



Enhancing Multisensorial Learning In Inclusive Education: The Consonant-Vowel-Consonant Audio Case

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Abstract: This study addresses the need for creative educational materials in special education by proposing the development of a Consonant-Vowel-Consonant (CVC) Audio Case as a multisensory learning method. The study indicates that, while the CVC Audio Case shows potential in improving inclusive education by catering to varied learning requirements, additional improvements in audio quality, durability, and overall design are required. Further development recommendations include incorporating noise-cancellation technology, improving durability, and employing a user-centric approach based on thorough testing and feedback. These modifications are intended to improve the accessibility and use of the CVC Audio Case in educational contexts, supporting inclusion and enhancing learning experiences for all students.

IndexTerms -Consonant vowel consonant, product evaluation, development, innovation.

I. INTRODUCTION

The researchers find it necessary to conduct a research study on “Enhancing Multisensorial Learning in Special Education: The Consonant-Vowel-Consonant Audio Case” due to the increasing recognition of the importance of innovative educational tools in enhancing learning experiences, particularly for special education and language development. In response to the demands for the needs of innovative educational tools that accommodate the diverse learning styles, this research proposes the development of a Consonant-Vowel-Consonant (CVC) Audio Case as a multisensorial learning approach. This tool aims to improve early childhood special education through incorporating children in the phonics and language acquisition processes through the use of tactile, auditory, and visual learning experiences. The conceptualization and development of a CVC audio case represent a concerted effort to promote inclusivity and accessibility in education that accommodates the evolving demands of educators and learners within the modern educational environment.

In the global context, the way that culture delivers its texts and how humans perceive their surroundings lead to the requirement for multimodal learning techniques. Thus, developing a variety of skills, such as "the creation, production, sharing and critical consumption of narrative content" in various methods and modalities, is necessary for a meaningful discussion with our cultural history (Scolari et al., 2018, as cited in Fadeev & Milyakina, 2021). Furthermore, a research study about multisensory instruction can benefit students with learning impairments in their ability to learn languages. Repetition along with the use of both multisensory and non-multisensory techniques appears to be the most efficient way to help children acquire vocabulary in the language they are attempting to learn (Ciccarone, 2019). A research study from Gazioğlu & Karakuş (2023) aims to uncover the impact of multisensory approach based on tale-telling on their listening skills. It has been demonstrated in their study that using a multimodal learning approach when combined with storytelling-based activities helped students' listening abilities.

In our neighboring country's context, A sequence of experiments using converging methods led to the amount of related objects' sensory experiences that may have an impact on how words are learned and understood. More sensory encounters (e.g. touch, see, smell, taste, and feel) help in the early detection and acquisition of words (Seidl et al., 2023). A study from Rostan et al., (2018) stated that multisensory instructional materials were employed by the majority of teachers despite its limited course. Teachers have a significant responsibility to help students feel fulfilled and happy, especially when they are beginning to read. To help students have meaningful learning experiences, teachers can take a variety of proactive measures, such as setting up a comfortable classroom and learning area, using a playing while learning strategy, and offering high-quality, student-friendly teaching materials.

In the local context, Filipino students in basic education are reported to perform poorly in the global assessment, even with the implementation of K–12 curricula. In the 2018 International Student Assessment Program, the Philippines received the lowest scores of all the participating nations in reading, math, and science. It has been highlighted about the effectiveness of the multisensory learning approach. For kindergarten students, this intervention can be a useful means of improving their language

skills (Faunillan, 2023). A study from Matolo (2018) suggested that teachers have an essential part to play in developing more innovative activities that provide students with a high-quality education.

There is still a need for a comprehensive evaluation of the developing product in order to be utilized and used for its purpose. Hence, this study intends to make a significant contribution to the domains of educational technology and pedagogy, particularly in the context of kindergarten literacy development, by analyzing the quality of the CVC Audio Case through the lenses of multisensory learning and the VARK model (Cruz, 2024).

III. RESEARCH METHODOLOGY

3.1 Research Design

In this study, a product design and development process was utilized, which aims to create a new product or improve an existing one. This process involves research, concept creation, prototyping, and testing (Delhi, 2019). This study also employs a product analysis method. Product analysis involves a systematic examination of various aspects of a product to assess its features, functionality, design, performance, and market viability. It aims to identify strengths, weaknesses, opportunities, and threats associated with the product (Kotler et al., 2016).

3.2 Sampling Design, Research Respondents, Environment

In this study, a purposive sampling method was employed to deliberately select participants who possess insights pertinent to the research objective, specifically experts in the fields of engineering and special education. The research aims to develop the product to be evaluated by the experts. The development of the product involves eliciting insights from at least one (1) engineer and four (4) special education teachers with varying levels of experience and expertise in the field of engineering and education. Data collection occurs within expert institutions, ensuring comprehensive insights and critiques for the development of the CVC Audio Case.

3.3 Research Instrument

In this study, participants serve as the primary data collection instruments, a common practice in qualitative research methodologies. They play an important role by providing insights and critiques to improve the areas in need of development in terms of the functionality and holistic aspect of the Consonant-Vowel-Consonant (CVC) Audio Case. Through methods such as in-depth interviews and participant inquiries, the researchers facilitated direct interactions to collect perceptions and perspectives from experts regarding the development of the CVC audio case with the integration of multi-sensory technology. An analytical rubric was employed in this study to evaluate the product that intends to be examined. The rubric's multiple criteria aim to evaluate different aspects of the product, including its durability, feasibility, usability, and potential impact of the multi-sensory CVC Audio Case as an instructional tool for kindergarten literacy instructions. By taking an analytical approach, all aspects of the product are taken into account, giving important information about its advantages and potential areas for development. This study intends to uphold objectivity and uniformity in the product development process by employing this rubric, hence augmenting the validity and reliability of the results. A semi-structured interview approach is utilized to elicit insights and critiques from experts. This approach involves asking questions about their observations of the CVC Audio Case such as their insights and critiques. Moreover, researchers employed follow-up probes to allow respondents to elaborate further on their responses, providing additional depth and insight into their viewpoints (Magaldi & Berler, 2022).

3.4 Data Gathering Procedure

The first part of the gathering procedure was the approval of the Ethics Clearance documents from the Research Ethics Committee of Cebu Normal University. Once the necessary ethical clearance is secured, subsequent steps in the research procedure can proceed seamlessly. To evaluate the effectiveness of the CVC audio case in a multisensory learning approach, professionals in education or related fields are selected for semi-structured interviews. The CVC audio case was shown to the professionals together with its features and compatibility with multisensory learning. A preview of its features were provided. Professionals then evaluate the CVC audio case based on specific criteria tailored for this purpose. The information gathered from these surveys is examined to determine its advantages and disadvantages. The findings are summarized in a report to guide further development and improvement of the CVC audio case for multisensory learning approaches.

3.5 Data Analysis

A thematic analysis was used in this research study. It was anticipated that the researcher offered a detailed, comprehensive interpretation of the data that addresses the subject (Vaismoradi & Snelgrove, 2019). Semi-structured interview data were transcribed and, thereafter, carefully examined. Through a process of coding, initial categories, and shorthand labels are known as "codes" to describe their content. Following the process was to generate themes by recognizing patterns from the codes. Next was to review the themes, return to the data set, and evaluate the topics accordingly to review, add, or discard themes. After reviewing, the defining of themes were followed. Naming themes includes brief and precise words to be easily understood. The final step was to write up the analysis data. To write the analysis data, an introduction is needed to specify the objectives and approach.

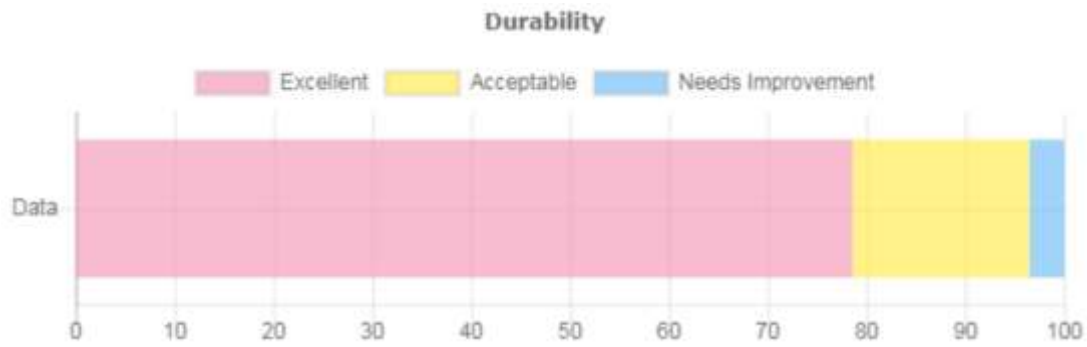
3.6 Ethical Considerations

Research participants in this study were not subjected to any harm. Their dignity was valued above any other consideration. Prior to the study, the subjects gave their full consent. Participants in the research had their privacy protected. Participants' confidentiality to an appropriate extent be maintained, and study data confidentiality also be maintained. A token of appreciation were given to the respondents for their participation. All correspondence pertaining to the study was carried out in an open and truthful manner; biased or deceptive representations of the primary data findings were also avoided.

IV. RESULTS AND DISCUSSION

4.1 Results of Product Survey Percentages

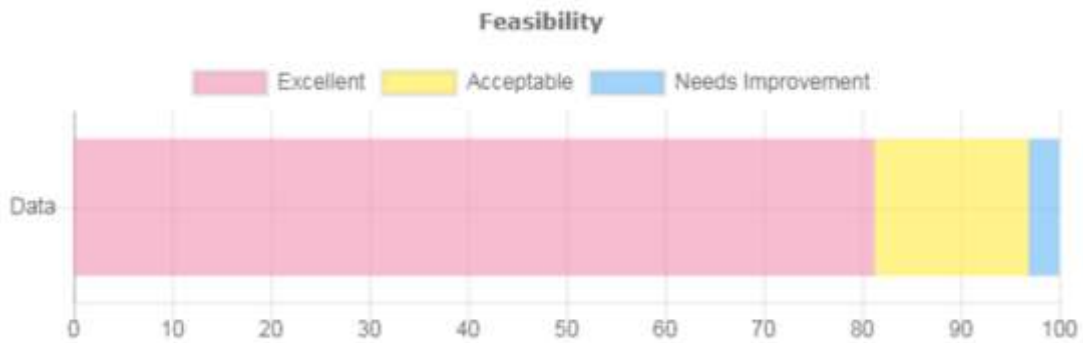
Table 4.1: Durability Percentage



The research investigation focuses on determining the durability of educational materials, with 78% of respondents rating it as excellent, 18% as acceptable, and 4% as needs improvement. The overall positive assessment of durability, with the majority ranking it as excellent, indicates that the teaching materials are generally well-built and sturdy. This high level of satisfaction implies that the materials can sustain frequent usage and will likely endure for a long period with minimal wear or damage. However, the number of respondents (18%) who assessed durability as acceptable indicates that there may be some variation in material quality or durability experiences. Further research may be required to determine the exact elements influencing these views, such as material composition, design aspects, or usage patterns. Furthermore, the small percentage (4%) of respondents who indicated a need for improvement reveals possible areas for development in future versions of instructional materials. Addressing these issues might improve the overall quality and lifespan of the products, increasing their usefulness in supporting objectives.

4.2 Results of Product Survey Percentages

Table 4.2: Feasibility Percentage



The research investigation focuses on assessing the practicality of teaching materials, with 82% of respondents ranking it as excellent, 14% as acceptable, and 4% as needs improvement. The highly positive assessment of feasibility, as evidenced by the majority ranking it as excellent, shows that the instructional materials are well-suited to their intended purpose and context of usage. This high degree of satisfaction suggests that the resources are seen as easily available, user-friendly, and useful in fostering learning experiences. However, the existence of respondents (14%) who assessed feasibility as acceptable implies that there is still potential for development or variety in usability experiences. Furthermore, the small fraction (4%) of respondents who indicated a need for improvement reveals possible areas for development in future versions of instructional materials. Addressing these issues could improve the materials' general feasibility and usefulness, increasing their efficacy in supporting objectives.

4.3 Results of Product Survey Percentages

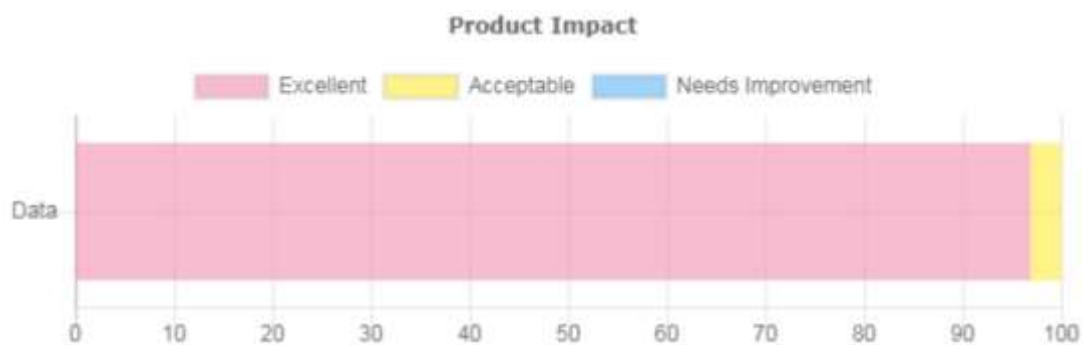
Table 4.3: Usability Percentage



The research investigation focuses on assessing the usability of instructional material, with 79% of respondents ranking it as excellent, 14% as acceptable, and 7% as needs improvement. The majority of respondents rate the instructional materials' usability as excellent, indicating that they are generally well-designed, intuitive, and effective at promoting learning experiences. This high degree of satisfaction indicates that the products are viewed as user-friendly and capable of addressing the demands of both educators and students. However, the existence of respondents (14%) who assessed usability as acceptable suggests that certain elements of the materials may be enhanced or adjusted to better meet user expectations or preferences. Further studies may be required to discover particular characteristics of usability that could be enhanced, such as teaching clarity, navigational features, or adaptation to different learning styles. Furthermore, the modest percentage of respondents (7%) who indicated a need for improvement identifies particular areas where enhancements may be required to solve usability issues. Addressing these issues could enhance the overall usability and efficacy of the instructional materials, increasing their impact on the objectives.

4.3 Results of Product Survey Percentages

Table 4.3: Product Impact Percentage



The research investigates the product impact of instructional material, indicating that 97% of respondents rated it excellent and 3% as acceptable. A large percentage of respondents consider that instructional material provides an effective impact on users in terms of learning outcomes, engagement, and overall effectiveness in accomplishing educational goals. This incredibly high degree of satisfaction indicates that the products are highly appreciated and successfully achieve their intended function, therefore greatly improving users' learning experiences. However, findings suggest that a minority of respondents (3%) evaluated product impact as satisfactory implies that the contents may be further modified to better fulfill the requirements or preferences of particular users. Further studies may be required to discover particular components of user effect that might be improved, such as relevance, accessibility, or alignment with learning objectives. Overall, this research analysis highlights instructional materials' strong beneficial effects on users, emphasizing their vital role in promoting successful and powerful learning experiences.

Based on the data gathered from the questionnaire given to the field of Special Education Teachers and Engineers, distinct themes have emerged, each representing significant patterns within the dataset. These are:

Theme 1. Specialized Education Support

The concept of "specialized educational support" denotes the kind of targeted assistance and materials given to kids who have a variety of learning needs, such as disabilities, or learning differences. According to Arajúo et al on 2019, Growing emphasis has been placed on creating an inclusive society that cherishes variety and each individual. This idea is becoming more and more ingrained in day-to-day activities. This continuous process has caused shifts in educational paradigms, societal views, and schools (Allam et al., 2021) These were supported by the range of responses expressed by Special Needs Education Teachers affirming:

"The device caters different learning styles that will be very beneficial to learners with special educational needs"- SPED teacher I

"I foresee the CVC audio as one of the instructional materials useful for learners with special educational needs. It is useful for learners especially who can't properly speak well, CVC audio helps them to know the words they hear through repetition. CVC audio have different kinds of strategies to enhance their skills. So I recommend you to use CVC audio case for it has different kinds of delivering lesson."- SPED teacher II

"As a mechanical engineer, this machine innovation can make learning more accessible for students with diverse learning needs"- Engr. K

This suggests that the use of adaptive materials, expertise, education, and time for adaptation and integration planning are some of the most important variables connected to the successful inclusion of students with special needs (Whipple & VanWeelden, 2015). This supports that a of support that eliminates barriers to learning is accommodation. Not what children learn, but how they learn (Our Kids, 2023) Tailored programs, technologies, and services are used in specialized educational support to address students' various requirements and give them equal opportunities for success. Schools can enable every student to succeed academically and socially by building inclusive settings, offering individualized education and accommodations, and both. Having collaboration, customized strategies, and continuous professional development, specialized educational support guarantees fair access to interventions that are specifically designed to meet the requirements of kids with a range of learning styles.

Theme 2. Technological Innovation

Results showed that the integration and innovation of technology in the instructional materials and in education involves the integration of new technologies into teaching and learning practices to enhance and improve instructional practices, student engagement, and learning outcomes (Ascione, 2023). These were supported by the responses and input of the selected experts specifically Special Education Teachers and Engineers:

“Generally, CVC Case audio is a very accurate innovation invention or resources instructional material.” - Teacher III

“..usable to students with disabilities” - Engineer W

“It's essential to ensure that appropriate training and resources are provided to effectively integrate this technology into educational settings and maximize its benefits” - Engineer K

“This integration of technology holds the potential to significantly advance education by enhancing learning experiences and outcomes.” - Sped Teacher I

The results indicate that the integration and innovation of technology in instructional materials and education aim to enhance teaching and learning practices, student engagement, and learning outcomes by offering new opportunities for personalized learning, collaboration, and access to educational resources. By incorporating innovative technologies into instructional materials and curriculum design, educators can create more dynamic and interactive learning experiences that cater to diverse student needs and learning styles. Several studies indicate that implementing instructional technology improves overall student motivation and involvement in learning (Mo, 2011). Specifically, technology engages students behaviorally (more time and effort spent participating in learning activities), emotionally (positively influencing attitudes and inclinations toward learning), and cognitively (mental involvement in understanding content).

The feedback from the experts highlights the potential of the CVC audio product to address specific needs in education, particularly for students with disabilities. By providing accurate and accessible instructional materials, such as audio resources, the CVC product has the potential to enhance inclusivity and support diverse learning needs. However, it's important to ensure that appropriate training and resources are provided to educators to effectively utilize the product in educational settings. There is a need for ongoing collaboration between educators and technology experts to help refine the product and ensure that it meets the main objective of the product.

Theme 3. Product Enhancement

Results showed that while the materials used in the development of the product are appropriate, it still needs a few modifications and enhancement to improve the overall quality of the product. These were supported by the responses of the Special Education Teachers and Engineers:

“...Instead of paper board, plastic, or other materials can be more durable.” - SPED Teacher I

“Needs more improvement with the audio and the overall quality of the product” - SPED Teacher II

“Probably making the design more vibrant and colorful” - Mechanical Engineer

This indicates that the materials used in making the product is generally acceptable however, it still requires some modifications to improve its functionality or increase its appeal to the users. This affirms that to validate the fundamental concepts throughout the early stages of designing a product, a prototype must be developed since validating this technological plan comes after the selection of material and manufacturing procedure then, the functioning part must then be produced and test the product's effectiveness (Jha, n.d.). A prototype is crucial when developing a product for the developers to test the product's durability, feasibility, and its impact on the actual learning setting. The user's comments and suggestions play an important role in determining the product's strengths and weaknesses. It serves as a basis for the developers to which specific areas need to be improved and maintained.

Conclusion

This study arrives at the conclusion that the Consonant-Vowel-Consonant (CVC) Audio Case presents a promising solution for enhancing multisensorial learning in inclusive education. It highlights the potential of the CVC audio product to address diverse learning needs, particularly those of students with disabilities. However, areas for improvement were also identified, including enhancing audio quality, using more durable materials, and improving overall design. These findings underscore the importance of continuous refinement and improvement in educational materials. By addressing these areas for enhancement, developers can further enhance the effectiveness and usability of the CVC audio product, ensuring its continued relevance and impact in inclusive education settings. This study recommends further development of the CVC audio case to enhance its accessibility and usability in educational settings. Firstly, integrating cutting-edges, noise-cancellation technology would improve sound quality and make the product more appealing to students across varied environments. Secondly, enhancing durability such as the wheel and how it is pasted by the velcro. It is better to use alternatives when using card boards and incorporating collaborative features, alongside vibrant design elements, in order to encourage active engagement with the product. Thirdly, adopting a user-centric approach would be ensured and overall satisfaction would be increased by carrying out extensive user testing and collecting feedback to improve the design and functionality, investigating strategic plans to improve the product's ergonomic design.

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