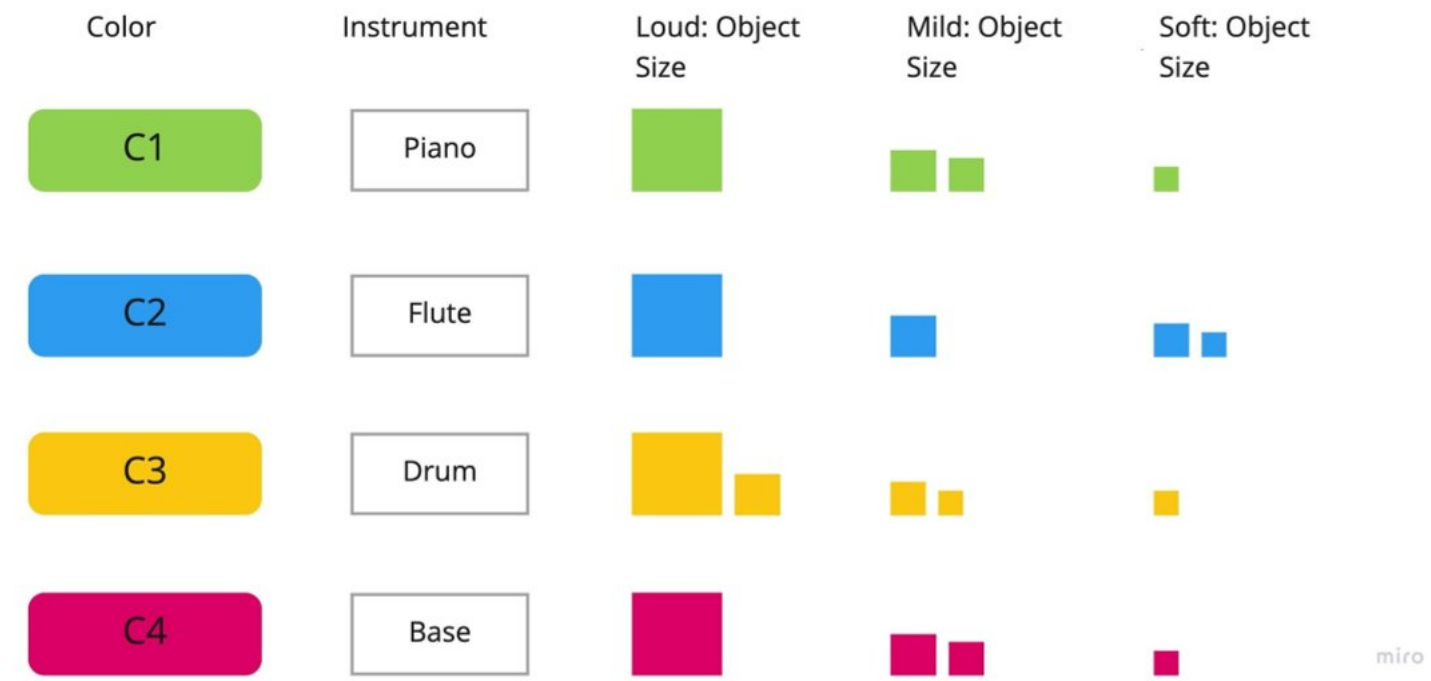
Figure 38 : Final board design for helping children explore sound

Learning concepts: Free Play + Basic Match have been incorporated into the above board, where the shape, color and size have been mapped onto the sound parameters.

Shape and Object Mapping

The above mapping caters to the type of objects and shape that the child would interact with while engaging with the platform. Each object and color have been mapped to specific sound properties that will be integrated with a musical instrument.

Instrument to color and size mapping

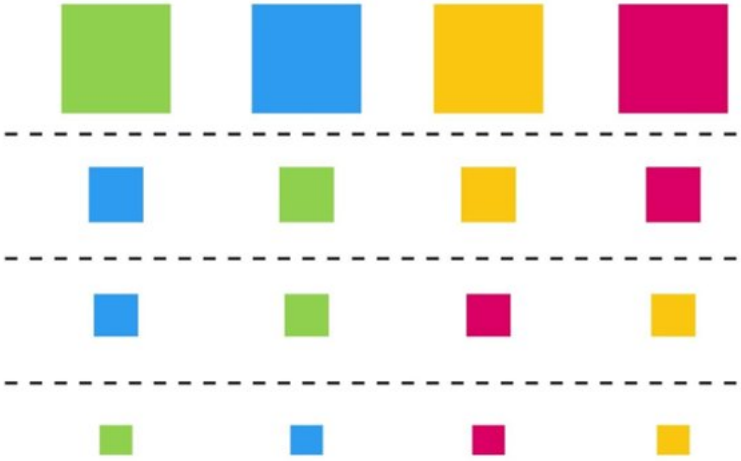


Earlier studies have indicated the preference of sounds these children have. Based of which, we have mapped the color and object size and number to the instrument, along with other properties of the sound.

On Board Design Mapping considerations

Each Quadrant of the total Four on the board, consists of four shapes of Two Colors and Four Sizes

Sound	Volume	Obj. Size	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
Instrument 1 Major Sound	Loud	S1				
Instrument 2 Accom. Sound	Mild	S2				
Instrument 2 Add. Rythm	Soft	S3				
Instrument 1 Add. Rythm	Soft	S3				



miro

While designing the board, considerations into the sequence of sounds within a limited area of interaction should be pleasing to the child, hence we divided the board into quadrants and fixed the number of instruments and the sequence of the same with respect to the block sizes and color.

Activity Scenarios

Initial Set-up by Caregiver/Parent Table / Floor	One Board 40cm x 40cm, 4 color stacked blocks (Total 16)		Smartphone + Phonestand + speaker Fit Board in the Smartphone camera frame default stand position inbuilt		
Parent/caregiver + Child	Child watches and tries to Imitate the Playing activity along with parent / caregiver	Assisted Play activity with the Child by placing and matching blocks on the shape sizes to trigger sound	Free Play activity with the Child by placing and matching blocks on the shape sizes to trigger sounds	Repetition of the tasks to improve skill development, motor + cognition + vocal stimulation	Child is bored or distracted, sound off. starts when detects motion on board.
Child + Other Children	Child can pick fav. color or sound to engage with the board (free or assisted)	If not Interested, Free Play of the color blocks stacking and grouping	Interested in the sounds: play activity as a group, discovering sounds	Finds it irritating, sounds stop even if blocks are in play. Recong. by physical signs of agitation rapid movement on board	Child Holds blocks and moves it on board, Default sound played to motivate the child

Activity scenarios considered while designing interactions on the board.

Final Concept 2: Talk and Walk
Gesture + Vocal Sound

Redesigned game that incorporated both free play as well as learning objects with sounds The game artwork is inspired by kids coloring book (figure 39). From the previous feedback session with the experts they indicated kids have a higher level of participation when both parents and caregivers engage with them, adding learning content motivates them to engage with the child. This Prototype utilises both vocal and gestural input to control the character based on their preference of input. This could in turn increase their participation while discovering new input modes. The repetitive task here is hitting the desired color and shape that have a sound. Note: (figure 38) contains placeholder objects.

Learning concepts: Free Play + Basic Match
Tools used: ML5.js Library, Wekinator, AudioClassification, Kadenze - ML, Unity - Assets

Figure 38: (left) Final game artwork design
Figure 39 (right) inspiration from the coloring books.

Design Guidelines:

This digital activity follows the guidelines considered in section 6.2.

A few points to note:
The activity uses a digital avatar, as earlier studies have indicated that children with special needs relate to game characters in their own way.

While designing artwork for the activity, careful considerations was taken up to ensure unobtrusive backgrounds and focused on subtle character animations to keep the child engaged through the gameplay.

Levels of complexity can be incorporated based off section 6.4, for this prototype we used free play and basic match as an initial level to check if participation of the child is active.

Repetition of tasks, like matching the desired color that the parent or caregiver asks showcases an involvement from caregiver towards the child. This is done for the initial stages for assisted play, later stages will focus on semi-assisted play to independent play based on the child's mental capacity.

The type of interaction/input depends on the level chosen for the child, this prototype focuses on free play to incorporate multiple inputs for an increased sense of engagement and participation.

Figure 40: Game controlled by multi modal inputs of sound, tactile, gesture. (as seen in figure 32, section 6.1.2)

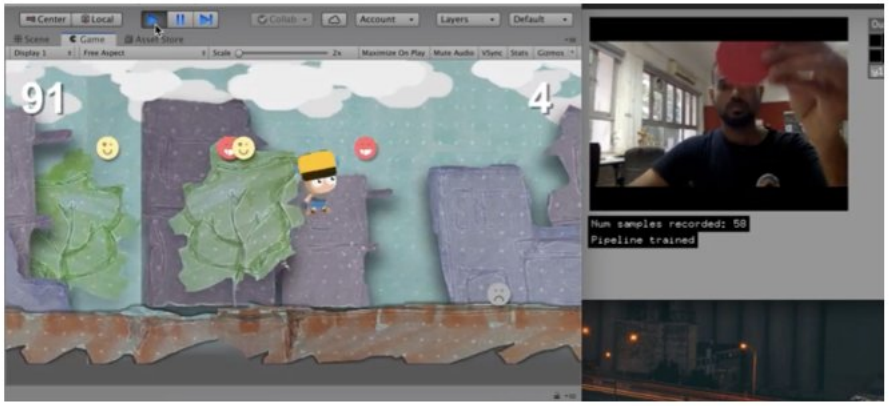


Figure 41: Incorporating basic shape learning blocks as triggers for action. This variation of the game lets the user trigger the character by showing the correct color or shape.

Learning concepts: Free Play + Basic Match
Tools used: ML5.js Library, Wekinator, AudioClassification, Kadenze - ML, Unity - Assets

Triggers for Interaction
Gesture + Vocal Sound

Touch	Sound (Sound+Gesture)	Gesture Only
Single /one child/ Stimulate self engagement ACTIVE	Single /one child/ Stimulate self engagement ACTIVE	Single /one child/ Stimulate self engagement ACTIVE
Multiple / Group of kids/ Social Interaction ACTIVE	Multiple / Group of kids/ Social Interaction ACTIVE	Multiple / Group of kids/ Social Interaction NOT ACTIVE
Stimulate Imitation	Stimulate Imitation	Stimulate Imitation

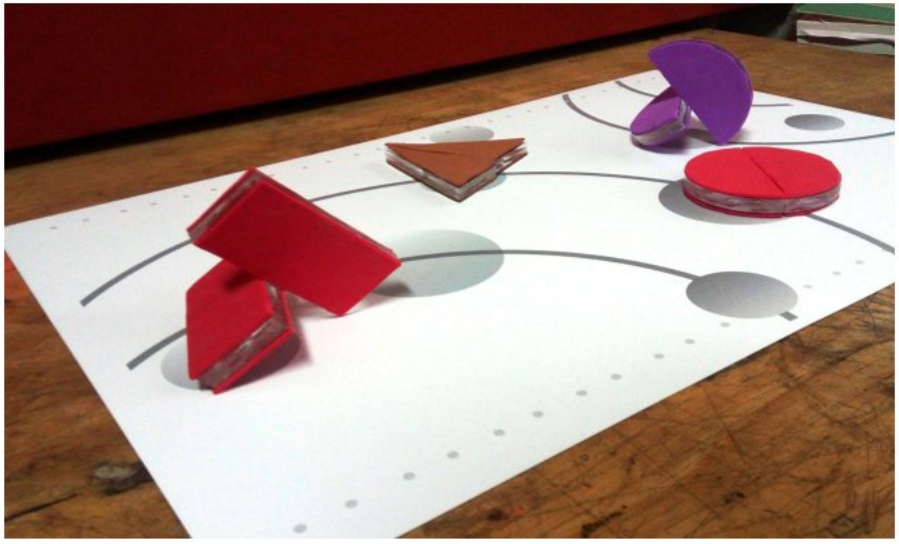
While we consider multiple inputs for these children, it is necessary to set triggers for specific inputs that are used in various scenarios while prototyping. This helps avoid an overlap of any unnecessary parameters.

Activity Scenarios

Initial Set-up by Caregiver/Parent Table	One table set-up on the table				
Parent/caregiver + Child	Open Application, selects appropriate level for the Child.	Caregiver/Parent demonstrates play with the interface, Child imitates. free play	Child interacts with the interface using one or multiple inputs of choice, either touch, gesture, vocal or sound	Levels based of learning through matching color and objects	Repetition of the tasks to improve skill development, motor + cognition + vocal stimulation
Child + Other Children	prefers to interact in their own way, gesture or vocal	If not Interested, Child leaves the play area	Interested in the play activity as a group, stimulating vocals and sound to control character	Finds it irritating, if input isn't taken default input to motivate child.	Default vocal input to help motivate child when they try to stimulate auditory responses

Activity scenarios considered while designing interactions with the interface.

Alternative use of the learning blocks when not in use, if the kid is disinterest in the activity, this blocks are designed to break and pair with other block. Ther have a small magnet that kids would connect and enjoy.
The connect whole block is used a trigger input for the digital game activity.



Learning concepts: Free Play + Basic Match

Figure 42: Blocks with magnets inlay for joining

8. Evaluation and testing

The reliability of the study based on success in an activity cannot be measured by a checklist; but, through the help of professionals who have constantly interacted with the children [16]. The proposed evaluation would look into aspects discussed earlier in appendix A. After obtaining permission and ethical clearance; stating, this is only an academic project and outline the process of the testing protocol, from the special school, recorded audio and video information will be used as a primary source to interpret the design feedback.

Earlier research studies have identified parameters to consider while assessing the engagement and participation of children with MID. Utilising these parameters, the proposed scheme would look at:

User Behaviour	Attention	On Task	Child is engaged	Time
		Off Task	Child is distracted	Time
	Emotion	Positive	Smile	Time
		Negative	Unhappy	Time
		None	No Expression	Time
User Movement	Hand	Finger	One or More	Freq
		Palm	One or Both	Freq
		Clenched	One or Both	Freq
	Vocal	High	Child is engaged	Freq
		Low	Child is distracted	Freq

This would be followed by an expert review of the interaction of the children with the prototype. Considering the identified parameters.

Scheduled field visit for feedback; first week of June. Special considerations in section 6.4 will be followed. The prototype developed was tested using the wizard of Oz method to simulate the intended interactions.

The small number of participants is due to the special considerations taken up, where a child will not be forced to participate in the activity if they feel hesitant or not interested in it. Only participants who showed interest along with the caregiver were considered.

Number of participants: 4
Type of mental disorder: ??
IQ Level : 50-60
Minimum number on skill development board: 12
Each Session : 15mins

This feedback from the field does not claim hard evidence to showcase child participation and engagement, but to open up future possibilities in this area of intervention.

After the field test, the recorded information that was through the center's caregiver was observed. The images are taken with permission of the center. Questions for the task of Concept 1 and Concept 2 was observed.Interpretation of the interactions through the recorded video and pictures are discussed later in section 8.1

Concept 1: Task observation
Did the children interact with the board and objects as intended?

Did the participant interact with the board and the blocks according to the intended purpose?
Did the participant avoid the board while playing?
Did the participant interact with the board and the blocks using freeplay?
Were they able to discover the sounds while interacting?

Figure 43: Below are images from the field test of the earlier visited centers. They showcase the children interacting with the blocks and the board.

Concept 2: Task observation

Did the children Participate with the design as intended?

Did the participant interact to the intended purpose?
Did the participant avoid the activity while playing?
Did the participant interact with the activity through different inputs?
Did they get bored of the repetition of the colored object and activity?
Did the design stimulate social interaction among children?
Was there a sense of strain by interacting with the medium?

Figure 44: Below are images from the field test of the earlier visited centers. They showcase the children interacting with the digital activity through a tablet.

Signs of Social Interaction

While we cannot justify the claim that the designed interventions could promote social interactions, there are indications of the possibility to encourage social interactions. The sequence of images in figure 45 showcases children who encouraged another individual to participate in the activity together. This could be due to the center's environment built around the children that fosters such interactions. But there exists a future possibility of exploring such social interactions between children of special needs.

Figure 45: Signs of social interaction and engagement.

8.1 Evaluation Discussion and Limitations

Due to the limited number of participants, these observations may not hold true for all, as only children who showed interest to participate, engaged with the activity. Another limitation was the Wizard of Oz prototype that may not be reliable.

Observations Concept 1 :

Children did use the blocks placing them on the circles as well as few intended free play.

The children did observe the change in sounds to discover other sounds

When the number of blocks increased difficulty increased, interest decreased.

Children are engaged by the activity.

Observations Concept 2 :

Children did switch between inputs to manipulate the character, alternative inputs served as defaults when the prototype did not detect a particular sound or gesture.

There is a positive effect on the social interaction between children

Sound as an input along with other gesture shows an increased participation from the children.

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Appendix A

Expert feedback on developed concepts and Ideas
A semi-structured session with the expert

Introduce the three concepts and earlier ideas.
Showcase the purpose, working of the prototypes and how they were developed.

Follow up questions during the discussion with regards to each concept.

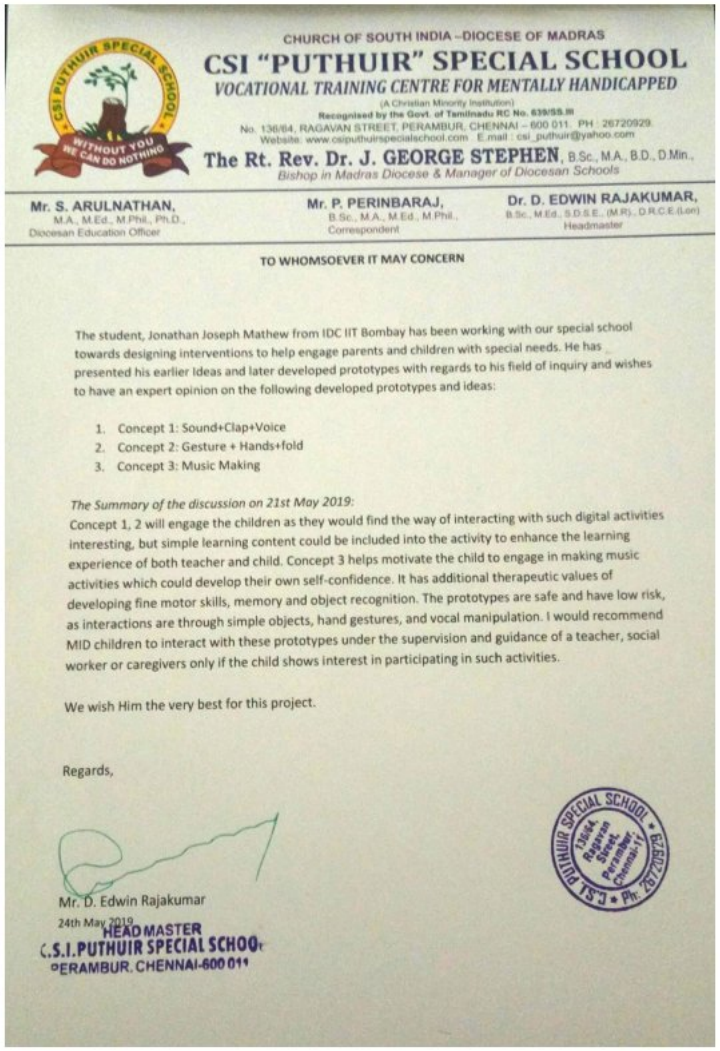
1. General Opinion of the developed prototypes for the intended purpose.
2. What could be the Appropriate developmental stage would you see this prototype being used?
3. What could be the other therapeutic purposes this prototype would be used in?
4. Do you see MID children actively engaging in this type of activity, if so where?
5. Would Parents or teachers engage in such types of activities with the children?
6. Are there any benefits for the MID children while engaging this prototype?
7. Would the children Play to participate and enjoy in such activities?
8. What would be the parent's perception of these activities?
9. What type of learning content is appropriate for the children to learn through this?
10. What is your opinion on taking a digital approach towards this?
11. Would parents look at this as a financial burden?
12. Safety and risk involved between the child and the prototype?

Additional feedback questions

- Sensory (Auditory, Visual, Tactile) exploration using this prototype?
- Development of visual + motor skills (coordination)?
- The practicality of the objects for easy handling and manipulation?Parents engagement with the child possible failure?
- The Set-up possibilities of such interactions, Availability of resources?
- Would you recommend MID children to interact with this prototype?

Summary of the session
Thank you for the appointment
Inquire about the future evaluation of prototypes with children with an ethical letter from the institution.

Appendix B



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TO WHOMSOEVER IT MAY CONCERN

The student, Jonathan Joseph Mathew from IDC IIT Bombay has been working with our special school towards designing interventions to help engage parents and children with special needs. He has presented his earlier Ideas and later developed prototypes with regards to his field of inquiry and wishes to have an expert opinion on the following developed prototypes and ideas:

1. Concept 1: Sound+Clap+Voice
2. Concept 2: Gesture + Hands+fold
3. Concept 3: Music Making

The Summary of the discussion on 21st May 2019:
Concept 1, 2 will engage the children as they would find the way of interacting with such digital activities interesting, but simple learning content could be included into the activity to enhance the learning experience of both teacher and child. Concept 3 helps motivate the child to engage in making music activities which could develop their own self-confidence. It has additional therapeutic values of developing fine motor skills, memory and object recognition. The prototypes are safe and have low risk, as interactions are through simple objects, hand gestures, and vocal manipulation. I would recommend MID children to interact with these prototypes under the supervision and guidance of a teacher, social worker or caregivers only if the child shows interest in participating in such activities.

We wish Him the very best for this project.

Regards,

Mr. D. Edwin Rajakumar
24th May 2019
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C.S.I.PUTHUIR SPECIAL SCHOOL
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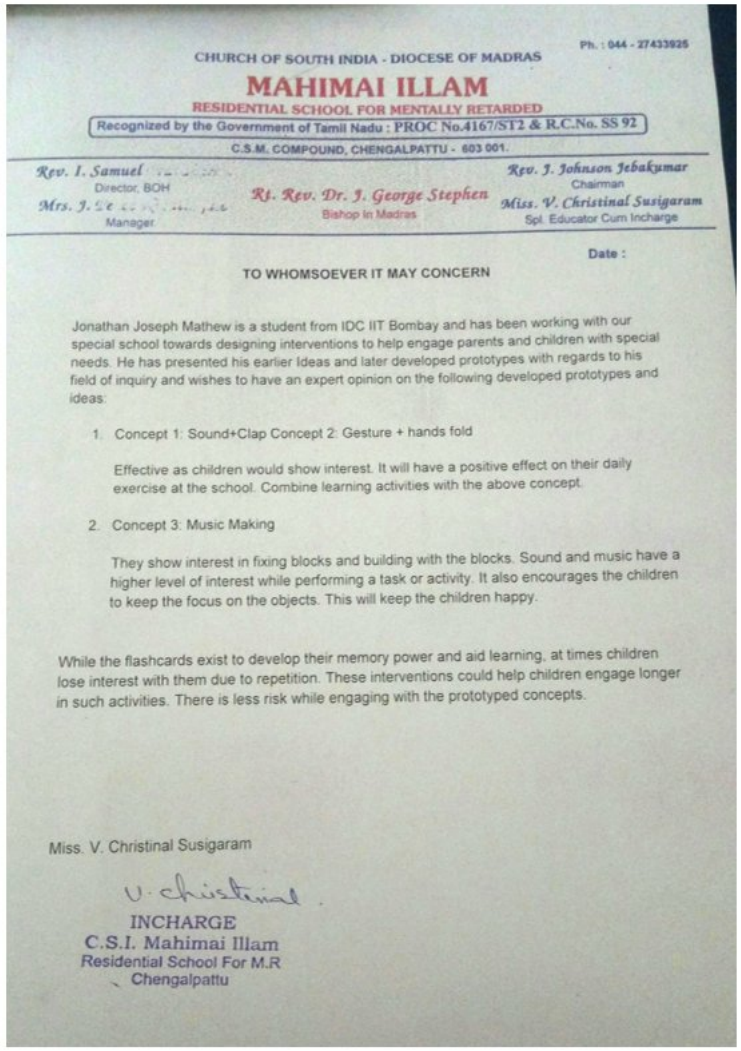

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Rev. J. Johnson Jebakumar Chairman

Miss. V. Christinal Susigaram Spl. Educator Cum Incharge

Date :

TO WHOMSOEVER IT MAY CONCERN

Jonathan Joseph Mathew is a student from IDC IIT Bombay and has been working with our special school towards designing interventions to help engage parents and children with special needs. He has presented his earlier Ideas and later developed prototypes with regards to his field of inquiry and wishes to have an expert opinion on the following developed prototypes and ideas:

1. Concept 1: Sound+Clap Concept 2: Gesture + hands fold

   Effective as children would show interest. It will have a positive effect on their daily exercise at the school. Combine learning activities with the above concept.

2. Concept 3: Music Making

   They show interest in fixing blocks and building with the blocks. Sound and music have a higher level of interest while performing a task or activity. It also encourages the children to keep the focus on the objects. This will keep the children happy.

While the flashcards exist to develop their memory power and aid learning, at times children lose interest with them due to repetition. These interventions could help children engage longer in such activities. There is less risk while engaging with the prototyped concepts.

Miss. V. Christinal Susigaram

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