



Developing Push N Feel ‘SensoShapes’ for Sensory Integration (SI)

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Abstract : The utilization of sensory tools and toys in educating children within inclusive settings can significantly benefit their overall development, particularly those with sensory processing disorders. Addressing their learning needs through academic interventions, such as play-based activities, is essential. Therefore, this research aims to develop a toy for sensory integration (SI) and investigate its effectiveness. The study employed a Product Development Design, specifically the ADDIE model, in designing and developing the product. Additionally, purposive sampling was utilized to gather information from experts, evaluating the product comprehensively in terms of usability, appearance, relevance, functionality, and durability. The five emergent themes identified using Braun and Clarke’s six-step process were: (1) Benefits of SensoShapes to Learners’ Sensory Experiences, (2) Interactive Learning and Tactile Exploration, (3) Catering to Learners’ Individual Differences, (4) Challenges and Disadvantages, and (5) Recommendations and Limitations of the Product. Furthermore, quantitative analysis was conducted to analyze the numerical data found in the evaluation rubrics. In conclusion, it is evident that modifications are necessary to enhance the product overall, and further research is needed to investigate its effectiveness for sensory integration and multisensory learning approach.

Index Terms - product development, sensory toy, multi-sensory, tactile, auditory feedback

I. INTRODUCTION

Healthy development for children during the early years is crucial for their overall well-being. It signifies that the child should grow into someone whose emotional, social, and educational needs are met. Moreover, the changes they undergo as they grow older are expected through developmental milestones, providing a glimpse of the anticipated changes at specific ages (CDC, 2023).

Among the specific skills that must be improved in babies are their basic motor skills, which develop over the first 2 years of life. According to Sutapa et. al. (2021), it is important to pay close attention to the development of their motor skills during the early childhood stage (0-8 years old), encompassing both fine and gross motor abilities because most activities involve motor elements. Additionally, their sensory development is equally crucial in this stage, as their senses play an essential role in stimulating the mind and helping them observe their surroundings.

Sensory Integration

In the early grades, learning often involves hands-on activities that help students move and touch things to better understand and stay interested in what they’re learning (Bryant, 2023). Sensory materials are made to help kids learn using their five senses: seeing, hearing, touching, smelling, and tasting. The early years are when our senses grow the most, so these activities really help kids understand and enjoy the world around them by using all their senses (Penney, 2017).

The Ayres Sensory Integration (ASI) framework, conceptualized by Dr. A. Jean Ayers in the 1970s, emphasizes the foundational role of intersensory integration in functioning. Dysfunction in sensory integration can lead to developmental, learning, and emotional regulation challenges in children, affecting their responses to daily activities like dressing, playing, and eating (Guardado & Segent, 2023).

Integration of sensory materials and tools adheres to the Sensory Integration (SI) method which is play-based therapy used to change how the brain reacts to touch, sound, sight, and movement. This helps the brain’s nervous system to process

sensory information through play activities which is commonly used by Occupational Therapists (OTs) in rehabilitations. Some of the techniques used in this method are play-based activities, visual stimulation, and environmental modifications (Physiopedia, 2023).

This integration is particularly evident during playtime, where sensory play involves activities that engage the child's senses, helping them develop necessary skills such as cognitive and motor skills. This is vital in the child's development from birth to early childhood as this helps in building nerve connections in their brain's pathways, leading to the child's development in completing complex tasks (Cleveland Clinic, 2023).

Global Scale

A simple object like a plush toy can serve as a sensory aid. These items not only offer a comforting and tactile experience but also have the potential to serve as valuable companions for learning and emotional expression. For instance, educators at Fayetteville-Manlius Elementary School in New York collaborated with researchers from Boston Children's Hospital to introduce Bluebee Pals, plush characters utilized as an assistive technology tool to support speech therapy and special education lessons for students with autism (PR Newswire, 2018). Teachers observed that their students with autism were deeply engaged with the Bluebee Pals, finding them helpful in following instructions and facilitating instructional delivery.

Moreover, Dr. Montiero, PhD has integrated sensory materials into her informal autism evaluations, during which she collects sensory objects and toys. She makes use of these sensory materials in starting and creating conversations with children whom she is going to evaluate for having suspected Autism Spectrum Disorder. This process led to the development of her widely-used Autism Evaluation method, the Monteiro Interview Guidelines for Diagnosing the Autism Spectrum (MIGDAS-2), Second Edition (Western Psychological Services, 2024).

Children with Autism Spectrum Disorder (ASD) may face challenges with sensory processing such as loud sounds, bright colors, and other sensory input. A study by Rusher (2020) found that varied sensory tools can be used to help students with autism thrive in the classroom, as they improve their concentration levels and reduce behavioral outbursts.

Learners with Special Needs (LSEs)

Different sensory tools and toys help with the nerves' relaxation, improving the sensory perception, and reducing anxiety, especially for children with Autism Spectrum Disorder (ASD) and Sensory Processing Disorder (SPD). They serve as a tool for therapy and a space for sensory exploration and fine motor development. Moreover, sensory play for children with special needs provides them an opportunity to experience different sounds or textures to keep them focused inside the classroom (NADO Disability Services, 2020). According to Shakur Jabbar (2023), sensory mats are a type of toy that provides children with sensory stimulation. They can be made from a variety of materials, such as fabric, foam, and plastic. Sensory mats often have different textures, colors, and sounds to help stimulate children's senses. Sensory mats have many benefits for children of all ages. They can help to improve sensory processing skills, fine motor skills, cognitive skills, and language skills. Sensory mats can also be used to calm and soothe children, and to help them learn to self-regulate.

National Scale

In the Philippines, kindergarten education is provided with a learning environment to engage children in developmentally appropriate practices (DAP) such as play-based activities and child-centered play, as stated in Republic Act 10157 (DepEd). A study by Annague and Ignacio (2023), entitled "Sensory Play-Based Instruction" from Union Christian College La Union, states that sensory play is manipulating tools in a classroom setting which are set up for children to play freely through the five senses.

There is a need to explore how tactile and auditory features can be integrated into sensory shape toys, especially in understanding how these combined features interact to improve multi-sensory learning. While existing literature recognizes the therapeutic benefits of sensory toys, further research is necessary to design sensory shape toys specifically for enhancing multi-sensory learning and sensory integration (SI).

Statement of the Problem

This study aims to investigate the effectiveness of a push and feel multi-sensory toy for early childhood education within the context of play-based learning. Specifically, it seeks to address the following questions:

1. Based on comprehensive literature review, what specific features can be incorporated into a multi-sensory toy to enhance its effectiveness?
2. What are the expert ratings and feedback for the following aspects of the multi-sensory toy?
 - A. Usability
 - B. Physical Appearance
 - C. Functionality

D. Relevance

3. How can the product be enhanced based on the findings?

II. RESEARCH METHODOLOGY

Research Design

The study employed a Product Development Design, which followed a comprehensive process in developing a product. This approach involved essential stages of conceptualization, design, prototyping, and evaluation to create and refine the push-and-squeeze multisensory toy for Early Childhood Education (ECE). By utilizing this method, this study aimed to systematically develop and improve the product to meet the specific needs and requirements identified through literature review and expert feedback. Moreover, to ensure its efficiency, the study adopted an instructional design commonly used to develop and streamline the production of a material called The ADDIE instructional design. According to its model, it followed a 5-step process in creating the product: Analysis, Design, Development, Implementation, and Evaluation (Bouchrika, 2024).

Sampling Design, Respondents, and Environment

The researchers used purposive sampling for this study. In this type of sampling, subjects were selected to be part of the sample with specific criteria in mind (SLC, 2013). With purposive sampling, the researchers believed that the participants met the research's desired basis better than other individuals, meaning they were chosen with proper consideration. The research purposely gathered data primarily based on students' grade level, which was within Early Childhood Education, specifically from ages 4 to 7 years old, along with their respective teachers serving as informants. Additionally, relevant experts were included as respondents, as their input was crucial for ensuring the efficiency and credibility of the overall product design. The responses obtained from the participants informed the study. The research took place in a selected school located in Cebu City, Philippines.

Research Subject

The main focus of this study was to develop a multisensory toy, based on a comprehensive literature review and expert feedback, called the 'Push N Feel SensoShapes'. This served as the central subject of the investigation. In exploring its efficacy, the study delved into complex evaluations of the toy's usability, design, functionality, and relevance to Early Childhood Education (ECE), with the intention of enhancing learning experiences among young children through multisensory interactions.

Research Instrument

In this study, the researcher played a crucial role as the main instrument, relying on their skills, perspectives, and interactions with participants for data collection and interpretation (Teherani et al., 2015). In this study, another essential research instrument was a questionnaire designed by the researchers for conducting semi-structured interviews with selected participants. The interviews followed a predetermined thematic framework and employed an open-ended approach, allowing researchers to ask follow-up questions as needed (George, 2023). Furthermore, this study utilized a quantitative approach in designing rubrics pertaining to the evaluation of the 'Push N Feel SensoShapes' toy which was utilized by relevant experts.

Data Gathering Procedure

The data gathering procedures of this study adhered to the ADDIE model, a systematic framework widely used in instructional design and educational research. In the first phase, Analysis, there was an in-depth examination of existing literature on multisensory toys and early childhood education, which led to the development of the "Push N Feel SensoShapes". In the Design phase, brainstorming and generating ideas for potential product design based on the literature review were conducted, which included outlining the features and design specifications. In the Development phase, the product was developed based on the finalized design and refinement. In the Implementation phase, data collection was carried out, such as semi-structured interviews and online surveys, to gather data regarding the product's usability, functionality, physical appearance, and relevance to the target audience. In the Evaluation phase, the collected data underwent analysis to determine the effectiveness and appropriateness of the "Push N Feel SensoShapes". Future research will implement any necessary adjustments based on the evaluation results and input from participants and experts, ensuring continuous improvement of the product.

Data Analysis

A thematic analysis approach was employed in analyzing the questionnaires, both student and teacher semi-structured interviews. Braun and Clarke (2008) developed a 6-step data analysis approach. The first step was to familiarize the data, which includes transcribing the audio, reading the text, and generally looking through the data. Coding was the second step, highlighting the text sections to develop "codes." Then, themes were generated in the third step, and after that came the reviewing of themes as the fourth step. The fifth step was formulating, defining, and naming themes to help understand the data. Lastly, the sixth step was to write the analysis of the data. This process helped avoid confirmation bias in formulating the analysis (Caulfield, 2019).

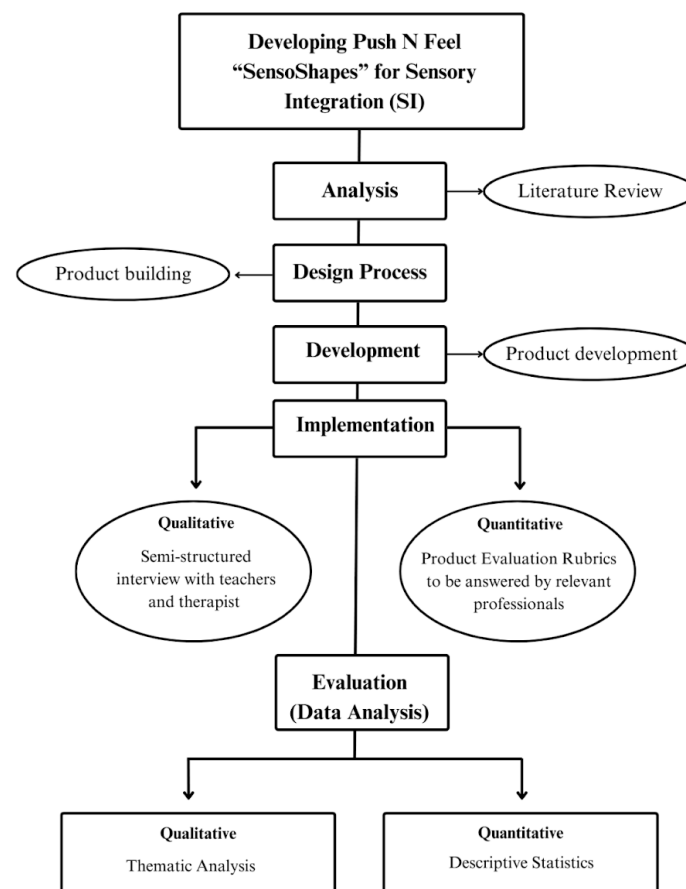
Additionally, in analyzing the evaluation tools, descriptive statistics was employed to organize, summarize, and present data meaningfully in a dataset. This analysis aims to clarify the evaluation rubrics from experts in analyzing the distribution and overall perception of the product's attributes (Bhandari, 2023). Furthermore, thematic analysis was utilized to investigate the themes present in the remarks or comments provided by relevant experts regarding the product. This comprehensive approach to

data analysis allowed for a thorough exploration of both quantitative and qualitative aspects, providing valuable insights for the study.

Ethical Considerations

Ethical research refers to the rules and ideals researchers must follow when conducting their studies. Firstly, participants will be provided with clear and comprehensive information about the study objectives, procedures, and potential risks, and their informed consent will be obtained before their involvement. Consent will be voluntary, free from coercion or undue influence, and can be granted either in written or verbal form. In addition to obtaining consent from parents or legal guardians, children will also be asked to provide assent to ensure ethical treatment and rights. Anonymity will be strictly maintained to ensure confidentiality and protect participants' privacy. Responses will be coded or anonymized to prevent identification of individual participants. Moreover, the research protocol, including the study design, procedures, and ethical safeguards, will undergo rigorous review and approval by the relevant ethics committee. This process ensures that the research complies with ethical guidelines, respects participants' autonomy, and prioritizes their welfare. Throughout the study, researchers will adhere to ethical principles, promote transparency, and remain accountable for the ethical conduct of the research.

III. RESULTS AND DISCUSSION



Flowchart of Results & Discussion following the ADDIE model

3.1 Analysis Literature Review

According to Hong in her study published in 2018 entitled "Tactile Toys: Therapy for Tactile Dysfunction", these toys are found to be effective when used skillfully and strategically by occupational therapists during varied learning activities. The variety of textures and shapes attract children to engage with them through touching, feeling, squeezing, and kneading. With guidance from therapists or parents, children can explore these toys in planned activities and games. Tactile Toys have the potential to soothe children and help regulate their stress levels by allowing them to release physical energy or tension through kinesthetic hand movements like pressing and squeezing.



International Journal of Technology and Inclusive Education (IJTIE), Volume 7, Issue 2, December 2018. Tactile Toys: Therapy for Tactile Dysfunctions (Figure 3., p. 1302)

According to the study of Fan, Chong, & Li (2024), entitled “Beyond play: a comparative study of multi-sensory and traditional toys in child education”, it emphasizes the importance of catering to diverse learning needs and ensuring safety in the design of multisensory children's educational toys. It highlights that children have varying learning styles, necessitating toys that offer visual, auditory, and tactile experiences. Safety considerations become essential, particularly with the integration of innovative elements like smell and taste, requiring non-toxic materials and adherence to rigorous safety standards. Additionally, the study stresses the significance of age-appropriateness and cultural inclusivity in toy design. Toys should be tailored to match the developmental stage of children, with complexity or simplicity adjusted accordingly. Moreover, cultural considerations are essential to ensure inclusivity across diverse demographics, recognizing the nuances and backgrounds of different cultural groups.

Furthermore, technological integration in multisensory toys can be beneficial to children especially to major innovative technology such as AR and Virtual Reality (VR) to sensor technology and artificial intelligence. This huge technological advancement can offer various learning opportunities where children can even be transported to different environments.

3.2 Design

Prior Art

Tactile Toys by R.J Fisher

Feb. 23, 1971 R. J. FISHER 3,564,735
TACTILE TOYS
Filed June 26, 1967 3 Sheets-Sheet 3

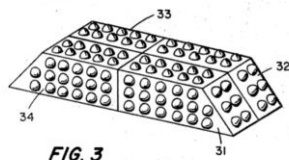


FIG. 3

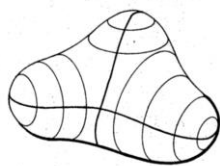


FIG. 4



FIG. 5

Feb. 23, 1971 R. J. FISHER 3,564,735
TACTILE TOYS
Filed June 26, 1967 3 Sheets-Sheet 2

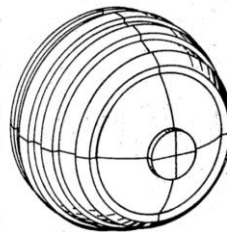


FIG. 2A

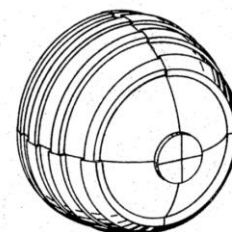


FIG. 2B

Source: <https://patentimages.storage.googleapis.com/a5/38/9c/8ff24a73a9f169/US3564735.pdf>

Tactile, Visual and Aural Toy for Entertainment and Learning by Pamela Long

U.S. Patent Aug. 26, 2014 Sheet 2 of 5 US 8,814,625 B1

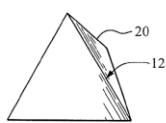


FIG. 2a

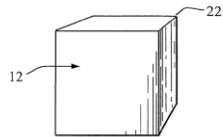


FIG. 2b

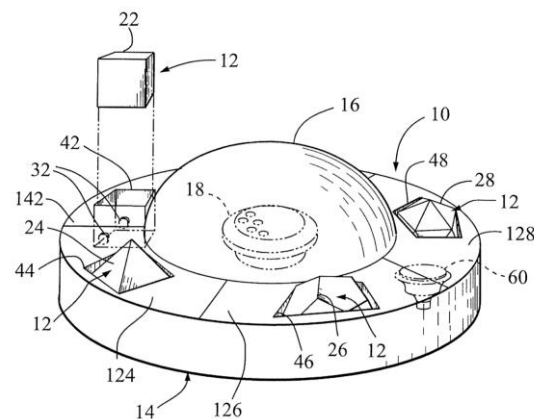
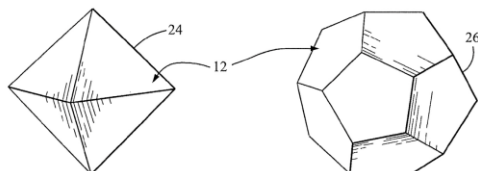


FIG. 1

Source: <https://patentimages.storage.googleapis.com/47/f9/65/61aaaa6620a561/US8814625.pdf>

Prototype



3.2 Development





Product Demonstration Video



- Like
- Dislike
- 0
- Share
- ⋮
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See link: <https://youtube.com/shorts/Ia874GsYG9g?feature=share>

3.3 Implementation

Informants	Instruments
SpEd teachers (2), General Education teacher, Occupational therapist, and Parents	Semi-structured interview and product evaluation rubrics (See Appendix A & B)
Engineer, Electrical Technician, & Professor teacher - Majoring in Mechanical Technology	Survey questionnaire (See Appendix C)

3.4 Evaluation

3.4.1 Qualitative Analysis (Thematic Analysis by Clarke & Braun)

A. Theme 1: Benefits of SensoShapes to Learners' Sensory Experiences

Results showed that SensoShapes have varied benefits to both learners in the special and regular environment. These mentioned benefits focus on learners' exploring different sensory experiences, tactile stimulation, and improved retention. These are supported by the responses of the participants that:

"This product is a great way to engage kids and help them explore different sensory experiences. I can imagine how much fun they would have while learning about textures through sound." - Informant 1

"This product can help enhance sensory exploration and tactile stimulation, allowing children to engage their senses and better understand different textures." - Informant 1

"I believe the more senses involved the better retention is in learning. With this product, the learner's tactile, auditory and visual senses are stimulated." - Informant 2

"The material is interactive in itself. It targets different senses. Some children will surely learn from this." - Informant 3

"The product could help address various developmental goals, including sensory regulation, attention and focus, fine motor coordination, and social interaction skills." - Informant 4

According to Watts (2020), sensory exercises motivate kids to learn more about their surroundings with all of the senses they have. By doing so, a neurological link will be established in a part of the brain that has a favorable impact on an increased understanding level.

Students who receive sensory inputs in a proper way respond appropriately in terms of appropriate conduct. The cognitive, self-regulatory, and social development of a young person may be impacted by their capacity in responding correctly. Several potentials exist for integrating sensory impulses from various different processes of senses in situations that are filled with sensory experiences. Nonetheless, caregivers of children who function healthily are unaware of the significance of sensory integration for optimal growth (McCormick, 2022).

B. Theme 2: Interactive Learning and Tactile Exploration

The results indicated that learners engage in interactive learning and tactile exploration with the utilization SensoShapes in the classroom. The context of hands-on learning experience, learning new concepts, and exploring different textures and shapes are mentioned. The following statements can support this:

"It can provide students with a hands-on and interactive experience, allowing them to explore different textures and shapes while engaging their senses." Informant 1

"This product can support sensory integration and tactile exploration, which is important for children with sensory processing difficulties." - Informant 1

"It seems to be a fun and interactive tool for children." - Informant 3

"Children using this product may experience increased engagement in sensory-based activities. The tactile and auditory stimulation provided by the product could support their overall sensory development." - Informant 4

"[Student A] is a child with autism and ADHD, she is extremely sensitive towards unfamiliar textures, when she attempted touching all of the shapes but most of the time she skipped when it came to the shapes, rough square and scratchy star. She intently stared at the box which contained all the shapes and gently touched three of the textures that

did not feel uncomfortable for her. As her fine motor skills are not practiced well, she did not attempt to push it so she needed guidance in pushing the shapes to make a sound. She enjoyed touching the shapes and kept on coming back as the colors caught her attention.” - Informant 4

“The tactile sensation of touching the shapes and feeling them push back while making delightful sounds brought her immense joy. It was evident that she was thoroughly enjoying herself. She followed along with the audio instructions, but for the texture names, she needed some extra guidance and repetition.” - Informant 1

According to Main (2024), in the field of education, active learning—which is supported by tactile exposure and activities is an ongoing phenomenon. It moves the emphasis from knowledge acquisition in a passive manner to active inquiry and discovery. With this style of instruction, learners become active contributors in their own education rather than merely listeners, which encourages greater involvement with what they are learning.

In school settings, tactile activities have the potential to greatly improve learning results of the learners. Teachers are able to build on learners' intrinsic interest and desire for discovery by integrating tangible materials and exercises into their teaching. This approach works particularly well for those that acquire knowledge best through activity and interaction to fully comprehend and remember what is being learned. Moreover, children with Autism Spectrum Disorder (ASD) or Attention Deficit/Hyperactivity Disorder (ADHD), who may experience sensory differences or sensory processing disorder, benefit greatly from tactile exploration as it can be one way to address these challenges through sensory integration therapy. Through this therapy, individuals with difficulties in sensory processing can better manage their sensory input, leading to improved functioning (Schrader, 2020).

C. Theme 3: Cater to Learners' Individual Differences

According to the results of the responses from the selected participants, they stated that SensoShapes cater to the diverse needs and differences of learners, especially those with disabilities. Consideration with the learners' difficulties, addressing and catering to learners' differences are mentioned by the informants. These are supported by the responses of the participants that:

“The product seems to be well-thought and carefully planned. It seems that individual learning differences are taken into consideration.” - Informant 2

“I believe it would address every learner's differences in terms of learning and they will also be able to learn other concepts such as colors and textures.” - Informant 2

“As this is an interactive device, children with delays can grasp the idea presented to them while interacting with the tools consistently.” - Informant 3

“It can be a great material if modified accordingly with the children's needs, abilities, and weaknesses in mind.” - Informant 3

“It appears to be a promising tool for sensory integration but modifications should be made accordingly to cater with the diverse needs of children.” - Informant 4

A multisensory method stimulates more areas of the brain, which improves learning outcomes. Through activities involving their hands and bodies, students can learn through seeing, hearing, feeling, and other senses. Because they can use several sensory inputs to connect facts or ideas, children using this strategy are better able to analyze, comprehend, and synthesize information. This has other long-term advantages like boosted motivation in addition to greatly improving comprehension skills (Structural Learning, 2023).

In addition to meeting the needs of each individual student, multisensory settings are proven to enhance cognitive growth (2U Wordpress, 2022).

D. Theme 4: Challenges and Disadvantages

Results showed that there are challenges and disadvantages in utilizing the product. The mentioned challenges were a source of funding for the purchasing of the product and attention span of the learners. These were supported by the statements of the selected participants that:

“One challenge might be the availability of resources and funding to purchase the product for classrooms or therapy settings.” - Informant 1

“As the objects are stationary inside, it can lose some of the students' attention.” - Informant 3

“One potential challenge could be ensuring that it meets the diverse needs of children with different sensory profiles.” - Informant 4

Learning is challenging when using a multisensory method, and children, particularly those who struggle with attention span issues, find it difficult to focus on the activities at hand (Structural Learning, 2023). Choosing toys for children with developmental disabilities can be crucial as it helps develop the abilities of the child through play therapy. Moreover, pediatric

physical therapists recommend toys that promote their overall wellbeing such as their physical, cognitive, and social development. It is important to identify their play capabilities and individual needs so as to determine which toys are appropriate and engaging for them (Simmons, 2020).

E. Theme 5: Recommendations and Limitations of the Product

Based on the results, there are few recommendations and limitations that are provided by the participants for the improvement of the product. Clarity of the sounds, additional textures and shapes, weight of the box, attractiveness of the product, and few suggested modifications are mentioned. These were supported by the statements the informants that:

“Add more different textures and shapes, make the box lighter so it's easier to carry, and include extra designs to captivate the students' interest.” - Informant 1

“The audio recording can be clearer in terms of pronunciation.” - Informant 2

“Again, it has potential if given more modifications and if it can be at par with the standards.” - Informant 3

“The material can be a Jack in a Box/ Magic Box type. Teachers can modify what's inside ie. animals, numbers, transportation, etc. The children will look forward to this as it changes every time they open the box. The possibilities can be endless.” - Informant 3

"I believe it would be more feasible to integrate the product in a therapy or small group setting wherein there is 1:1 guidance and the child can take his/her time exploring the material." - Informant 2

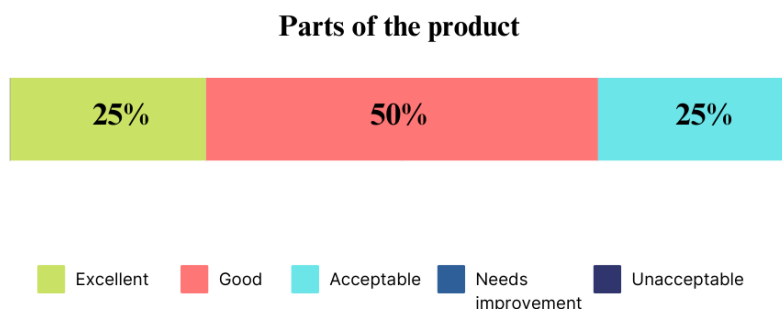
“To enhance the product, considerations should be made for incorporating a wider range of textures, shapes, and colors to cater to different sensory preferences. Additionally, ensuring durability and safety is crucial, especially for children with sensory processing difficulties.” - Informant 4

For children with disabilities, modifying the toys and materials they play with is crucial to accommodate their learning needs and enhance their overall development in the long run. According to Vansadiya & Vasoya (2022), most modifications to toys focus on concerns such as stability, extension, attachment, and confinement. Additionally, parents and caregivers should consider the abilities and interests of the learners when selecting toys. It is important to note the various recommendations from experts to enhance the product and meet the diverse needs of children. The above statements are the various recommendations that the evaluators have stated. One notable recommendation is making the box lighter in weight in order to make it convenient for them to carry around.

3.4.2 Quantitative Analysis

Ratings from Teachers and a Therapist

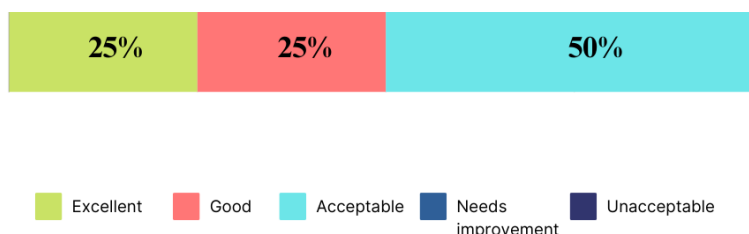
The following figures depict bar graphs illustrating the ratings provided by 2 Special education teachers, a General education teacher, and an Occupational therapist. These ratings reflect their assessments of the product's components, usability, physical appearance, functionality, and safety through a rubric.



As seen in the figure above, a total percentage of 100% is calculated in the first part of the rubric. The 4 selected participants rated the 5 items on the rubrics in the Parts of the product. Parts of the product consist of 5 items which includes the Box, Shapes, Textures, Audio, and Overall Physical appearance. The overall ratings of the 5 items accumulated that there are 25% ratings labeled as 'Excellent', 50% under the 'Good', 25% under the 'Acceptable', and 0 ratings from both 'Needs improvement', as well as for 'Unacceptable' were gathered out of the total 20 ratings, 5 items in the first part of the rubric and 4 participants. From the 20 ratings (100%), 'Good' had the biggest portion among the five ratings with a percentage of 50%, both 'Excellent' and 'Acceptable' as the second rating with a percentage of 25% each, and both 'Needs improvement' and 'Unacceptable' as the third rating with a percentage of 0.

Individually classified by items, the following are the individual interpretations of the 5 parts of the product. In item 1, there are 4 (100%) ratings under “Good”, and 0 ratings for ‘Excellent’, ‘Acceptable’, ‘Needs improvement’, and ‘Unacceptable’. For item 2, 2 (50%) ratings for ‘Excellent’, 1 (25%) under the label ‘Good’, 1 (25%) for ‘Acceptable’, and 0 ratings for both ‘Needs improvement’ and ‘Unacceptable’. Item 3, there are 2 (50%) ratings for ‘Excellent’, 2 (50%) under ‘Acceptable’, and 0 rating for ‘Good’, ‘Needs improvement’, and ‘Unacceptable’. For the 4th item, there are 4 (100%) ratings for ‘Good’, while ‘Excellent’, ‘Acceptable’, ‘Needs improvement’, and ‘Unacceptable’ have 0 ratings. In the last item, there is 1 (25%) rating for ‘Excellent’, 1 (25%) under ‘Good’, 2 (50%) ratings for ‘Acceptable’, and 0 ratings for both ‘Needs improvement’ and ‘Unacceptable’. The positive ratings of the participants indicated that the components of the product ranges from Excellent to Acceptable. Furthermore, some suggested minimal improvement, namely the possibility of considering the convenience of carrying and adjusting the weight of the box and its shade of color to be lighter. Overall, the majority rated that the shapes are well defined and therefore easily recognized, as well as that the product is a great tool, especially for the interactive and hands-on learning of learners both in special education and regular classroom settings.

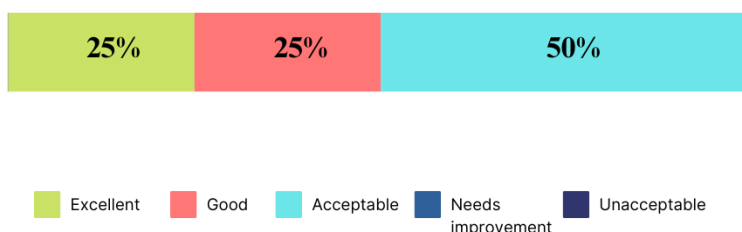
Usability



Based on the results of the gathered data, the usability of the product and user experience accumulated a total of 100% ratings from the 4 selected participants. The overall ratings showed that there is 1 (25%) rating labeled as ‘Excellent’, 1 (25%) under the ‘Good’, 2 (50%) under the ‘Acceptable’, and 0 ratings from the ‘Needs Improvement’, as well as for ‘Unacceptable’ were gathered. From the percentage of ratings (100%), ‘Acceptable’ had the biggest portion among the five ratings with a percentage of 50%, both ‘Excellent’ and ‘Good’ as the second rating with a percentage of 25% each, and both ‘Needs improvement’ and ‘Unacceptable’ as the third rating with a percentage of 0. The comprehensive calculation of the ratings showed the participants’ satisfaction with the product’s usability, also ranging from Excellent to Acceptable.

The gathered results indicated that the product’s design and function is appropriate and user-friendly, as well as it contains consistent visual components that are appropriate for the users’ ages and effectively meet the product’s objectives. Furthermore, few aspects are suggested for the improvement of the product in order for it to be fully engaging. Hence, prioritizing that the learners can fully use the product according to their capacity is crucial so ensuring that it can accommodate to their strengths, with their ages and physical capability being taken into consideration, is one of the recommendations.

Functionality

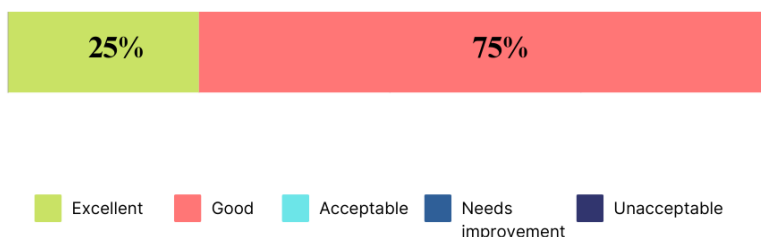


According to this data, the research product’s functionality was rated by the participants with the total percentage of 100%. 1 (25%) participant rated ‘Excellent’, following this, 1 (25%) rated under ‘Good’, and 2 (50%) ratings in the rubric are marked as ‘Acceptable’. Moreover, ratings of ‘Needs improvement’ and ‘Unacceptable’ remain at the percentage of 0 consistent with the previous items. Overall, the data gathered from all 4 participants’ ratings of the product’s functionality indicates that the majority of the participants rated 50% as ‘Acceptable’, followed by ‘Excellent’ and ‘Good’ having a percentage of 25% each. There were items that received 0 ratings, particularly in the categories of ‘Needs improvement’ and ‘Unacceptable’.

Results imply that the product performs its core functions satisfactorily, meeting basic requirements and expectations. While there are minimal disruptions in the product’s functionality, the overall performance of the product meets user needs effectively. Based on ratings, consistent range from Excellent to Acceptable mark for the product’s performance. The overall

ratings was majorly denoted by ‘Acceptable’ which shows that there are minor improvements that can be applied for the product to function fully and effectively meet its expectations.

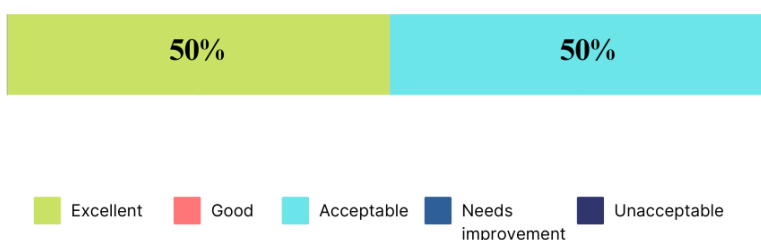
Relevance



Based on the results of the gathered data, the product’s relevance to the audience accumulated a total of 100% ratings from the 4 selected participants. The overall ratings showed that there is 1 (25%) rating labeled as ‘Excellent’, and 3 (75%) under the ‘Good’. While there are 0 ratings from the ‘Acceptable’, ‘Needs Improvement’, as well as for ‘Unacceptable’ were gathered. From the percentage of ratings (100%), ‘Good’ had the biggest portion among the five ratings with a percentage of 75%, having 3 participants rate it, ‘Excellent’ as the second rating with a percentage of 25%, and all 3 options ‘Acceptable’, ‘Needs improvement’ and ‘Unacceptable’ as the third rating with a percentage of 0. The comprehensive calculation of the ratings showed the participants’ satisfaction with the product’s relevance, ranging from Excellent to Good.

Results showed that the product is extremely relevant to its target audience, a well-suitable tool for early childhood and those within the age-frame. Considered as generally appropriate for the target ages and educational level by all the participants. Hence, the product offers basic educational value, provides some sensory stimulation, and ensures moderate safety. It also encourages engagement and promotes educational, valuable, and adequately stimulating senses while ensuring safe experiences. Furthermore, minor areas of improvement are suggested, such as providing more description about the product and its objectives.

Safety



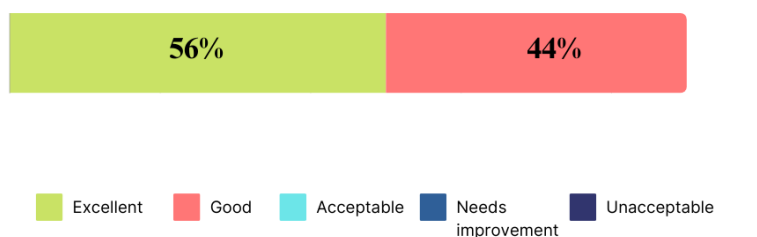
Based on the results of the gathered data, the users’ safety while utilizing the product accumulated a total of 100% ratings from the 4 selected participants. The overall ratings showed that there are 2 (50%) ratings labeled as ‘Excellent’, and 2 (2%) under the ‘Acceptable’. While there is a consistent 0 ratings from the ‘Good’, ‘Needs Improvement’, as well as for ‘Unacceptable’ were gathered. From the percentage of ratings (100%), both ‘Excellent’ and ‘Acceptable’ had the biggest portion among the five ratings with both having a percentage of 50% each, and all 3 options ‘Good’, ‘Needs improvement’ and ‘Unacceptable’ as the third rating with a percentage of 0. The comprehensive calculation of the ratings showed the participants’ satisfaction with the product’s safety for the users, ranges Excellent and Acceptable.

The gathered results indicated that the product is completely safe and user-friendly. It does not contain any toxic materials that could cause harm to the user when touched or consumed. However, few parts of the product, specifically the box is heavy, which can be a hazard if it accidentally falls. Nevertheless, the safety of the user is prioritized and taken into consideration as the product was ensured to not contain any sharp objects and harmful elements that may endanger the user.

Ratings from Engineer and Technicians

The following figures depict bar graphs illustrating the ratings provided by an Engineer, Electrical Technician trainee, and an Educator majoring in Mechanical Technology. These ratings reflect their assessments of the product’s usability, physical appearance, functionality, and durability.

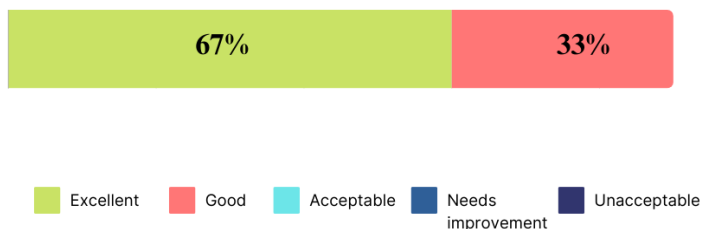
Usability



Based on the results of the gathered data, the usability rating of the product in terms of its technical aspect accumulated a total of 100% from 3 participants. The overall ratings showed that 56% of the respondents rated 'Excellent' and 44% of the respondents rated 'Good' for the product's overall usability.

The gathered results provided insights into the participants' perceptions regarding the overall usability of the product. They found the product's design to be intuitive for maintenance and assembly. Additionally, all three participants rated the technical specifications as highly user-friendly with a score of 5. However, the troubleshooting and repair aspect of the product received a score of 4, suggesting a need for improvement to enhance its efficiency in addressing technical issues.

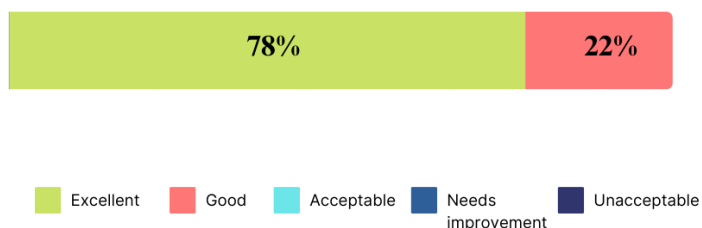
Physical Appearance



Based on the results of the gathered data, the rating of the physical appearance from a technical perspective accumulated a total of 100% from 3 participants. The overall ratings showed that 67% of the participants rated 'Excellent' and 33% of the respondents rated 'Good' for the product's overall physical appearance.

The gathered results revealed that the overall rating for the product's physical appearance is 67% excellent, suggesting that there is room for improvement, as 33% or more of the participants rated it one level lower (score of 4). One participant consistently rated the physical appearance as 4, indicating that there is potential for further enhancement to make the product more visually appealing and engaging, especially considering its intended use as a sensory tool for children.

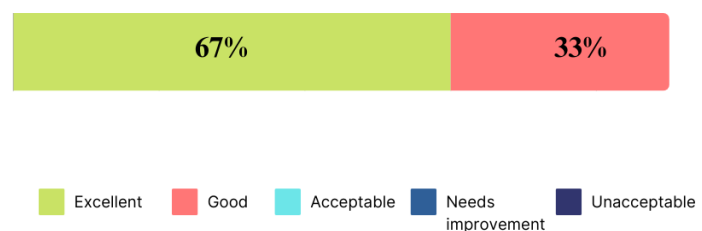
Functionality



Based on the results of the gathered data, the rating of the product's functionality from a technical perspective accumulated a total of 100% from 3 participants. The overall ratings showed that 78% of the participants rated 'Excellent' and 22% of the participants rated 'Good' for the overall functionality of the product.

The specific results under functionality revealed that 2 participants rated the effectiveness of the product's sensory exploration as 'Excellent', while 1 participant rated it as 'Good'. This suggests that, from their perspective, the product has the potential to stimulate sensory engagement but requires further improvement. Furthermore, all participants rated the reliability of the audio cues as 'Excellent' during interactions with the target audience, indicating a high level of satisfaction in this aspect. In terms of the extent of active participation and engagement of the children towards the product, 2 participants scored 'Excellent' and 1 participant scored 'Good'. This indicates that while the product shows promise, there is a need for additional stimulation to capture the full attention of children.

Durability



Based on the results of the gathered data, the rating of the product's durability from a technical perspective accumulated a total of 100% from 3 participants. The overall ratings showed that 67% of the participants rated 'Excellent' and 33% of the participants rated 'Good' for the overall durability of the product.

Upon closer examination of the specific questions related to durability, all three participants provided a 2:1 ratio between 'Excellent' and 'Good'. This suggests that while the product's durability is commendable, there is still room for improvement, particularly in its ability to withstand normal usage conditions. Additionally, enhancements are needed to ensure resilience against humidity and temperature changes. Furthermore, it should be capable of enduring prolonged periods of use, especially given its intended use as a toy for children.

Conclusion

In conclusion, the study gathered valuable information from various sources such as literature reviews and expert feedback. Each participant has varied experiences and perspectives on the product's usability, functionality, physical appearance, relevance, safety, durability and components. The study identified different benefits of SensoShapes in general classroom settings, as well as both regular and special education. These are sensory and tactile exploration of the learners, interactive learning, and catering to learners' individual differences. Moreover, there were few challenges recognized in the overall evaluation of the product namely; its availability for both educational and therapy settings, and a regard for learners' attention span and different sensory profiles. It is recommended that additional elements can encourage more engaged learners in sensory exploration. Modifications regarding the weight as well as shade of the box must also be taken into consideration. In addition, further research must be done to develop a toy for sensory integration in a multi-sensory approach to promote interactive and hands-on learning.

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