Journal of Educational Sciences
Journal homepage: https://jes.ejournal.unri.ac.id/index.php/JES

P-ISSN 2581-1657
E-ISSN 2581-2203

Development of Talk Button Media as an Audio Aid to Support Orientation and Mobility for Students with Visual and Intellectual Disabilities in Special Schools

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ARTICLE INFO

Article history:

Received: 15 Jan 2026
Revised: 05 March 2026
Accepted: 08 April 2026
Published online: 15 April 2026

Keywords:

Assistive Media,
Audio-Based Learning,
MDVI,
Orientation and Mobility,
Special Education

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Article Doi:

https://doi.org/10.31258/jes.10.4.p.776-796

A B S T R A C T

Education for students with multiple disabilities with visual impairment (MDVI) requires accessible support to promote independence, particularly in orientation and mobility (O&M). In special schools, MDVI students often have difficulty recognizing rooms independently and rely heavily on verbal guidance from teachers. Although Braille-based signage is commonly used, it is not always effective because some MDVI students have limited Braille skills and working memory constraints. This study aimed to develop and examine the feasibility and initial usability of the Talk Button, an audio-based room marker designed to support O&M for MDVI students. The research employed a Design and Development Research (DDR) approach including needs analysis, product design, development, expert validation, and limited usability trials. Validation involved a material expert, a media expert, and a special education practitioner using a five-point Likert scale. The results showed that the Talk Button was considered feasible to very feasible. A limited trial with one MDVI student indicated that the student could operate the device and respond to the audio cues with minimal assistance. Overall, the Talk Button shows potential as an accessible room marker for MDVI students.

1. Introduction

Education is a fundamental right of every child, without exception. This right applies not only to regular students but also to students with special needs. As stated by the United Nations Committee on the Rights of Persons with Disabilities (CRPD, 2016), "inclusive education is a fundamental human right of all learners." Therefore, a fair and meaningful education system must reach all students,

including those with multiple disabilities with visual impairment (MDVI), so they can develop their full potential.

MDVI students require more specific support because the combination of sensory and cognitive impairments can impact their independence and participation in the school environment. In the context of functional learning, the ability to recognize their surroundings and move around safely is crucial. MDVI students may experience difficulties understanding environmental information, recognizing objects/spaces, and navigating simple routes, ultimately increasing dependence on teachers or peers for assistance (Lancioni et al., 2022).

One skill that plays a significant role in supporting the independence of students with visual impairments is orientation and mobility (O&M). Orientation helps individuals understand their position in their environment, while mobility relates to the ability to move from one place to another safely and efficiently. Virgili et al. (2010) emphasize that orientation and mobility are interrelated skills: mobility becomes more meaningful when orientation is established. Therefore, O&M is an important resource for supporting a sense of security, building self-confidence, and expanding student participation in school activities and daily life.

In the Indonesian context, the provision of services for students with visual impairments, including those with visual impairments (MDVI), still requires strengthening, particularly in terms of adaptive facilities and media. Data from the Directorate of Special Education and Special Services (Kemdikbudristek, 2023) indicates that there are more than 16,000 students with visual impairments enrolled at various levels of special education, some of whom have additional disabilities, such as intellectual or motor disabilities. However, specific data for the MDVI category has not been integrated nationally, putting their needs at risk of not being optimally accommodated in educational institutions.

National policy has emphasized the importance of providing appropriate accommodations for students with disabilities. Ministerial Regulation No. 48 of 2023 emphasizes that educational institutions need to adapt facilities, infrastructure, and media to support accessibility and participation for students with disabilities. This policy direction aligns with the need for special education schools (SLB) to provide functional, contextual, and accessible support, particularly for students with multiple disabilities, such as MDVI.

Based on field conditions in special needs schools (SLB), MDVI students still experience difficulty identifying rooms and remembering routes. Students often require assistance to find specific classrooms or rooms, especially when the school is crowded or when the route is not always the same. This condition is related to the characteristics of intellectual disabilities that affect working memory and information retention. Schuchardt et al. (2010) explain that individuals with intellectual disabilities tend to experience limited working memory, causing new information to be quickly lost if not reinforced through repetition and concrete experiences.

On the other hand, special needs schools generally provide Braille-based room markers. However, their use is not optimal for MDVI students because not all students are able to adequately understand Braille. Research findings indicate that MDVI students often have difficulty distinguishing and remembering Braille dot patterns due to the similarity between letters, making Braille signs less effective as room guides for this group (Yaum et al., 2023). This condition aligns with findings that incompatible wayfinding systems can lead to the risk of misdirection, confusion, and increased dependence on assistance from others (Bacalla et al., 2024). As a result, MDVI students remain dependent on teachers and peers to find the room so that their O&M skills and independence have not developed optimally.

The gap between the needs of MDVI students and the limitations of existing room indication media indicates the need for innovations that better suit user characteristics. Audio-based media is a potential alternative because it is more accessible to students who have not yet mastered tactile symbols like Braille, and can be repeated as needed. Salih (2022) explains that voice-based technology has the potential to help individuals with visual impairments understand their environment and support orientation and mobility. Furthermore, audio-based navigation systems can provide more intuitive instructions through voice cues, helping users navigate spaces without relying on visual information (Mishra et al., 2023; Khusnunnisa & Andriani, 2025).

The use of assistive technology can also impact psychosocial aspects. Szekely et al. (2025) state that assistive technology has the potential to expand accessibility while supporting self-confidence and social participation in daily activities. Therefore, the development of simple, contextual, and reusable media is relevant to supporting the needs of MDVI students in special education settings.

Based on these conditions, this study developed the Talk Button media as an audio aid to help MDVI students recognize rooms at school. This media was designed to provide room name information through a consistent sound when the button is pressed and allow for repetition of the information as needed by the students. Development was carried out through design stages, expert validation, and limited trials, with attention to ease of use and suitability for the SLB context as part of reasonable accommodations.

The focus of this research was to produce a product that was feasible and suited to user characteristics, and to describe its usability in limited trials. This research was not an experimental test of the media's effectiveness in improving O&M skills. The novelty of the research lies in the design of the button-based audio media, developed specifically for the needs of MDVI students, including not only visual impairments but also working memory limitations, the need for concrete and concise information, and the need for consistent and repeatable audio stimuli. Therefore, the Talk Button was developed contextually for the SLB environment and aimed at its feasibility and initial usability for MDVI students in recognizing rooms.

Based on the background, identification, and limitations of the problems that have been described, this research is focused on the development of Talk Button media

as an audio aid to support students with visual impairments accompanied by intellectual disabilities (MDVI) in Special Schools (SLB). Specifically, this research aims to identify the basic needs in the development of Talk Button media to help MDVI students in recognizing rooms in the school environment, develop a prototype of Talk Button media that suits the characteristics and needs of MDVI students and assess its feasibility based on the validation results of media experts, material experts, and education practitioners, and describe the results of limited trials of the use of Talk Button media which include the accuracy of room recognition, the need for assistance (prompts), and the perception of usability of MDVI students and teachers in Special Schools (SLB).

2. Methodology

Research Design

This study employed a Design and Development Research (DDR) approach to develop and conduct formative evaluation of an audio-based assistive medium, namely Talk Button, designed to support orientation and mobility (O&M) for students with multiple disabilities including visual impairment (MDVI) in a special school (SLB) context. DDR was selected because the study focused on systematic product development, expert validation, and limited usability testing rather than experimental effectiveness testing. As emphasized by Richey & Klein (2014), DDR prioritizes iterative design and formative evaluation to ensure the initial quality and feasibility of educational products. The study was conducted through three main phases: design, development, and formative evaluation, following the framework proposed by Richey & Klein (2014) and Plomp & Nieveen (2013).

Design Phase

The design phase aimed to identify user needs and formulate the initial specifications of the product to ensure that the media would be appropriate for students with multiple disabilities with visual impairment (MDVI). Data were collected through several techniques, including classroom observations, environmental analysis of the school building, and semi-structured interviews with special education teachers. These activities were conducted to understand how MDVI students navigate the school environment and recognize different rooms. During observation, particular attention was given to how students move between spaces, how they respond to existing room markers, and how much assistance they require from teachers. Interviews with teachers were also used to explore common difficulties faced by students when identifying classrooms, toilets, offices, and other facilities. The findings indicated that many students rely heavily on verbal guidance and direct assistance from teachers because the available signage does not adequately support independent navigation. Braille-based signs are not always effective because some students have limited Braille literacy and difficulties in tactile exploration. Additionally, students may experience working memory limitations that make it difficult to remember room locations. Therefore, an

accessible and intuitive audio-based marker was considered necessary to support their orientation and mobility.

Based on the results of the needs analysis, several initial product specifications were formulated to guide the development of the Talk Button media. These specifications included the physical size of the button to ensure it could be easily reached and pressed by students, the direction and clarity of the audio output so that the message could be heard clearly in the surrounding environment, and the duration of the recorded message to ensure the information was concise but understandable. Additional considerations involved the inclusion of volume control, the durability of the device, and the safety of materials used in the product. Placement considerations were also analyzed to determine the most appropriate locations for installing the button so that students could easily locate it when approaching a room. All of these specifications were compiled into the first design concept, referred to as Design I. This initial design served as the preliminary blueprint for the product and was then reviewed by experts in special education and instructional media. Based on the feedback and suggestions provided by the experts, several improvements were made to the design. These revisions resulted in Design II, which became the finalized blueprint used for the development and prototyping stage of the Talk Button media.

Development Phase

In the development phase, a functional prototype of the Talk Button was produced based on Design II. The prototype incorporated simple record–play audio functionality, tactile-accessible buttons, and adjustable volume to ensure usability for MDVI students. Formative validation was conducted involving three validators: a media expert, an O&M/material expert, and a special education practitioner. Validation instruments were administered using a five-point Likert scale accompanied by open-ended feedback. Validation focused on usability, safety, audio clarity, accessibility, and contextual relevance. The validation results were used to guide formative revisions, ensuring the prototype was safe, usable, and contextually appropriate prior to field testing.

Formative Evaluation (Initial Trial)

Formative evaluation was carried out through a limited usability trial to examine the initial functionality and usability of the Talk Button in a real school context. The trial involved one MDVI student, selected purposively to allow in-depth observation, consistent with the exploratory nature of DDR-based usability testing. The trial was conducted in an SLB environment across structured O&M activities. Observations focused on the student's ability to operate the device, understand audio messages, associate sounds with specific rooms, level of prompting required, and overall responsiveness to the media. A hierarchical prompting strategy (physical, gestural, verbal, independent) was applied only when necessary to ensure safety. Data collection techniques included structured observation sheets, short interviews with teachers, and field notes. The trial aimed to obtain preliminary

evidence of usability and contextual feasibility rather than to measure learning effectiveness.

Research Site and Participants

The research was conducted at SLB Negeri A Citereup in Cimahi, which was selected purposively as the research site. This school was chosen because it provides educational services for students with visual impairments and has students who meet the criteria of multiple disabilities with visual impairment (MDVI). In addition, the institution demonstrated openness and support for research related to the development of assistive learning media. Conducting the research in this environment allowed the prototype to be tested within a realistic educational context where orientation and mobility learning activities take place regularly. The school environment also provided various physical spaces such as classrooms, corridors, and service rooms that could be used to simulate navigation activities using the Talk Button media. The cooperation of teachers and school administrators played an important role in facilitating the implementation of the study.

The participant involved in the usability trial was one MDVI student who met several inclusion criteria established by the researcher. These criteria included the ability to respond to auditory stimuli, basic motor ability to press a button, and active participation in orientation and mobility learning activities at school. The purposive selection of a single participant allowed the researcher to observe the interaction between the student and the device in greater depth. In addition to the student participant, three validators were involved in the expert validation process. These validators consisted of one orientation and mobility or material expert with academic expertise in the field of visual impairment education, one media expert with experience in instructional media development, and one special education practitioner who had practical experience teaching students with visual impairments. Each validator met relevant academic and professional qualifications to ensure that the evaluation of the product was credible and contextually appropriate.

Data Analysis

Data analysis in this study employed both qualitative and quantitative descriptive approaches. Qualitative data obtained from observations, interviews, and field notes were analyzed thematically to identify patterns related to usability, student responsiveness, and the level of assistance required during the trial. Thematic analysis allowed the researcher to interpret how the student interacted with the device and how the media functioned within the real school environment. Important themes such as ease of operation, clarity of audio messages, student engagement, and teacher perceptions were identified and described systematically. This qualitative analysis helped provide a deeper understanding of the practical use of the Talk Button and the contextual factors influencing its implementation.

Quantitative data were obtained from expert validation instruments and structured observation scales used during the trial. These data were analyzed using descriptive

statistical techniques, particularly mean scores, to determine the overall level of feasibility and usability of the media. The mean scores were then interpreted using categorical criteria to classify the results into levels such as feasible, very feasible, or capable. The combination of qualitative and quantitative data allowed the researcher to triangulate the findings and obtain a more comprehensive evaluation of the product. Integrating both types of data also ensured that expert judgments and user experiences were considered together in assessing the feasibility of the Talk Button media. This integrated analysis provided a solid basis for concluding whether the media was appropriate for further development and wider implementation in orientation and mobility learning for MDVI students.

3. Results and Discussion

This research is a developmental research approach using a Design and Development Research (DDR) approach, which is used to systematically guide the media development process based on user needs and is formatively evaluated before wider use in educational contexts. In this study, DDR was applied to develop the Talk Button media as an audio aid intended to support orientation and mobility (O&M) for students with visual impairments and intellectual disabilities (MDVI) in Special Needs Schools (SLB). In line with the scope of the research, Chapter IV presents findings from each development stage to emphasize that this research does not aim to test the media's effectiveness, but rather to assess the feasibility and usability of the Talk Button media in a limited context through formative evaluation.

The research and development stages include: (1) needs analysis, (2) product design, (3) product development, and (4) evaluation and revision. The needs analysis stage was conducted to obtain an overview of the initial conditions of MDVI students, orientation-mobility barriers, and the limitations of available media in schools through observations and teacher interviews. The results of this stage served as the basis for formulating the required media specifications and characteristics.

The product design stage involves developing the initial concept of the Talk Button media, including its function, physical form, and method of use, tailored to the characteristics and learning needs of students with multiple disabilities with visual impairment (MDVI). At this stage, the design focuses on creating an accessible and simple device that can assist students in identifying rooms through audio cues. Considerations include the size and placement of the button, the clarity and direction of the audio output, and the ease of operation for students with limited visual and cognitive abilities. The goal of this stage is to produce a clear design framework that reflects both user needs and practical usability in a school environment.

The product development stage involves transforming the initial design into a functional prototype that can be used and evaluated in practice. During this stage, the Talk Button device is assembled and equipped with basic record–play audio

features that allow teachers to record room identification messages. Adjustments are made to improve audio clarity, volume control, and the responsiveness of the button to ensure the device is accessible and easy to operate for MDVI students. The prototype is then prepared for expert validation and usability assessment to determine its feasibility and readiness for implementation in an educational setting.

Next, the evaluation and revision stage is conducted through validation by subject matter experts, media experts, and education practitioners, as well as limited trials with MDVI students to obtain an overview of the media's usability, safety, and suitability for use in the field. The findings from this formative evaluation are used as the basis for product revisions and refinements. Thus, these stages yielded needs findings and a media design that served as the basis for the development of the Talk Button product, as described in the following subsection.

Results of the Analysis of the Needs for the Development of Talk Button Media

A needs analysis is the initial stage in this research and development, aimed at identifying the actual conditions of students, their learning needs, and the limitations of orientation and mobility media available at the school. The analysis was conducted prior to the development of the Talk Button media, allowing the findings to serve as the primary basis for product design. Data were collected through direct observation of MDVI students and interviews with teachers involved in orientation and mobility instruction at the Special Needs School. Observations covered aspects of self-orientation, use of non-visual senses, response to verbal instructions, physical mobility, level of independence, and safety and efficiency in moving around the school environment. The analysis revealed that MDVI students still had difficulty identifying rooms independently, had limitations in forming mental maps of their surroundings, and were not yet able to optimally utilize Braille-based room signs. Students tended to be more responsive to concrete, brief, and repetitive instructions and showed better responses to audio-based stimuli than to tactile stimuli that require complex interpretation.

In addition to student needs, the analysis also revealed the needs of teachers and the school environment. Teachers reported that currently available room indication media, such as Braille signage, guiding blocks, and trailing signs, are not fully suited to the characteristics of MDVI students and therefore require intensive support. Alternative, automatic media are considered less effective because they have the potential to disrupt concentration and learning activities due to continuous sound. Therefore, teachers need orientation and mobility aids that are practical, simple, safe, easy to operate, and flexible to adapt to school conditions, including environmental noise levels. These findings indicate a gap between the needs of MDVI students and available media, necessitating the development of audio-based media that can be accessed independently or with minimal assistance, allows for repetition of information, and supports a gradual reduction in reliance on verbal directions. A summary of these needs and their implications for the design of the Talk Button media is presented in Table 1.

Table 1. Summary of Design Requirements and Implications

Needs Findings	Implications for Talk Button Media Design
Students are not yet able to use Braille signs independently	Audio-based media as the primary source of information (not dependent on Braille)
Limited mental maps/routes; easily forget paths	Audio messages are concise, consistent, and repeatable at any time
Responds better to concrete and repetitive instructions	Audio messages use simple language and a consistent delivery pattern
High dependence on verbal directions and physical assistance	Media allows for user initiative (button press) and facilitates gradual reduction in prompts
School areas have varying noise levels	Sound clarity and volume settings are adjusted to environmental conditions
Alternative media are automatically distracting due to continuous noise	System activates when the button is pressed (does not trigger an automatic repeat sound)
Teachers need practical, easy, and flexible tools	Low-tech to mid-tech media, easy to operate, with a re-recording feature based on the room name

Description and Development of Media Talk Button Products

This section presents a description of the Talk Button media product, developed as an audio aid to support the orientation and mobility of students with visual impairments and intellectual disabilities (MDVI) in Special Needs Schools. The description includes the product name and function, the media's physical design, components and operation, how it is used by students and teachers, and the media's advantages over existing room indicators. The design of this media not only considers technical aspects but also the principles of functional learning and accessibility, particularly the need for MDVI students for concrete, simple, and repeatable information.

The product developed in this research is called the Talk Button media. The Talk Button media is an audio-based aid designed to provide information on the names of rooms within the school environment through a voice message played when the button is pressed. The primary function of this media is as an audio-based room indicator that helps MDVI students identify rooms more independently without relying on Braille or other visual markers. The information conveyed is concise, clear, and can be replayed as needed by the students. The physical design of the Talk Button media was developed in stages through two stages: the initial design and the revised design. Development was carried out based on the results of a needs analysis and initial discussions with teachers, before the media entered the validation stage by experts and practitioners. The differences between the initial and revised designs demonstrate efforts to refine the media to better suit the characteristics of MDVI students and the conditions of use in the school environment.

In the initial design, the Talk Button media was designed in a simple form, with the main components being a pushbutton and a speaker. The button in the initial design was placed flush with the media surface, thus blending with the device's body. However, during the initial use phase, the position of this button still needed adjustment to make it more easily recognized tactilely by MDVI students. The speaker in the initial design was oriented upward to maximize sound output, but

this orientation was deemed suboptimal when the media was mounted on certain surfaces or used in relatively noisy school areas. Furthermore, the initial design lacked a re-recording feature and volume control, and still used nails as the mounting system and batteries as the sole power source. An illustration of the initial Talk Button media design is shown in Figure 1.

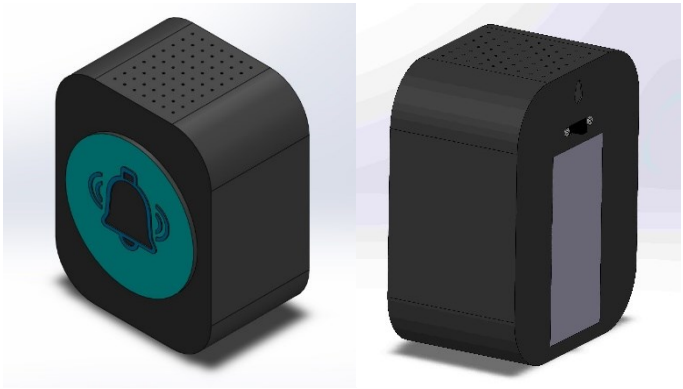

Figure 1. Initial Design of the Media Talk Button

Based on discussions with teachers and consideration of the characteristics of MDVI students, improvements were made to the revised design of the Talk Button media. In this design, the button is made to protrude from the media surface so that it is easier to recognize and operate tactilely. Changes were also made to the speaker position, from facing upwards to facing forwards, so that the sound is more directional and easier to capture when the media is installed near the door of the room or used in certain school areas. The media in the revised design is equipped with a message re-recording feature and volume adjustment so that teachers can adjust the content and sound strength according to the needs and conditions of the school environment. The mounting system is replaced with a magnet so that the media can be installed and removed without damaging the wall, and is more flexible for transportation. In addition to using a replaceable battery, the revised design also features a charging port as an alternative power source. An illustration of the revised design of the Talk Button media is shown in Figure 2.

The Talk Button consists of several main components: a power activation button, a volume control button, a voice record button, a voice playback button (the main button), a speaker for audio output, and a power source consisting of an AAA battery and a charging port in the revised design. The device operates simply and functionally: the device is activated, the volume is adjusted, a voice message is recorded by the teacher with the room name, and students play the message by pressing the main button. The message can be played repeatedly as needed, and the device is then turned off after use.

In use, the Talk Button is installed in a strategic location, such as near the room door. Students use the device by pressing the playback button to hear the room name and can repeat the message when they need reinforcement. Meanwhile, the teacher plays a role in preparing the device by adjusting the volume, recording the audio

message, ensuring sound clarity, and regularly checking the power source to ensure it is always ready for use.

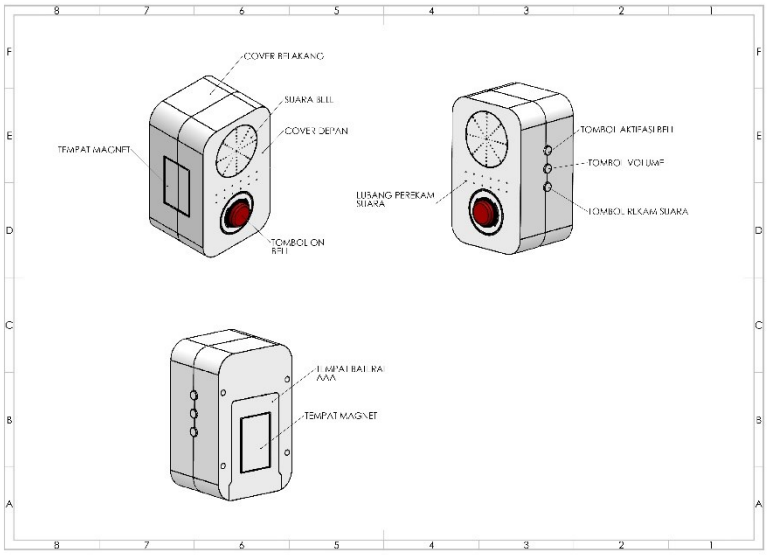

Figure 2. Revised Design of the Talk Button Media

Compared to previously available room indicator devices, the Talk Button has several advantages. It does not require Braille literacy, is operated via simple buttons, and provides audio-based information that can be re-recorded and played back. Furthermore, the Talk Button only emits a sound when pressed, allowing for greater control and a non-disruptive learning environment. This advantage makes the Talk Button more suited to the characteristics and needs of MDVI students in supporting orientation and mobility in special needs schools.

Talk Button Media Feasibility Validation Results

Validation of the Talk Button media's suitability was conducted as a formative step to ensure product suitability before implementation in the context of orientation and mobility (O&M) learning in Special Needs Schools (SLB). The validation process involved subject matter experts, media experts, and education practitioners (teachers). The aim was to assess the media's suitability in terms of audio content, design and technical aspects, safety of use, ease of operation, and suitability for students with visual impairments and intellectual disabilities (MDVI). Validation results were analyzed descriptively quantitatively using average scores and eligibility categories, and descriptively qualitatively based on notes and input from the validators.

The validation results by subject matter experts indicated that the audio message content in the Talk Button media met the development objectives as an audio-based room marker in the O&M context in SLB. The language used was deemed simple, clear, non-interpretable, and presented contextually by referring directly to real school spaces and positioning them at the point of use. From an MDVI perspective,

the audio message was deemed concise, concrete, and repeatable, thus not burdening students' information processing and supporting the habituation of simple orientation. A summary of the material expert assessment scores shows an overall average score of 4.098, categorized as "Feasible," as presented in Table 2.

Table 2. Summary of Material Expert Validation Results

No.	Assessed Aspects	Average Score	Category
1	Content Suitability	4,6	Very Eligible
2	Language Clarity	4,42	Very Eligible
3	Relevance and Contextuality	3,8	Eligible
4	Suitability to MDVI Student Characteristics	4	Eligible
5	Usefulness	3,67	Eligible
	Overall Average	4,098	Eligible

The assessment by the media expert indicates that the Talk Button media is feasible from a design and technical perspective. The media is considered easy to operate due to its simple mechanism: pressing a button plays an audio message, making it practical for use in daily school activities. The audio quality is deemed clear enough to convey room names and relatively safe for use by MDVI students. However, the media expert noted minor improvements related to the sturdiness of the casing and protection of internal components to improve durability during repeated use, as well as the importance of maintaining volume stability and audio clarity. The summary of the media expert validation results shows an overall average score of 4.087, categorized as "Feasible," as presented in Table 3.

Table 3. Summary of Media Expert Validation Results

No.	Assessed Aspects	Average Score	Category
1.	Physical Media Design	4	Eligible
2	Sound/Audio Quality	4,27	Very Eligible
3	Practicality and Ease of Use	4,07	Eligible
4	Safety of Use	4,27	Very Eligible
5	Suitability to MDVI Student Characteristics	3,83	Eligible
	Overall Average	4,087	Eligible

Meanwhile, the validation results by education practitioners (teachers) indicate a very high level of feasibility from a field implementation perspective. The Talk Button media is considered accessible because it does not require Braille or visual symbol skills and provides easily understandable audio information that can be repeated according to the needs of MDVI students. In terms of usability, the media was deemed very easy to use by both teachers and students, with simple operational procedures and a non-disruptive learning experience, as sound only occurs when the button is pressed. The media was also deemed relevant to the school context and practical for implementation in O&M learning. A summary of validation scores from education practitioners showed an overall average score of 4.282, categorized as Very Appropriate, as presented in Table 4.

Table 4. Summary of Validation Results of Education Practitioners (Teachers)

No.	Assessed Aspects	Average Score	Category
1	Suitability to MDVI Student Characteristics	4,225	Very Eligible
2	Ease of Use (Usability)	4,225	Very Eligible
3	Security and Technical Feasibility	4,32	Very Eligible
4	Usefulness (Educational and Practical Benefits)	3,96	Eligible
5	Relevance to the School Context	4,36	Very Eligible
6	Feasibility of Implementation (Practicality in the Field)	4,58	Very Eligible
	Overall Average	4,282	Very Eligible

Overall, the validation results showed that the Talk Button media received an Appropriate to Very Appropriate rating from all validators. The overall average score from subject matter experts was 4.098, media experts 4.087, and education practitioners 4.282, indicating that the media met the eligibility criteria in terms of audio content, design and technical quality, ease of use, security, and suitability for MDVI students and the SLB context. A summary of the Talk Button media eligibility validation results is presented in Table 5.

Table 5. Summary of Talk Button Media Feasibility Validation Results

Validator	Overall Average Score	Category	Key Notes
Subject Matter Expert	4,098	Eligible	Content and language appropriate for purpose; short, concrete messages; contextual for room marking; easy to understand MDVI
Media Expert	4,087	Eligible	Simple operation; clear audio; needs minor improvements to the casing/finish; maintain volume stability/audio clarity
Practitioner (Teacher)	4,282	Very Eligible	Very practical in schools; user-friendly; supports repetition; minor notes: casing reinforcement and sound/volume stability

Media Talk Button Initial Trial Results

A limited trial of the Talk Button media was conducted as an initial implementation phase to obtain a picture of the media's usability in a real-world school context, particularly in supporting the orientation and mobility of students with visual impairments and intellectual disabilities (MDVI). This trial was not intended to test the media's effectiveness, but rather to describe how students respond to audio information, operate the media, and relate the information heard to orientation activities in the school environment. The trial was conducted on an MDVI student with the initials I (10 years old, grade III SDLB) at SLB Negeri A Citeureup, Cimahi City, with the school corridor as a daily mobility route and locations relevant to the media's function as an audio-based room marker. Data were collected through structured observations using a limited trial observation sheet, accompanied by brief clarification after use of the media and field documentation to support the description of the findings.

The results of the observations indicated that students were generally able to respond to the audio stimulus produced by the Talk Button media and use it as an initial marker to identify rooms in the school environment. Regarding spatial orientation, students were generally able to name the room they heard after pressing the button, especially in familiar rooms and in relatively conducive environmental conditions. However, response consistency still varied when students were asked to differentiate between rooms or when there were environmental distractions, so in certain situations audio repetition or reinforcement in the form of concrete questions was still necessary.

In terms of navigation or mobility, the media functioned as audio landmarks that helped students confirm the presence of the room in front of them and increased confidence in proceeding to a nearby and familiar location. However, safe and efficient mobility was not yet fully independent, especially in busy corridors or when there were changes in the environmental contours. These findings indicate that the media supported initial orientation, but still required minimal assistance in certain situations. The audio-location association aspect showed that students were beginning to be able to connect the name of the room they heard with the intended location. Students could recall audio information and, on several occasions, direct attention to the appropriate area of the room. However, this association was not fully stable in less conducive conditions or when students were asked to differentiate between two adjacent rooms, so audio repetition was still necessary as reinforcement.

In terms of independence in media use, students were able to perform core steps such as pressing the audio player button and waiting for the message to finish, as well as replaying the playback when necessary. Independence was not yet fully consistent at the initiation stage, particularly in locating the wall-mounted media, so assistance in the form of simple verbal or gestural prompts was still required. Response to sound stimuli was generally good, as indicated by students' attention to the sound source and ability to repeat key words, although consistency decreased when there were surrounding sound distractions. Regarding device operation, students were able to press the buttons correctly and apply sufficient pressure, with a tendency to press repeatedly at the beginning of use that diminished after a short period of familiarization. From an affective perspective, students demonstrated good engagement, did not resist using the media, and were willing to repeat activities, although spontaneous initiative was still developing. Quantitatively, a summary of the results of the limited trial observations showed that the overall average score was in the Capable category, reflecting MDVI students' initial use of the Talk Button media, with minimal assistance needed in several aspects. A summary of the scores for each aspect is presented in Table 6.

Table 6. Summary of Limited Trial Results

No.	Assessed Aspects	Average Score	Category
1	Spatial Orientation	2,24	Able with Assistance
2	Navigation/Mobility	2,35	Able with Assistance
3	Audio-Location Association	2,52	Able
4	Media Independence	2,87	Able

5	Response to Sound Stimuli	2,68	Able
6	Tool Operation	2,71	Able
7	Self-Confidence	2,5	Able with Assistance
	Overall Average	2,562	2,562

Product Revision and Improvement

Revisions and improvements to the Talk Button media were carried out as a follow-up to the evaluation results at the validation stage by material experts, media experts, and education practitioners, as well as findings from limited trials. The revisions in this study were minor and oriented towards improving the feasibility and usability of the media in the context of Special Needs Schools (SLB), not to test the media's effectiveness. The basis for the revisions included input from material experts who emphasized the importance of consistent, concise, clear, and contextual audio messages for MDVI students; input from media experts related to technical aspects, especially the clarity of sound output, the durability and finish of the casing, and the safety of power components for repeated use; and input from education practitioners who highlighted the practicality of use in the field, including ease of operation, volume adjustment to noise levels, and the media's durability in school routines.

In addition, the findings of the limited trials indicated the need for habituation so that students press the button in a more focused and less repetitive manner without purpose. Based on this basis, product improvements focused on adjusting the sound output quality to be clearer and more consistent in school corridors, increasing button response to be more stable and comfortable to use, strengthening physical durability and protection of internal components to ensure safe use, and confirming media placement and volume settings to suit school environmental conditions. After minor revisions were made, the Talk Button media was in a final product condition ready for use as an audio-based room marker, with the main characteristics of simple operation via the voice message player button and adaptive volume settings. The improvements made increased comfort, safety, and sustainability of use, so that the Talk Button media was declared suitable for use as an audio aid to support the orientation and mobility of MDVI students in the SLB environment.

Discussion of the Results of the Talk Button Media Development

This subchapter discusses the results of the Talk Button media development based on the Design and Development Research (DDR) stages by interpreting the relationship between needs analysis, design decisions, feasibility validation results, limited trial findings, and minor revisions as a follow-up to formative evaluation. The needs analysis findings indicate that MDVI students still experience difficulties in independently recognizing rooms, rely on verbal teacher directions, and have not optimally utilized Braille signs. Therefore, media design decisions were directed at using audio as the primary mode of information, simple button-based controls, and short, repeatable messages. The choice of audio aligns with the need for just-in-time support in wayfinding activities that helps reduce the burden on route memory (Parker et al., 2021), while the lack of Braille as the primary mode reflects the

limitations of tactile discrimination skills in the MDVI context (Jarjoura, 2016). The user-activated button mechanism was chosen to maintain practicality and avoid disruption to the learning environment, while the concise and repetitive message design and volume settings respond to the need for information reinforcement and variations in school noise levels (Feghali et al., 2024; Febriyanti & Andriani, 2025). The feasibility validation results reinforced the suitability of the design, with assessments from subject matter experts (mean 4.098; Feasible) confirming the appropriateness of the audio content, media experts (mean 4.087; Feasible) assessing the physical design, audio quality, security, and usability aspects, and education practitioners (mean 4.282; Very Feasible) emphasizing the practicality and relevance of implementation in the field; the consistency of these assessments indicates that the media met conceptual, technical, and contextual feasibility prior to the trial.

The findings of the limited trial as a formative evaluation showed an overall mean score of 2.562 (category Capable), indicating initial usability of the media, particularly in concrete operational aspects such as pressing buttons, attending to audio stimuli, and repeating information, in line with literature emphasizing the effectiveness of concise, repeatable audio prompts for users with intellectual disabilities (Savage & Doughty, 2017; Masrukhin et al., 2024). Variations in achievement in spatial orientation, navigation/mobility, and self-confidence with ongoing assistance reflect the influence of contextual factors, such as environmental distractions, familiarity with finding the device, and the need for light prompts, as is common in O&M activities influenced by user, task, and environmental interactions (Parker et al., 2021; Gusmida & Islami, 2017). Minor revisions were then made as part of an iterative development process to improve performance stability and usability without altering the primary functionality of the device, with a focus on audio clarity, button responsiveness, and physical durability, in accordance with the principles of utilizing formative evaluation in prototype refinement (Göttgens & Oertelt-Prigione, 2021; Alqadri & Munawwarah, 2025). Overall, the Talk Button device contributes to Special Education practice by providing simple, controlled, and contextual audio-based access to environmental information, supporting MDVI students' orientation and mobility learning, helping teachers provide more standardized and practical environmental instructions, and strengthening schools' efforts to build more accessible learning environments.

Research Limitations

This study used a Design and Development Research (DDR) approach focusing on the development of the Talk Button media and the assessment of its feasibility and initial usability as an audio aid to support orientation and mobility (O&M) for students with multiple disabilities with visual impairment (MDVI). Although the research was conducted systematically following the DDR stages, several limitations need to be acknowledged to properly interpret the findings. These limitations relate to the number of participants, the research setting, the duration of the trial, the scope of evaluation, and the supporting data used in the study. Recognizing these limitations is important so that the results are not interpreted beyond the context of the research design. The study was primarily exploratory and

development-oriented, meaning that the main focus was on producing a feasible assistive media prototype rather than testing large-scale educational outcomes. Therefore, the results should be viewed as preliminary findings that provide an initial understanding of how the Talk Button media can function in a real school environment. Future studies are required to expand the scope and strengthen the evidence related to the use of this media in supporting O&M learning for MDVI students.

The first limitation concerns the number of trial participants. The limited usability trial involved only one MDVI student, specifically a Grade III SDLB student aged 10 years. The selection of a single participant was intended to allow in-depth observation of the interaction between the student and the media during the early stage of development. However, MDVI students have diverse characteristics, including differences in cognitive abilities, sensory responsiveness, communication skills, and prior orientation and mobility experiences. These variations can significantly influence how a student interacts with assistive media such as the Talk Button. As a result, the usability findings observed in this study may not fully represent the experiences of other MDVI students with different profiles. The results should therefore be interpreted as an initial indication of usability rather than a general conclusion about all MDVI learners. Further research involving a larger number of participants is necessary to obtain more representative and generalizable results regarding the use of the media.

The second limitation relates to the research setting and environmental context in which the trial was conducted. The study took place at SLB Negeri A Citeureup in Cimahi City, and the usability trial was mainly carried out in a school corridor. While this environment provided a realistic setting for testing the device, it does not fully represent the wide range of physical environments that MDVI students encounter within a school. Other locations such as classrooms, outdoor areas, stairways, and spaces with varying noise levels may present different challenges for the use of audio-based markers. Environmental factors such as background noise, crowd activity, and spatial complexity may influence how clearly students can hear the audio messages or how easily they can locate the device. Because the testing environment was relatively limited, the study does not capture the full range of possible contextual conditions. Consequently, the results mainly reflect the usability of the Talk Button within a specific setting rather than across multiple environmental contexts.

The third limitation concerns the duration of the implementation. The usability trial sessions were conducted over a relatively short period, with activities lasting approximately one hour per day and sometimes less depending on the school schedule. This limited duration means that the observations primarily reflect the student's initial interaction with the device rather than long-term patterns of use. Orientation and mobility skills typically develop gradually through repeated practice and consistent exposure to environmental cues. Because the study did not involve long-term implementation, it was not possible to observe whether regular use of the Talk Button would lead to increased independence, improved spatial recognition, or stronger associations between audio cues and room locations. The

short duration also limited the opportunity to observe whether the student would develop habitual use of the device over time. Therefore, the findings mainly provide insight into early usability rather than sustained learning outcomes.

The fourth limitation lies in the scope of the evaluation conducted in this research. The study focused on assessing product feasibility through expert validation and observing initial usability through a limited trial. Expert validation involved a material expert, a media expert, and a special education practitioner who evaluated the product based on criteria such as accessibility, usability, safety, and contextual relevance. While these evaluations provide important feedback regarding the appropriateness of the media, the study did not measure the effectiveness of the Talk Button in improving learning outcomes related to orientation and mobility. Variables such as increased independence, improved navigation accuracy, or measurable changes in O&M performance were not formally assessed. As a result, the conclusions of the study are limited to stating that the media is feasible and potentially supportive for use in educational settings. Claims regarding the effectiveness or impact of the media on student learning require further experimental or quasi-experimental studies.

Another limitation relates to the data collection and analysis procedures used in the study. The primary source of trial data was structured observation sheets used during the usability sessions. These observations were supported by brief interview clarifications with teachers to provide additional contextual information about the student's responses and behaviors. However, these interviews were conducted informally and did not use a separate structured interview instrument. In addition, the study did not calculate inter-rater reliability to measure the consistency of observational assessments among multiple observers. As a result, the interpretation of observational data relied mainly on descriptive analysis based on predetermined indicators of usability. While this approach is appropriate for exploratory development research, it limits the level of statistical rigor in the interpretation of behavioral responses during the trial.

The final limitation concerns the long-term durability and technical performance of the product. During the development process, revisions were relatively minor and focused primarily on improving audio clarity and button responsiveness. The study did not conduct comprehensive durability testing related to prolonged use of the device, such as resistance of the casing material, stability of the audio system over time, or the device's performance when installed in different environmental conditions. These aspects are important for ensuring that assistive media can function reliably in daily school activities. Because such testing was outside the scope of this study, the current recommendations for the use of the Talk Button remain limited to the specific research context. Future development efforts should include extended durability testing and broader implementation scenarios to ensure that the device can be safely and effectively used in a variety of school environments.

4. Conclusion

Based on the results of research and development of Talk Button media as an audio aid to support orientation and mobility (O&M) of students with visual impairments accompanied by intellectual disabilities (MDVI) in Special Schools, it can be concluded that the main needs of MDVI students lie in the limitations of recognizing rooms independently and high dependence on verbal directions from teachers, while Braille-based markers cannot be utilized optimally due to limited Braille skills. This condition emphasizes the urgency of developing audio-based room marker media that is simple, concrete, repeatable, and does not depend on visual or Braille information. Answering these needs, this study has succeeded in developing Talk Button as an audio-based room marker with the characteristics of simple button operation, short voice messages containing the name of the room that can be played back, as well as volume control and re-recording features according to the school context. The validation results show that this media is declared feasible to very feasible to use, with an average score from material experts of 4.098 (Feasible), media experts 4.087 (Feasible), and education practitioners 4.282 (Very Feasible). A limited trial resulted in an initial usability score of 2.562 (the Capable category), indicating that learners were able to operate the media and respond to audio information, although they still needed assistance in certain situations. As a follow-up evaluation, minor revisions were made focusing on improving the clarity of the audio output and the comfort and stability of the button response. However, the results of this study are limited to the trial context and cannot be generalized, and the effectiveness of the Talk Button on improving O&M skills has not been quantitatively tested.

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How to cite this article:

Rijal, M. A., Pujaningsih., Edlina, M. N., & Fitri, R. (2026). Development of Talk Button Media as an Audio Aid to Support Orientation and Mobility for Students with Visual and Intellectual Disabilities in Special Schools. *Journal of Educational Sciences*, *10(4)*, 776-796.