

## **Breaking Barriers: Empowering Visual Impaired Students with Audio-Assisted Balinese Script Relief Media for Enhanced Literacy at A Special Public School**

**I Komang Sudarma**

Universitas Pendidikan Ganesha, Indonesia  
*Email: ik-sudarma@undiksha.ac.id*

**I Wayan Sujana**

Universitas Pendidikan Ganesha, Indonesia  
*Email: iwayan.sujana@undiksha.ac.id*

**Kadek Andre Karisma Dewantara**

Universitas Pendidikan Ganesha, Indonesia  
*Email: andre.karisma@student.undiksha.ac.id*

**I Nyoman Suka Ardiyasa**

STAHN Mpu Kuturan Singaraja, Indonesia  
*Email: suka.ardiyasa@gmail.com*

**Ni Pande Kadek Dewi Sudiartini**

Universitas Pendidikan Ganesha, Indonesia  
*Email: pande.dewi@undiksha.ac.id*

*Received: 22 June 2022*

*Reviewed: 21 February 2024-20 May 2024*

*Accepted: 30 May 2024*

*Published: 28 June 2024*

### **Abstract**

The difficulties faced by teachers at a Special Public School in teaching Balinese script literacy to visually impaired children have resulted in low literacy skills in Balinese script among these students. In order to maximize Balinese script learning, appropriate learning media tailored to the characteristics of visually impaired children are necessary. This study aims to determine the design, feasibility, and effectiveness of the Relief Balinese Script Media (*Reaksi*) assisted by audio to improve the Balinese script literacy of visually impaired students at a Special Public School. The study utilizes the ADDIE development model with a quantitative research design. Data collection methods include written tests assessing Balinese script writing. The subjects of this study are 12 visually impaired students. The results of this development study are as follows: (1) the design of the audio media achieved a score of 93.15%, qualifying as excellent; (2) the *Reaksi* media was deemed feasible, scoring 91.44% and qualifying as excellent; (3) the obtained t-value was 77.97, while the t-table value at a significance level of 5% was 2.101. These results indicate that the t-value is greater than the t-table value, thus rejecting H<sub>0</sub> and accepting H<sub>1</sub>. Therefore, it can be concluded

that the Relief Balinese Script Media (*Reaksi*) assisted by audio is effectively applied to improve the Balinese script literacy of visually impaired students at a Special Public School. This audio-assisted Relief Balinese Script Media (*Reaksi*) helps visually impaired students recognize the actual forms of Balinese script, thereby enhancing the literacy skills of Balinese script reading and writing among visually impaired students.

Keywords: Development; learning media; Balinese script; Balinese script relief; visually impaired students

## Introduction

Education is everyone's right, both normal children and children with special needs. Education is a process to develop students' potential optimally (Taufiq, 2021). Schools as educational institutions are obliged to provide optimal learning for students. Not only in normal schools, special public schools are also expected to be able to provide optimal learning and fulfill the learning rights of children with special needs (Al Faiq dan Suryaningsih, 2021). One of the learning contents taught in schools is local content. Bali Province Regional Regulation Number 1 of 2018 concerning Balinese Language, Literacy and Literature requires all levels of education to teach local content for a minimum of 2 hours per week. The local content in Bali is Balinese (Tresnawati, 2021). One of the materials in local Balinese language content is about Balinese script (Gunada, dkk., 2022). Local Balinese language content is of course also taught to students with visual impairments.

Visual impairment is a term used for the condition of individuals who experience problems or obstacles to their visual function (Andrisani dan Iswari, 2021). Educationally, a person is said to have visual impairment if for his learning activities, he requires special tools, special methods or certain techniques so that he can learn without sight or with limited vision (Widjaya dan Chrisna, 2019). In line with other opinions which state that a visual impairment child is someone who has visual impairments and prevents the individual from doing activities so they need special tools, special materials and special training for them (Darmawati, dkk., 2023). Blind children tend to rely on the use of other senses to receive information or messages, such as their sense of hearing and touch. Other research states that blind children use senses that are still functioning well to absorb information or messages in everyday life, including the sense of touch (auditory) and the sense of hearing (Praptaningrum, 2020).

Based on the method of learning, blindness can be divided into two groups, namely blind or severely visually impaired and low vision or mildly blind. (Widjaya dan Chrisna, 2019). A person is said to be severely visually impaired (blind) if he has no sight at all, so that for learning purposes he must use non-visual senses, for example to read he uses braille which is read through his fingertips or audio recordings which are "read" through hearing (Widjaya dan Chrisna, 2019). A person is said to be mildly blind or low vision if the person can still see with the help of special equipment or their vision function can be improved using optical aids and environmental modifications (Darmawati, dkk., 2023). Educators need to provide tools that are used as learning media by adjusting students' needs and characteristics. In line with other research which states that teaching staff must follow an adaptive pattern according to student needs and must have adequate facilities (Sa, dkk., 2021).

Based on an interview with the Head of a Special Public School, the results showed that there was no learning media used to teach Balinese script to blind students. The teacher only teaches Balinese script verbally and does not teach about the actual forms of Balinese script. Optimal learning is not only realized by teaching verbally, but also requires tools that are used as learning media for blind children in recognizing the true forms of Balinese script (Giri, 2017;

Andrisani dan Iswari, 2021). The ability to read and write Balinese script for children with special needs has been regulated in the Independent Curriculum with local content in Balinese Special School Level. By seeing the importance of Balinese script literacy for children in Bali, schools with special needs require a solution to solve problems specifically in Balinese literacy for blind children and need help in how to teach Balinese script to blind children using learning media that suits their characteristics and learning styles (Hasan, 2021; Mustika, 2018).

To overcome this problem, it is necessary to have learning media to teach Balinese script. Despite their limitations, if blind children are taught according to their characteristics, they can have the potential to read and write Balinese script using their strong imagination (Romdhiana, 2020). Learning Balinese script must also be pursued because it is part of the local content curriculum for children with special needs in Bali. Balinese script has become a part of the mandatory subjects for students, from elementary school to high school (Dewi et al., 2023). Not only in formal schools, but special public schools are also expected to strive to learn Balinese script. To support the learning rights of blind children, it is necessary to strive for learning media for Balinese script. The right media to use as a solution for teaching Balinese script is Balinese Script Relief (*Reaksi*).

*Reaksi* was designed using a wooden board by making a concave carving using a carving technique according to the shape of Balinese characters the size of a finger's touch to help blind children learn by touching (Rifandi & Haryanto, 2020). The use of sound-assisted *Reaksi* can enable blind children to know the original shape of the Balinese script because blind children feel the relief curves of the Balinese script which are made concave and are also equipped with audio buttons that can make sounds. This is in line with research which states that Arabic braille reading boards made of wood can be used to introduce Arabic *Hijaiyah* letters to blind children (Alfionita & Irdamurni, 2022). This Balinese script relief is also equipped with voice-assisted buttons because it is adapted to the learning characteristics of blind children, namely auditory. Blind children can press the button located at the top left corner and the Balinese script will sound. Listening skills have an important role in the learning process of blind children. This auditory ability is one of the important sources used by blind children to obtain information (Praptaningrum, 2020).

The use of voice-assisted reaction media certainly requires the teacher's role as a guide in the learning process (Praptaningrum, 2020). The training provided is how to use voice-assisted Reaction media and how to teach Balinese script using voice-assisted Reaction to blind children. The teacher's ability to teach Balinese script also has an impact on the Balinese literacy of blind children (Dasor et al., 2021). Certainly, with this program, schools can offer optimal Balinese script instruction to enhance the reading and writing literacy of visually impaired children (Mirnawati, 2020). The provision of Balinese script learning to visually impaired children also open opportunities for them to participate in preserving the Balinese script. The preservation of the Balinese script has been regulated in the Governor Regulation of Bali Province Number 80 of 2018, specifically in Article 7 paragraph 1 concerning the Balinese Language Month.

This research has the objectives namely; 1) to find out the design of audio-assisted Balinese Script Relief (*Reaksi*) media to increase Balinese script literacy for students with visual impairments at a Special Public School; 2) to determine the feasibility of audio-assisted Balinese Script Relief (*Reaksi*) media to increase Balinese literacy literacy of students with visual impairments at a Special Public School in terms of content, design, media, individual testing, small group testing, and field trials at a Special Public School; 3) to determine the effectiveness of audio-assisted Balinese Script Relief (*Reaksi*) media to increase Balinese literacy literacy of students

with visual impairments at a Special Public School.

### **Literature review**

Learning media that relies on the senses of touch and hearing

Optimal learning is not only realized by teaching verbally, but also requires tools that are used as learning media for blind children (Fansury et al., 2019; Kissi & Dreesmann, 2018). Despite their limitations, if blind children are taught according to their characteristics, they can have the potential to read and write using their strong imagination. Blind children need special tools, special materials and special training for activities (Praptaningrum, 2020). In connection with their learning activities, blind children need special tools, special methods or certain techniques to be able to learn without sight or with limited vision (Andrisani & Iswari, 2021). Blind children can understand learning with audio media which is set using clear and easy to understand sound because it suits their characteristics and learning style. Apart from audio media, the use of replica media or artificial objects that rely on the sense of touch in learning can also improve learning outcomes for blind children (Anam & Priharto, 2021).

Research conducted by Alfionita & Irdamurni (2022) states that tactual media using braille in the form of tactile books can be used by blind people because they can recognize the image or image of the actual shape with tactual images. These tactile books can be defined as simple books that contain pictures in relief form and information transferred through touch in braille. In line with other study by Hamdani et al (2019) explained that braille-based board games can be an interactive, fun and effective learning tool in introducing the world of fruit to blind children. With an inclusive, touch-based approach, this board game will help blind children overcome their limitations and expand their knowledge and skills.

In addition, research conducted by Praptaningrum 2020 stated that by using audio media, blind children are more motivated and can easily understand learning, and can learn and imagine the sounds they hear through audio so that blind children can better understand the material presented. Likewise with research conducted by Anam & Priharto 2021 explained that interactive audio modules can be used in learning as a medium for blind students to be more motivated and easier to understand the material, as well as being able to learn and imagine the sounds they hear with audio so that blind students can understand the material presented well.

In line with the results of this research, research conducted by Pratama (2023) stated that by having learning media that suits the characteristics of blind children in the form of voice-assisted Balinese Script Reactions or Reliefs, it can improve the literacy skills of reading and writing Balinese script for blind children. This reaction was designed using a wooden board with concave carvings in the shape of Balinese characters the size of a finger's touch to help blind children learn by touching, and is equipped with sound-assisted buttons because it is adapted to the learning characteristics of blind children, namely auditory.

Reading and writing literacy of blind children

Obtaining knowledge for blind children is by listening to information or reading texts in braille form. The knowledge that has been obtained will of course be conveyed to other people through oral and written means. The ability to read and write braille for blind children is a requirement that needs to be had during the educational process. Braille reading and writing skills do not appear automatically but are achieved through continuous practice and habit. Braille is a special code for a language used by certain communities so that it can be read by blind children,

especially in terms of education. The braille writing code is accessed by blind children through touch or tactile senses, especially fingers (Nahar et al., 2022).

One of the lessons taught to blind students is literacy skills. For blind students, the literacy development model is different from students in general, they develop reading, writing and arithmetic skills using braille and technology applications such as screen readers, JAWS, MPDI, and various additional audio features (Ernayanti et al., 2019). The difficulties most experienced by blind students in literacy are training sensitivity to use braille letters, memorizing braille dots, and operating numbers in mathematics lessons. The strategy they use to overcome difficulties is to use tools that support them, such as laptops, audio and computer applications. Apart from that, students can overcome difficulties because of encouragement and attention from their parents, enthusiasm to continue learning, and starting to learn from the easiest things (Gusmuliana, 2018).

Blind children who have a limited sense of sight certainly need braille as a means of obtaining education and increasing activities that involve touch and hearing. Blind children's reading readiness can be developed through literacy activities. Literacy activities can be implemented every day and teachers provide key words to strengthen understanding and create contextual teaching materials. Blind children need higher initiative to understand information from the surrounding environment through the sense of touch, although this is difficult to do because it has three aspects of limitations (Liliana et al., 2020). Aspects that are limitations for blind children are cognitive, mobility orientation and social interaction. Blind children need communication skills to take the initiative to ask questions about something (expressive) and the ability to understand other people's explanations verbally (receptive). The process of listening to blind children is carried out through touch and audio. In the basic literacy process of a blind child, especially reading and writing, special services are needed according to the child's condition and media or tools that can provide meaningful experiences and form understanding for the blind child.

The constructivist theory applied needs to be multisensory involving touch (Cattaneo, 2017; Sunanik, 2014). Blind children use physical contact to support interaction with the environment in forming an overall concept. This physical contact is used to provide experience using the sense of touch as a channel for receiving information about the impact of visual impairment. Understanding the concept of blindness often experiences errors when the knowledge is conveyed in an incorrect way. Apart from that, it also provides understanding by means of explanatory information received through the sense of hearing. Blind students' self-confidence is developed through group work, personal reinforcement and presentation activities to the teacher.

Behavioristic theory by providing stimuli to achieve the right response, the sense of touch requires structured training, involving long periods of training and the use of various materials (Boyadzhieva, 2016; Fielding & Hornsey, 2016). Activities carried out to develop the sense of touch must be interesting and fun, and can be packaged in the form of games. The training program must develop the ability to recognize objects, differentiate objects and finally determine these objects through touch. Knowledge information enters through the senses, both visual and auditory. Of all incoming information, a small portion is stored to be continued in short-term memory while the rest is lost from the information processing system. Therefore it can be emphasized that through these basic reading and writing literacy activities, blind children are expected to be able to add more vocabulary so that the language barriers experienced by blind children can be overcome. Apart from that, reading and writing literacy activities can also make it easier for the blind to "visualize" an object in a descriptive way.

## **Research method**

### Design of the study

The type of research used in this research is development by applying the ADDIE development model. The ADDIE model is used in an effort to overcome problems related to learning, one of which is multimedia development (Branch, 2009). Apart from that, the ADDIE model also has systematic stages so that it can be a basis for developing this interactive multimedia product. The ADDIE model has five systematic stages, namely: 1) analysis, 2) design, 3) development, 4) implementation, and 5) evaluation (Tegeh et al., 2015).

### Participant

The subject of this research is visually impaired students at a Special Public School. Moreover this study also involve expert test subjects, drawn from diverse fields such as design, learning content, design, and media, provide invaluable insights into the product's functionality, usability, and overall effectiveness. Their expertise helps in pinpointing areas for improvement and refining the product to meet the highest standards. In addition to expert evaluations, trials with students offer real-world feedback and user perspectives. Individual trials involving groups of three students provide intimate insights into how individual users interact with the product, while small group trials involving 12 blind students at a Special Public School offer a unique opportunity to assess the product's accessibility and inclusivity. By combining expert assessments with student trials, the product testing process ensures that the final product is not only technically robust but also user-friendly and tailored to meet the needs of its target audience.

### Instrument: procedures and validation

The data collection method is carried out through the test method. The test method used in this research was a Balinese script writing test to obtain pretest and posttest data used in the effectiveness test. Apart from effectiveness testing, non-test methods are used to obtain data related to product suitability as well as analyzing research problems using questionnaires and interview guides. The data analysis technique in this research uses qualitative descriptive analysis techniques, quantitative descriptive analysis, descriptive statistical analysis, and inferential statistical analysis via dependent sample t-test. The instrument grid used in this research is presented in Table 1, Table 2, Table 3, Table 4, Table 5, and Table 6.

Table 1. Design expert instrument grid

No	Component	Indicator
1	Development model used	a. Suitability of the development model used with the characteristics of the product produced b. Accuracy of reasons for selecting a development model
2	Development stages	a. Suitability of the development stages carried out with the development model used b. Accuracy of depiction of development stages
3	Clarity, practicality and conciseness	a. Clarity of development stages based on the development model used b. The level of practicality of the development process implemented c. Collapse of development steps
4	Formative and summative evaluation	a. The accuracy of the evaluation design according to the model used b. Clarity of the evaluation instruments developed

## c. Validity and reliability of evaluation instruments

Table 2. Expert instrument grid for content / learning materials

No	Component	Indicator
1	Curriculum	a. Compatibility of material with KD b. Compliance of indicators with KD c. Suitability of material to learning objectives
2	Material	a. Material truth b. Material accuracy c. The importance of material d. Depth of material e. Material attractiveness f. Suitability of material to students' situations and characteristics g. Material is easy to understand h. The material represents real life
3	Grammar	a. Use of appropriate and consistent language b. The language used is appropriate to the characteristics of the students
4	Formative	a. The accuracy of the evaluation design according to the model used b. Clarity of the evaluation instruments developed

Table 3. Learning design expert instrument grid

No	Component	Indicator
1.	Objective	a. Clarity of learning objectives b. Consistency between objectives, materials, and evaluation
2.	Strategy	a. Clarity of the material provided b. Systematic delivery of material c. Presentation of material in an interesting manner d. Learning activities can motivate students e. Provide examples according to presentation f. Give students the opportunity to practice independently
3.	Evaluation	a. Provide evaluation questions to test student understanding b. Suitability of questions to learning outcomes

Table 4. Learning media expert instrument grid

No	Component	Indicator
1.	Technical	a. Ease of use of learning audio media b. Audio media can help students understand the material c. Learning audio media can be used repeatedly d. The duration of learning audio is effective for student learning
2.	Appearance	a. Consistency of the content of audio material b. Appropriate use of sound effects c. Appropriate music support d. Audio learning raises student motivation e. Use of appropriate and appropriate narrative

Table 5. Instrument grid for individual trials, small group trials and field trials

No	Component	Indicator
----	-----------	-----------

1.	Appearance	a. The attractiveness of learning using media b. The attractiveness of audio music c. Interesting sound effects in audio d. Ease of access to audio features e. Audio sound quality when delivering material
2.	Material	a. Clarity of description of the material b. Material benefits c. The material is easy to understand
3.	Motivation	a. Media is able to provide enthusiasm in learning oral gamelan b. Media can increase interest in learning oral gamelan
4.	Operation	a. Ease of use of media products

(Suartama, 2016)

Table 6. Balinese script writing test grid

No	Criteia	Very Good (4)	Good (3)	Poor (2)	Very Poor (1)
1.	Similarity of written form to Balinese script	The form of the Balinese script that is made is very similar to the original form of the Balinese script	The form of the Balinese script that is made is similar to the original form of the Balinese script and there are 1-2 characters that are not similar	The form of the Balinese script that was made is less similar to the original form of the Balinese script and there are 3-5 characters that are not similar	The form of the Balinese script that is made is not similar to the original form of the Balinese script and there are 6 or more characters that are not similar
2.	Accuracy of Balinese script forms	The form of the Balinese script is very precise	The form of the Balinese script is correct and there are 1-2 characters that are incorrect	The form of the Balinese script is not quite right and there are 3-5 characters that are incorrect	The shape of the Balinese script is not correct and there are 6 or more incorrect characters
3.	Neatness of writing	The Balinese script is very neat	The Balinese script is written neatly and there are 1-2 characters out of line	The writing of the Balinese script is not neat, there are 3-5 characters that are out of line	Balinese script writing is not neat, there are 6 or more characters that are out of line
4.	The beauty of writing	The form of writing is very beautiful	The writing is beautiful	The form of writing is less beautiful	The form of the writing is not beautiful

## Results

The Bali Script Relief Media (*Reaksi*) with audio assistance is designed to enhance the literacy of visually impaired disabled students in a Special Public School. The development of the Bali Script Relief Media (*Reaksi*) with audio assistance to enhance the literacy of visually impaired



disabled students in a Special Public School follows each stage of the ADDIE development model, which consists of five systematic stages: 1) analysis, 2) design, 3) development, 4) implementation, and 5) evaluation. In the analysis stage, several analyses are conducted, namely learning needs analysis and curriculum analysis. The data collection method used is non-test through interviews with Balinese language teachers and visually impaired students at a Special Public School, which revealed that the literacy of reading and writing in Balinese script among visually impaired students is still low. In the learning needs analysis stage, information is obtained that the learning objectives in Balinese language, especially literacy in reading and writing in Balinese script, have not been maximally achieved. This is evidenced by 0% of visually impaired children never reading and writing in Balinese script due to the lack of Balinese script learning media. Through this problem, the development of learning media is considered necessary to address the existing issues. This causes visually impaired students with special needs to require learning media that suits their characteristics to recognize the original forms of Balinese script. In the curriculum analysis stage at the Special Public School, the Merdeka Belajar curriculum is used as a reference in the learning process.

In the design stage, several activities are carried out, namely 1) designing flowcharts, storyboards, and ADDIE model flow diagrams, 2) conducting design tests, 3) preparing tools and materials for creating Reaction media with audio assistance, 4) compiling content, and 5) creating media assessment instruments. Flowcharts and storyboards are designs of the product's appearance, while the ADDIE model flow diagram is a design of steps that align with the ADDIE development model. Design tests are conducted with design experts, resulting in a score of 93.15%, categorized as very good. Additionally, at this stage, research instruments are prepared, such as validity questionnaires by experts, trial questionnaires for students, as well as Balinese script writing test instruments for pretest and posttest effectiveness testing.

In the development stage, the process of developing audio-assisted Reaction media is carried out according to the designed flowchart and storyboard. The product is designed using tools and materials such as wood, cables, Arduino, and audio devices.

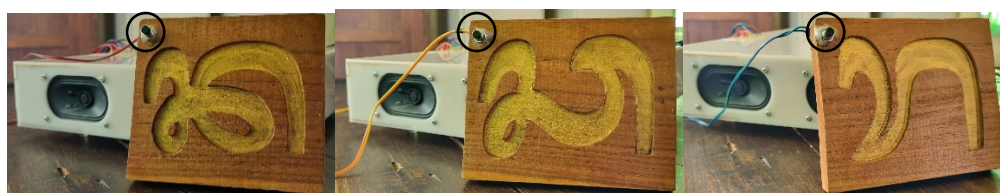


Figure 1. Relief of Balinese script (*Reaksi*) assisted by audio

Furthermore, the *Reaksi* media product is tested for validity by learning content experts, learning design experts, and learning media experts. The data collection method used for expert testing is a questionnaire. The results of validity tests by experts are presented in Table 7.

Table 7. Percentage of validity test results by experts

No	Test Subjects	Score	Qualification
1	Test Learning Content Experts	93.33	Very good
2	Learning Design Expert Test	92.5	Very good
3	Learning Media Expert Test	94.11	Very good

In the development stage, product testing was also conducted on visually impaired students as research subjects. The *Reaksi* media product, which has been validated by experts, was then

tested on students through individual trials and small group trials to obtain feedback from visually impaired students regarding the developed *Reaksi* media product. The data collection method used for product testing on visually impaired students is the Balinese script writing test. The results of the *Reaksi* product trial on visually impaired students are presented in Table 8.

Table 8. Percentage of test results for interactive multimedia products with students

No	Test Subjects	Score	Qualification
1	Test Learning Content Experts	92.33	Very good
2	Learning Design Expert Test	91.5	Very good
3	Learning Media Expert Test	92.11	Very good
4	Individual Trial	90.67	Very good
5	Small Group Trials	90.6	Very good

Based on the validity test results by experts and the product trial results with students, it was found that the percentage range qualifies as excellent. This indicates that the Reaction media product for visually impaired students at the Special Public School is suitable for use in the learning process.

During the implementation phase, the Reaction media product, which has been deemed suitable based on expert and visually impaired student feedback, was implemented into learning activities to assess the effectiveness of the audio media product. Effectiveness testing was conducted through pretests and posttests. The pretest results had an average of 0, while the posttest results had an average of 86.67, indicating an increase in the average skill score of visually impaired students in vocalizing gamelan. Hypothesis testing was conducted by analyzing pretest and posttest data using the dependent t-test formula. Calculations using the formula for dependent sample t-test yield a t-value of 77.97. This t-value is then compared with the critical value at a significance level of 5% with degrees of freedom ( $df = n - 1 = 12 - 1 = 11$ ), resulting in a critical t-value (t-table) of 2.201. The result indicates that the calculated t-value of 77.97 > the critical t-value of 2.101, thus rejecting the null hypothesis ( $H_0$ ) stating that there is no significant difference (5%) in the acquisition of Balinese script literacy scores among visually impaired students. Instead, the alternative hypothesis ( $H_1$ ) stating that there is a significant difference (5%) in the acquisition of Balinese script literacy scores among visually impaired students at the Special Public School is accepted. Therefore, it can be concluded that the Relief Balinese Script (Reaction) media with audio assistance is effectively applied to enhance the Balinese script literacy of visually impaired students at this Special Public School.

In the evaluation phase, evaluations are conducted to determine the success of developing the audio-assisted Reaction media. The evaluations conducted include formative evaluation and summative evaluation. Formative evaluation is carried out for product refinement at each stage based on inputs, while summative evaluation is conducted at the end to determine the effectiveness of the product on the literacy of reading and writing Balinese script for visually impaired students at this Special Public School. In the evaluation phase, evaluations are conducted to determine the success of developing the audio-assisted Reaction media. The evaluations conducted include formative evaluation and summative evaluation. Formative evaluation is carried out for product refinement at each stage based on inputs, while summative evaluation is conducted at the end to determine the effectiveness of the product on the literacy of reading and writing Balinese script for visually impaired students of this Special Public School.

## Discussion

The development of the Audio-Assisted Reaction media followed the structured approach of the ADDIE model, encompassing five distinct phases: analysis, design, development, implementation, and evaluation. The outcome yielded exceptionally favorable results. Firstly, the analysis stage involved a thorough examination of requirements and objectives, ensuring alignment with learning content. Secondly, during the design phase, meticulous planning and conceptualization took place to craft engaging and pedagogically sound materials. Thirdly, in the development phase, the envisioned media were brought to life through careful construction and refinement. The expertise demonstrated in this stage garnered excellent ratings from instructional media specialists, affirming its relevance and efficacy (Bila et al., 2022; Cahyani et al., 2020). Fourthly, upon implementation, the Audio-Assisted Reaction media were introduced into learning environments. Feedback from individual trial assessments highlighted its excellent performance and suitability in meeting educational objectives. Lastly, during the evaluation phase, both individual and small group trials were conducted to assess the effectiveness and usability of the media. The results from these evaluations consistently indicated outstanding performance and strong suitability, affirming the quality and efficacy of the developed materials.

Based on the thorough evaluation of the product's feasibility, it can be confidently affirmed that the Bali Script Relief Media, known as *Reaksi*, when augmented with audio assistance, stands as a commendable tool for incorporation within the educational framework. This assertion stems from a comprehensive examination of its utility and efficacy within the realm of learning. The effectiveness of this innovative media product, *Reaksi*, is meticulously gauged through a structured assessment comprising both pretests and posttests, aimed at discerning its impact on the target audience. Upon scrutinizing the results derived from these evaluations, it becomes evident that the calculated t-value, which stands at 77.97, surpasses the critical t-value of 2.101, as per the designated table. Consequently, this statistical analysis leads to the rejection of the null hypothesis ( $H_0$ ) while affirming the alternative hypothesis ( $H_1$ ). In simpler terms, it implies that there exists a tangible and statistically significant improvement attributable to the utilization of the Bali Script Relief Media with audio assistance, *Reaksi*, in facilitating the learning process (Nugraha, 2022; I. W. Widiana et al., 2023, 2024). This empirical validation underscores the efficacy of integrating audio assistance within the *Reaksi* media platform as a means to bolster the acquisition and comprehension of Balinese script literacy among visually impaired students enrolled at this Special Public School. By harnessing the synergy between innovative technology and pedagogical objectives, this approach not only enhances accessibility but also fosters inclusivity within the educational landscape, thereby empowering students with disabilities to engage meaningfully in the pursuit of knowledge and skill acquisition (I Wayan Widiana & Jampel, 2016; Zulkhairi & Hajar, 2023).

Based on the program results that have been presented, it can be stated that audio-assisted Balinese script Relief (*Reaksi*) media can increase the Balinese literacy of blind children. These results are in line with research by Alfionita dan Irdamurni (2022) regarding the Arabic braille reading board media made of wood that can be used to introduce Arabic Hijaiyah letters to blind children. These results indicate that tactile media is relevant and appropriate to use for introducing letters to blind children. Another study also revealed that children with special needs, such as the blind, can understand learning using audio media which is set to use clear and easy to understand sound (Alfionita & Irdamurni, 2022; Praptaningrum, 2020). Based on this supporting research, it can be stated that media that can be touched and heard is very appropriate to the characteristics of blind children and is relevant to the implementation of community service programs (Alifah et al., 2022; Apriyansyah, 2018).

Blind children need special tools, special materials and special training for activities (Darmawati et al., 2023). In connection with their learning activities, blind children need special tools, special methods or certain techniques to be able to learn without sight or with limited vision (Widjaya & Chrisna, 2019). Voice-assisted *reaksi* can of course be used by teachers in learning Balinese as a special tool for teaching Balinese script to blind children because it suits their characteristics and learning style which prioritizes the senses of touch and hearing (Praptaningrum, 2020). Teachers also apply certain techniques and special exercises to teach Balinese script using voice-assisted *reaksi* to blind children, such as the four stages of the Reaction technique which adopts the stages of learning braille for blind children, namely the techniques of touching, recognizing, reading and writing (Nini & Harum, 2023). These stages are practiced repeatedly, guided by Thorndike's law of learning, namely the law of exercise. Therefore, the use of voice-assisted Reaction and the application of the four stages of the Reaction technique are appropriate for improving teachers' abilities in teaching Balinese script to blind children and increasing the reading and writing literacy of Balinese script for blind children. Through the use of replica media or artificial objects in learning, it can improve learning outcomes for blind children (Purwaningsih, 2019).

This research can make a significant contribution to improving literacy for visually impaired students by utilizing audio-based supportive media supported by Balinese script. These implications could impact more inclusive and effective teaching methods for students with special needs in the same school. Furthermore, the research can broaden perspectives on the development of education technology that is responsive to the needs of visually impaired students. By using media that provide audio accessibility and utilizing the Balinese script, these implications can inspire the development of new educational products focusing on inclusivity. Moreover, by incorporating the Balinese script into educational media, this research can enhance awareness of local culture among visually impaired students. These implications not only enrich their educational experiences but also promote appreciation for Bali's cultural heritage. However, the research also faces limitations. One major barrier is accessibility to the technology needed to develop and use audio relief media with the Balinese script. In less developed educational environments or rural areas, it may be difficult to obtain the hardware and software required to create and access such media.

## Conclusion

This study that adopts ADDIE model consisting of five stages: analysis, design, development, implementation, and evaluation. The development of the audio-assisted Reaction media has yielded very good/very feasible outcomes. The feasibility of the audio-assisted Reaction media for learning content experts, instructional design experts, and learning media experts is qualified as very good/very feasible. Furthermore, both individual and small group trial assessments also indicate the same qualification. Therefore, it can be concluded that the Relief Aksara Bali (*Reaksi*) media assisted by audio is effectively implemented to enhance Balinese script literacy among visually impaired students at this Special Public School..

Based on the data analysis results and conclusions, the recommendations that can be given are for visually impaired students to use audio-assisted *Reaksi* media as a support for the Balinese literacy learning process. This media is very suitable for the characteristics of visually impaired children. Teachers are advised to use audio-assisted *Reaksi* media. Furthermore, it is also recommended for teachers to utilize varied learning media and resources so that students can learn more effectively. Schools are advised to use this research as a consideration in determining policies

regarding the procurement of varied media and learning resources to improve the quality of learning in the classroom. Other researchers are recommended to use the results of this research as a reference in developing relevant similar products.

#### Declaration of conflicting interest

The authors declare that there is no conflict of interest in this work.

#### Funding acknowledgements

The research received no external funding.

#### References

- Al Faiq, M. F., & Suryaningsi, S. (2021). Hak anak penyandang disabilitas untuk sekolah. *Nomos: Jurnal Penelitian Ilmu Hukum*, 1(2), 44–50. <https://doi.org/10.56393/nomos.v1i2.568>
- Alfionita, V., & Irdamurni. (2022). Penggunaan papan bacaan arab braille dalam upaya meningkatkan kemampuan mengenal huruf hijaiyah arab braille bagi tunanetra. *Jurnal Edumaspul*, 6(1), 999–1005. <https://ummaspul.e-journal.id/maspuljr/article/view/3418>
- Alifah, D., Mais, A., & Ariyanto, D. (2022). Pengaruh media kombinasi flashcard braille dan media realia terhadap kemampuan mengenal huruf abjad pada siswa tunanetra kelas i di SLB Samala Nerugrasa Lumajang. *SPEED Journal: Journal of Special Education*, 5(2), 27–32. <https://doi.org/10.31537/speed.v5i2.632>
- Anam, C., & Priharto, M. (2021). Desain meja board game ular tangga untuk interaksi sosial pada tunanetra studi kasus SLB YPAB Tegalsari Surabaya. *Jurnal IDEALOG Ide Dan Dialog Indonesia*, 6(1), 38–48. <https://doi.org/10.25124/idealog.v6i1.3684>
- Andrisani, S., & Iswari, M. (2021). Pengembangan media brajiiyah (braille hijaiyah) untuk mengenalkan konsep huruf hijaiyah pada anak tunanetra. *Jurnal Penelitian Pendidikan Kebutuhan Khusus*, 9(2), 108–119. <https://ejournal.unp.ac.id/index.php/jupekhu/article/view/112493>
- Apriyansyah, C. (2018). Peningkatan kecerdasan naturalis melalui penggunaan media realia. *Jurnal Audi: Jurnal Ilmiah Kajian Ilmu Anak Dan Media Informasi PAUD*, 3(1), 13–26. <https://doi.org/10.33061/ad.v3i1.2069>
- Bila, M. E. S., Umam, N. K., & Subayani, N. W. (2022). Pengembangan Media pop-up book berbasis audio dan android materi metamorfosis hewan untuk kelas iv sd. *Jurnal Pendidikan Dasar Flobamorata*, 3(2), 359–367. <https://doi.org/10.51494/jpdf.v3i2.777>
- Boyadzhieva, E. (2016). Learner-centered teaching and learner autonomy. *Procedia - Social and Behavioral Sciences*, 232, 35–40. <https://doi.org/10.1016/j.sbspro.2016.10.008>
- Branch, R. M. (2009). Approach, instructional design: The ADDIE. In *Department of Educational Psychology and Instructional Technology University of Georgia* (Vol. 53, Issue 9).
- Cahyani, R. P., Samawi, A., & Maningtya, R. T. (2020). Pengembangan media pembelajaran berbasis pop up book audiovisual tentang tata cara berwudhu untuk anak tk kelompok b. *Cakrawala Dini: Jurnal Pendidikan Anak Usia Dini*, 11(2), 117–122. <https://doi.org/10.17509/cd.v11i2.28281>
- Cattaneo, K. H. (2017). Telling active learning pedagogies apart: From theory to practice. *Journal of New Approaches in Educational Research*, 6(2), 144–152. <https://doi.org/10.7821/naer.2017.7.237>
- Darmawati, T. L., Hastijanti, R. R., & Murti, F. (2023). Strategi desain fasilitas pendidikan bagi tunanetra dan tunagrahita. *Sarga : Journal of Architecture and Urbanism*, 17(2), 23–32.

- <https://doi.org/10.56444/sarga.v17i2.781>
- Dasor, Y. W., Mina, H., & Sennen, E. (2021). Peran guru dalam gerakan literasi di sekolah dasar. *Jurnal Literasi Pendidikan Dasar (JLPD)*, 2(2), 19–25. <https://unikastpaulus.ac.id/jurnal/index.php/jlpd/article/view/970>
- Dewi, K. H. S., Melati, I. G. A. S., Putera, W. A., & Darmawan, I. G. I. (2023). Implementasi media pembelajaran aksara bali berbasis web menggunakan framework laravel pada siswa SMP. *JCI: Jurnal Cakrawala Ilmiah*, 2(5), 2237–2248. <https://doi.org/10.53625/jcijurnalcakrawalailmiah.v2i5.4977>
- Ernayanti, S., Hadi, W., & Saragi, D. (2019). Feasibility of audiovisual media for literacy activities of students of grade v in public elementary school (SDN) 067241 Medan Denai. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal*, 2(2), 235–249. <https://doi.org/10.33258/birle.v2i2.293>
- Ester, V. (2021). Hak anak berkebutuhan khusus untuk mendapatkan pendidikan di sekolah luar biasa negeri Pembina Samarinda. *De Cive: Jurnal Penelitian Pendidikan Pancasila Dan Kewarganegaraan*, 1(9), 337–347. <https://doi.org/10.56393/decive.v1i9.523>
- Fansury, A. H., Lutfin, N., & Arsyad, S. N. (2019). Audio books as teaching media to blind students in learning EFL. *Klasikal : Journal of Education, Language Teaching and Science*, 1(1), 1–9. <https://doi.org/10.52208/klasikal.v1i1.4>
- Fielding, K. S., & Hornsey, M. J. (2016). A social identity analysis of climate change and environmental attitudes and behaviors: Insights and opportunities. In *Frontiers in Psychology*. <https://doi.org/10.3389/fpsyg.2016.00121>
- Giri, I. M. A. (2017). Pelestarian bahasa, aksara, dan sastra bali melalui pengoptimalan tripusat pendidikan. *Purwadita*, 1(1), 27–32. <https://stahnmpukuturan.ac.id/jurnal/index.php/Purwadita/article/download/6/5>
- Gusmuliana, P. (2018). The use of total physical response strategy at junior high school of SLBN South Curup, Rejang Lebong. *ENGLISH FRANCA : Academic Journal of English Language and Education*, 2(2), 115. <https://doi.org/10.29240/ef.v2i2.633>
- Hamdani, M. S., Wardani, M., & Widi, K. (2019). Penerapan model pembelajaran team games tournamen (TGT) pada pembelajaran tematik terpadu kelas 5 untuk peningkatan keterampilan kolaborasi. *Jurnal Ilmiah Sekolah Dasar*, 3(4), 440. <https://doi.org/10.23887/jisd.v3i4.21778>
- Hasan, M. M. D. H. K. T. (2021). *Media pembelajaran*. Tahta Media Group.
- Kissi, L., & Dreesmann, D. (2018). Plant visibility through mobile learning? Implementation and evaluation of an interactive Flower Hunt in a botanic garden. *Journal of Biological Education*, 52(4), 344–363. <https://doi.org/10.1080/00219266.2017.1385506>
- Liliana, R. A., Raharjo, W., Jauhari, I., & Sulisworo, D. (2020). Effects of the online interactive learning media on student's achievement and interest in physics. *Universal Journal of Educational Research*, 8(3 B), 59–68. <https://doi.org/10.13189/ujer.2020.081507>
- Mirawati. (2020). *Identifikasi Anak Berkebutuhan Khusus di Sekolah Inklusi* (1st ed.). Deepublish.
- Mustika, I. K. (2018). Pergeseran bahasa Bali sebagai bahasa ibu di era global (Kajian Pemertahanan Bahasa. *Purwadita: Jurnal Agama Dan Budaya*, 2(1). <https://jurnal.stahnmpukuturan.ac.id/index.php/Purwadita/article/download/26/24>
- Nahar, L., Sulaiman, R., & Jaafar, A. (2022). An interactive math braille learning application to assist blind students in Bangladesh. In *Assistive Technology* (Vol. 34, Issue 2). Taylor & Francis. <https://doi.org/10.1080/10400435.2020.1734112>
- Nini, K., & Harum, R. (2023). Metode struktural analitik sintetik (SAS) untuk meningkatkan

- kemampuan membaca huruf braille pada anak tunanetra di Bhakti Luhur Malang. *Jurnal Pelayanan Pastoral*, 4(1), 44–54. <https://doi.org/10.53544/jpp.v4i1.413>
- Nugraha, A. A. (2022). Designing educational games as learning media for lontara / bugis script for children 7-8 years old memory game with aksara lontara content. *Journal of Games, Game Art, and Gamification*, 6(2). <https://journal.binus.ac.id/index.php/jggag/article/view/7941>
- Praptaningrum, A. (2020). Penerapan bahan ajar audio untuk anak tunanetra tingkat SMP di Indonesia. *Jurnal Teknologi Pendidikan*, 5(1), 1–19. <https://doi.org/10.33394/jtp.v5i1.2849>
- Pratama, B. K. (2023). Pembelajaran vocal bagi siswa tuna netra di special public school Seduri Mojosari pada masa pandemi covid-19. *Jurnal Pendidikan Sendratasik*, 12(2), 247–258. <https://ejournal.unesa.ac.id/index.php/jurnal-pendidikan-sendratasik/article/view/49327>
- Purwaningsih, E. (2019). Peningkatan kemampuan mengenal bangun ruang melalui media benda konkrit pada siswa tunanetra kelas iv di SDLB-A/D Kemala Bhayangkari 1 Trenggalek. *SPEED: Journal of Special Education*, 2(2), 38–48. <https://jurnal.unipar.ac.id/index.php/speed/article/view/130>
- Rifandi, F. M., & Haryanto, E. (2020). Kajian bentuk estetis relief ukir mulyoharjo Jepara. *Eduarts: Journal of Arts Education*, 9(3), 12–22. <https://doi.org/10.15294/eduarts.v9i3.40500>
- Romdhiana, Y. F. (2020). *Kemampuan imajinasi matematis siswa tunanetra SMPLB pada pembelajaran joyfull learning berbantuan audio geobrilie*. Universitas Negeri Semarang.
- Sunanik, S. (2014). Perkembangan anak ditinjau dari teori konstruktivisme. *SYAMIL: Jurnal Pendidikan Agama Islam (Journal of Islamic Education)*, 2(1), 14. <https://doi.org/10.21093/sy.v2i1.491>
- Tegeh, I. M., Jampel, I. N., & Pudjawan, K. (2015). Pengembangan buku ajar model penelitian pengembangan dengan model ADDIE. *Jurnal Dimensi Pendidikan Dan Pembelajaran*, 3(1), 24–29. <https://ejournal.undiksha.ac.id/index.php/ika/article/view/1145>
- Widiana, I. W., Parwata, I. G. L. A., Jampel, I. N., & Tegeh, I. M. (2024). The needs of a metacognitive-based learning model in elementary schools. *Nurture*, 18(2), 394–403.
- Widiana, I. W., Triyono, S., Sudirtha, I. G., Adijaya, M. A., & Wulandari, I. G. A. A. M. (2023). Bloom's revised taxonomy-oriented learning activity to improve reading interest and creative thinking skills. *Cogent Education*, 10(2), 2221482. <https://doi.org/10.1080/2331186X.2023.2221482>
- Widiana, I Wayan, & Jampel, I. N. (2016). Improving students' creative thinking and achievement through the implementation of multiple intelligence approach with mind mapping. *International Journal of Evaluation and Research in Education (IJERE)*, 5(3), 246–254. <https://doi.org/10.11591/ijere.v5i3.4546>
- Widjaya, A., & Chrisna. (2019). *Seluk beluk tunanetra dan strategi pembelajarannya* (2nd ed.).
- Zulkhairi, T., & Hajar, I. (2023). How Jawi script influences religious attitudes: An evidence from Aceh. *Jurnal Ilmiah Peuradeun*, 11(2), 633–650. <https://doi.org/10.31291/jlka.v20.i1.993>