Available online at: http://e-jurnal.lppmunsera.org/index.php/parahita
Wikrama Parahita: Jurnal Pengabdian Masyarakat
p-ISSN 2599-0020, e-ISSN 2599-0012

Enhancing Literacy and Educational Inclusion through Human-Centered Design of the PELITA Interactive Audio Table Game

Fahrobby Adnan[1*], Januar Adi Putra[2], Abd. Mu'iz Samsul Arifin[1], Richie Olajuwon Santoso[1], Dea Novela Ramadani[1], Aprillia Bliesy[3], Fabian Nabil[4], Syahrial Rafky[4]

[1]Department of Information Systems, Universitas Jember, Jl. Kalimantan No. 37, Jember, East Java 68121, Indonesia
[2]Department of Informatics, Universitas Jember, Jl. Kalimantan No. 37, Jember, East Java 68121, Indonesia
[3]Department of Mathematics Education, Universitas Jember, Jl. Kalimantan No. 37, Jember, East Java 68121, Indonesia
[4]Department of Information Technology, Universitas Jember, Jl. Kalimantan No. 37, Jember, East Java 68121, Indonesia

Article Information

Article history

Received: December 16, 2025
Revised: May 7, 2026
Accepted: May 13, 2026

Keywords: Assistive technology; Audio Games; Gamification; Inclusive Education; Octalysis Framework; Visual impairment

Abstract

Educational inequality for persons with disabilities in Indonesia remains a major challenge, with approximately 40% of individuals with disabilities never having received formal education, while visual impairment represents the highest disability category, at 64%. Despite the increasing number of Special Education Schools (Sekolah Luar Biasa/SLB), many schools, including SLB Negeri Jember, still rely on conventional and monotonous teaching methods with limited interactive learning facilities, creating a gap between the learning needs of visually impaired students and existing educational solutions. This community service project developed PELITA (Personalized Ethnographic Learning with Interactive Table-Based Audio Game), an audio game–based educational platform designed to improve inclusive learning experiences for visually impaired students. The project applied a participatory community engagement approach involving teachers, students, parents, and school administrators through field observations, focus group discussions, co-design activities, product trials and iterative evaluations. PELITA was developed using the Octalysis Framework for gamification and integrates a joystick, touchpad keyboard, mini PC, stereo speakers, and monitor to support interactive and contextual learning based on real-life scenarios. Product testing involving visually impaired students demonstrated improvements in spatial orientation ability (37.1%), fine motor skills (22.1%), listening ability (24.3%), problem solving(29.2%), self-confidence(36.5%), social interaction(22.4%), and learning motivation (39.1%). These findings indicate that gamification-based assistive technology can effectively support inclusive education and provide adaptive learning experiences for students with visual impairment. Furthermore, PELITA offers a scalable and replicable innovation model that can be implemented in other regions through collaboration among schools, universities, local governments, and communities by adapting ethnographic learning content to local cultural contexts.

*Corresponding Author

Fahrobby Adnan
E-mail: fahrobby@unej.ac.id

© 2026 Some rights reserved

INTRODUCTION

Educational equity for persons with disabilities in Indonesia faces substantial challenges. According to the 2020 Population Census data released by Statistics Indonesia, most persons with disabilities aged 15 years and above have attained only elementary-level education, while 40 percent have never attended school or were unable to complete basic education. These data reveal a pronounced disparity compared to the non-disabled population, which, on average, is able to complete senior high school education (Direktorat Analisis dan Pengembangan Statistik, 2023). This constitutes a major obstacle to the realization of equitable and inclusive education for persons with disabilities, thereby limiting their ability to participate independently and on equal terms within society.

In response, the government has intensified efforts to promote equitable access to inclusive, high-quality education. This commitment is reflected in data from the Coordinating Ministry for Human Development and Cultural Affairs, which reported a 0.24% increase in regular school participation rates in 2023 compared to 2021, as part of its support for

© 2026 All forms of plagiarism and misuse of intellectual property rights due to the publication of this community service paper are the responsibility of the author.

DOI: https://dx.doi.org/10.30656/jpmwp.v10i1.11645

inclusive education (Fauzan, 2023). Furthermore, the Ministry of Education, Culture, Research, and Technology recorded an increase in the number of Special Education Schools (Sekolah Luar Biasa/SLB) established across various provinces, reaching a total of 2,329 schools, with East Java Province ranking first with 417 schools (Rainer, 2023). Despite this positive trend, the implementation of inclusive education has not been fully effective due to the incomplete development of inclusive school culture, limited access to information, varying levels of parental readiness, disproportionate numbers and quality of teachers, and inadequate learning facilities and infrastructure (Arifa, 2024). These challenges are further corroborated by field observations and interviews conducted with teachers and students at SLB Negeri Jember in January 2025, which revealed that current learning practices are monotonous. The learning process still relies heavily on conventional teaching methods, such as verbal explanations, textbooks, and repetitive written exercises, while the availability of interactive learning facilities and visual-based educational media remains limited. Classrooms are not yet adequately equipped with engaging visual aids, adaptive digital tools, or multisensory learning materials to support students with diverse learning needs. Consequently, students often experience decreased motivation, difficulty maintaining focus, and limited participation during classroom activities. Therefore, the integration of visual aids and interactive learning media is essential to improve the effectiveness, engagement, and inclusivity of the current learning system at SLB Negeri Jember.

Data from the 2020 National Socioeconomic Survey indicate that visual impairment constitutes the largest proportion of disabilities in Indonesia, accounting for 64% of the total population with disabilities (Fajri et al., 2021). Similarly, the Ministry of Health, through the 2023 Indonesian Health Survey (SKI), reported that the highest prevalence of disability is associated with visual impairment at 0.6%, followed by hearing and physical impairments, each at 0.4% of a weighted sample comprising 863,402 individuals aged one year and older (Kementerian Kesehatan, 2023). These findings underscore the urgent need to provide accessible and inclusive facilities for individuals with visual impairments, particularly in the educational sector.

Arriani et al. (2021) emphasize that curriculum implementation in inclusive education must be flexible and adaptive to the characteristics and needs of each learner to ensure that all individuals can access education effectively and in accordance with their potential. In addressing challenges within inclusive education, Saputra (2018) similarly argues that a personalized approach is essential. One critical aspect of curriculum design and the learning process is the effective utilization of learning media. However, the inadequate development of learning media for visually impaired students may hinder the proper implementation of inclusive education principles (Solihah et al., 2024). This limitation is primarily attributable to the lack of variation and innovation in instructional delivery, which can reduce students' learning motivation and impede the optimal development of their potential.

Based on the results of the problem analysis, engaging and interactive learning media are critically needed for visually impaired students. Therefore, this study proposes a technological innovation in the form of an audio game table known as PELITA (Personalized Ethnographic Learning with Interactive Table-Based Audio Game). This innovation integrates gamification concepts with an ethnographic approach, which serves as a key differentiator from existing audio-based learning media because it contextualizes learning activities according to students' daily environments, social interactions, and real-life experiences. Through this approach, students are not only exposed to abstract instructional content but are also guided to recognize familiar situations, environmental sounds, mobility patterns, and communication practices commonly encountered in everyday life (Adnan et al., 2025). The ethnographic approach enhances contextual understanding, spatial orientation, adaptive behavior, and social communication skills while creating a more meaningful, personalized, and inclusive learning experience for visually impaired students.

The gamification features were specifically designed through the implementation of the Octalysis Framework to enhance orientation, motor, mobility, social, and communication skills, thereby providing a more interactive, effective, and comprehensive learning experience. The ethnographic approach is also applied in a personalized manner during platform development to facilitate the understanding of cultural contexts and various everyday life scenarios by visually impaired students. This platform is expected to serve as a solution that facilitates learning access for educators and visually impaired students while also creating new opportunities to achieve optimal learning outcomes.

The primary objectives of this community service initiative are as follows: (1) to develop an inclusive, audio game–based educational platform specifically designed to provide accessible learning opportunities through engaging and easily understandable gameplay for visually impaired learners; and (2) to provide innovative learning media that can assist teachers in delivering instructional content, monitoring student progress, and enhancing the overall learning process.

DOI: https://dx.doi.org/10.30656/jpmwp.v10i1.11645

MATERIALS AND METHODS

The materials and methods section contains the main materials used in the service activities and problem-solving methods, including analysis.

Materials

The primary materials used in the development of PELITA include both hardware and software components. The hardware components include: (1) a mini PC with specifications sufficient to run game applications smoothly; (2) an ergonomically designed joystick to ensure comfort during prolonged use; (3) a wireless touchpad keyboard to provide flexible additional input; (4) stereo speakers capable of producing clear and realistic audio output; (5) a monitor to support visual display; (6) a desktop microphone for voice input; (7) 20 × 20 galvanized hollow steel for frame construction; (8) 2 mm acrylic sheets for protective covering; and (9) Braille stickers to enhance accessibility. The software components include an operating system, programming languages for game development, and audio editing software used to create immersive sound effects and instructional audio.

Methods

This community service activity employs Participatory Action Research (PAR) combined with a Problem-Based Learning (PBL) approach to ensure that the developed product effectively addresses the needs of visually impaired users. The implementation process was conducted systematically through five main phases, as illustrated in the activity flow diagram (Fig. 1). In developing the PELITA design, the partner (Jember State Special School) was actively involved. Teachers helped design the game content by explaining the learning materials provided to blind students. This served as the primary reference for developing game scenarios.

Phase 1: Literature Review and Observation

In the initial phase, the authors conducted an in-depth literature review of assistive technology, gamification, ethnography, and instructional design for visually impaired students. In addition, direct observations of the learning process of visually impaired students were conducted at SLB Negeri Jember in January 2025 to identify their learning needs, challenges, and preferences. The authors also conducted interviews with teachers, visually impaired students, and school administrators to gather further insights into their needs and expectations of PELITA. This participatory approach ensured that the developed product was genuinely user-centered and addressed real-world challenges in education.

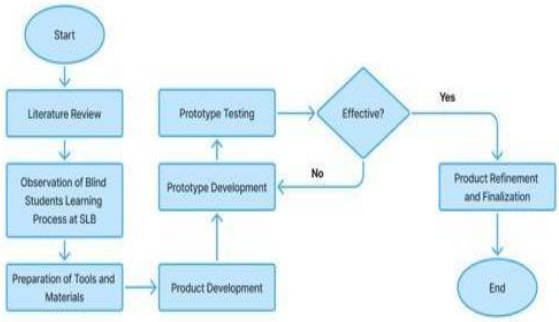


Fig. 1 Activity implementation flow diagram

Phase 2: Preparation of Tools and Materials

In this phase, all hardware and software components required for the development of PELITA were prepared. Hardware preparation included the procurement of a mini PC, joystick, touchpad keyboard, stereo speakers, monitor, microphone, construction materials, and three-dimensional (3D) printing services for custom components. The software preparation involved the installation of the operating system, programming environments, game development engines, and audio editing software. This careful preparation was essential to ensure a smooth and efficient product-development process.

Phase 3: Product Development and Prototype Design

During this phase, the authors designed an engaging and effective learning experience for visually impaired users by implementing the Octalysis Framework for gamification. The development process began with the selection of games incorporating relevant learning materials, followed by the design of interactive and challenging narratives. The games were organized into multiple levels with gradually increasing difficulty, allowing users to engage in progressive and scaffolded learning.

The eight core drives of the Octalysis Framework were implemented as follows: (1) Epic Meaning, through narratives that position students as heroes engaged in meaningful learning missions; (2) Accomplishment, through a clearly structured level system and achievement-based rewards; (3) Empowerment, by allowing learners to choose their learning pathways and receive immediate audio feedback; (4) Ownership, through collectible learning achievements; (5) Social Influence, via features that enable the sharing of achievements with peers; (6) Scarcity, through limited-time or exclusive challenges; (7) Unpredictability, by incorporating various elements of surprise within the gameplay; and (8) Avoidance, through a saving system that preserves learning progress and motivates continued engagement (Fig. 2).

DOI: https://dx.doi.org/10.30656/jpmwp.v10i1.11645

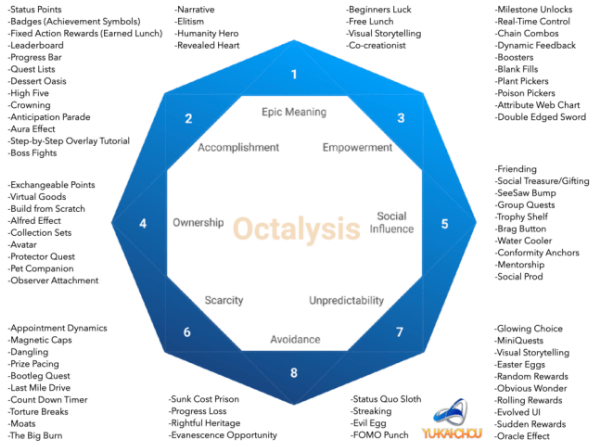


Fig. 2. The octalysis framework for gamification (Yukaichou, 2024)

The gameplay mechanics were designed to be intuitive, utilizing a joystick for navigation to facilitate the user interaction. To ensure accessibility for visually impaired users, the game is equipped with background music, sound effects, and clear audio-based descriptions, enabling users to understand and engage with the game without relying on visual cues. An ethnographic approach was further applied by integrating local cultural content and everyday life scenarios familiar to students, such as traditional markets, local transportation, and region-specific cultural activities in Jember. In addition, a simple and intuitive user interface was designed, a PELITA prototype was developed, and all the hardware and software components were integrated into a fully functional system.

Phase 4: Product Testing

At this stage, visually impaired users were directly involved in testing the PELITA prototype through a series of structured evaluations. The testing process employed the Experiential Learning Method, in which students learned through direct, hands-on interaction with the device. The testing was conducted at SLB Negeri Jember, involving visually impaired students as primary users and teachers as facilitators.

The testing process consisted of (1) an introduction to the PELITA device and its features, (2) guided trial sessions with teacher assistance, (3) independent trial sessions conducted by students, (4) focused group discussions to collect qualitative feedback, and (5) the distribution of questionnaires to measure user satisfaction levels. The evaluated parameters included ease of use, audio quality, control responsiveness, clarity of instructions, effectiveness in supporting learning activities, and students' motivation and engagement levels. Valuable feedback was obtained regarding the device's usability, sound quality, and effectiveness in supporting the learning process. This feedback served as the basis for the refinement and improvement of the PELITA prototype (Fig. 3).

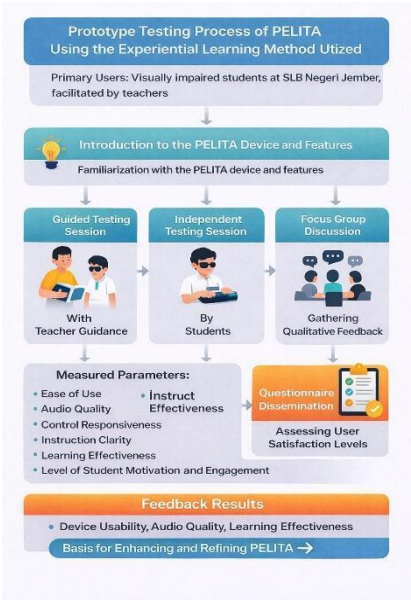


Fig. 3. PELITA testing process diagram

Phase 5: Product Refinement and Finalization

Following the PELITA testing phase, data were collected to analyze the system performance across the predefined parameters. These parameters were selected to ensure the overall functionality and reliability of the PELITA. The analysis aimed to enhance and refine the system to ensure optimal and effective performance, in accordance with the original design objectives. Refinements were implemented based on user feedback, including (1) adjustments to audio volume and sound quality, (2) improvements to joystick sensitivity, (3) simplification of navigation flow, (4) addition of more diverse learning content, and (5) reinforcement of the device's physical construction to enhance durability. The final product was comprehensively documented, including a user manual in Braille and video tutorials with audio descriptions.

RESULTS AND DISCUSSION

Design and Development of PELITA

The Personalized Ethnographic Learning with Interactive Table-Based Audio Game (PELITA) is an innovative educational device specifically designed to provide an inclusive learning experience for visually impaired students. The design of PELITA adapts to the special needs of blind students, including table height, use of game aids, and audio.

DOI: https://dx.doi.org/10.30656/jpmwp.v10i1.11645

The system integrates multiple core components that function synergistically to create an interactive, audio-based learning environment. Fig. 4 illustrates the design and development of the PELITA system, including the table frame structure, protective casing, monitor installation, and integration of various hardware components. PELITA consists of several main components, each serving a specific function (Table 1). PELITA uses an integrated combination of multiple components to create an inclusive, audio game–based educational device. The operational workflow of PELITA is carried out in several stages, as illustrated in Fig. 5.

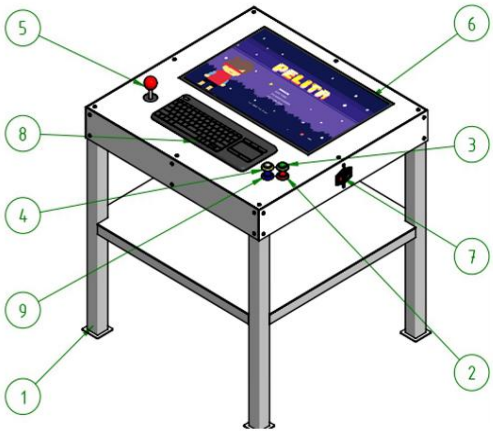


Fig. 4. PELITA system components

Table 1. Components of the pelita system

No	Component	Function
1.	Table Frame	It serves as the physical platform and housing for the device, enabling students to use the game in a natural learning posture, similar to conventional learning activities involving a table and chair.
2.	Arrow Right	A control input was used to navigate or move the game interface to the right.
3.	Arrow Up	A control input was used to navigate or move the game interface upward.
4.	Arrow Left	A control input was used to navigate or move the game interface to the left.
5.	Joystick	The primary control device is ergonomically designed to ensure comfort during prolonged use and provide responsive interaction for various in-game actions.
6.	Monitor	It provides a visual display of the game interface to support non-visually impaired users or facilitators in monitoring gameplay progress and learning activities.
7.	Mini PC with Audio Jack and Speaker Support	It serves as the main control unit responsible for running the game application, processing user input data, and generating audio-visual output delivered through speakers, earphones, and the monitor.
8.	Touchpad & Keyboard	The joystick is complemented by providing a flexible additional input, integrating keyboard keys and a touchpad into a single device to support navigation and more complex input commands.
9.	Arrow Down	A control input was used to navigate or move the game interface downward.

DOI: https://dx.doi.org/10.30656/jpmwp.v10i1.11645

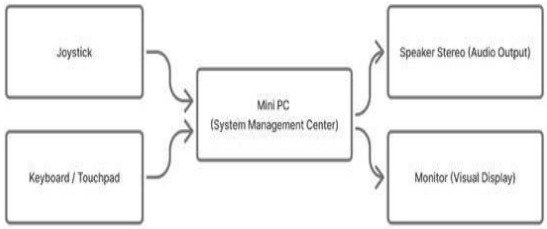


Fig. 5. Operational workflow of the PELITA system

The workflow begins with the Control System, in which the joystick and touchpad keyboard function as the primary input devices for operating the game. These components enable users to issue commands intuitively during the gameplay. Subsequently, the Mini PC serves as the System Management Unit, which is responsible for controlling the entire device, including real-time data processing and game execution. The audio output stage delivers immersive and high-quality sound through stereo speakers, providing guidance and instructional feedback to users and ensuring accessibility for individuals with visual impairments. Finally, the Visual Display Stage utilizes a monitor to provide visual support for the game, allowing teachers, companions, or users without visual impairments to monitor gameplay progress and learning activities.

Implementation of the Octalysis Framework in the Game

The implementation of the Octalysis Framework in PELITA was specifically designed to enhance the user engagement and learning motivation. This framework, developed by Chou (2019), focuses on eight core drives that motivate users to participate in specific activities. The integration of this framework within PELITA contributes to a more interactive, effective, and comprehensive learning experience for visually impaired students (Table 2).

Research conducted by Daemei et al. (2025) demonstrated that gamification can integrate elements such as interactive narratives, achievement-based rewards, and progressive tutorials, thereby enhancing students' motivation and learning outcomes in gamified learning environments. These findings are consistent with the implementation of PELITA, which integrates all elements of the Octalysis Framework to create an engaging and effective learning experience for students. Furthermore, Mohanty & Christopher (2023) indicate that the Octalysis Framework can be employed to design activities that promote positive behavioral change among students through the use of game elements such as leaderboards and achievement-based rewards.

Ethnographic Approach in Content Development

The ethnographic approach applied in PELITA enables students with visual impairments to learn about their surrounding world in a more profound and meaningful manner. This approach not only enhances knowledge acquisition but also fosters the development of social and emotional skills. The game content is designed to reflect everyday life and local culture familiar to students in the Jember region, including the following:

a. Traditional Market Scenarios: Students learn to identify various sounds commonly found in traditional markets, such as vendors calling out their products, price bargaining interactions, and other distinctive ambient sounds characteristic of traditional marketplaces.
b. Local Transportation: Simulations of public

Table 2. Components of the PELITA framework

Core Drive	Implementation in PELITA	Expected Impact
Epic Meaning	Narrative design that positions students as heroes engaged in meaningful learning missions	Enhances learners' sense of purpose and the perceived importance of the learning process
Accomplishment	A clearly structured level system with achievement-based rewards	Increased learning motivation through measurable and tangible achievements
Empowerment	Provision of multiple learning pathways and immediate audio feedback	Peningkatan otonomi dan keterlibatan siswa Enhanced learner autonomy and active engagement
Ownership	Collectible learning achievements	Strengthened sense of ownership over learning progress
Social Influence	Features that enable sharing achievements with peers	Reinforcement of social interaction and healthy competition
Scarcity	Limited-time special challenges	Increases curiosity and learner dedication
Unpredictability	Various surprise elements within the game	Sustained engagement through variation
Avoidance	A saving system that preserves learning progress	Motivation to continue learning in order to avoid losing progress

DOI: https://dx.doi.org/10.30656/jpmwp.v10i1.11645

Table 3. Evaluation results of the PELITA system

Evaluation Aspect	Score (1-5)	Category	Remarks
Ease of Use	4.3	Excellent	Easy to learn with intuitive controls
Audio Quality	4.5	Excellent	Clear and non-intrusive
Control Responsiveness	4.2	Excellent	Responsive with minimal lag
Instruction Clarity	4.4	Excellent	Clear and easy to understand
Learning Effectiveness	4.1	Good	Supports learners' understanding of the material
Student Motivation	4.6	Excellent	Highly engaging and motivating
Device Comfort	4.0	Good	Comfortable for long-term use
Overall Satisfaction	4.3	Excellent	Users expressed a high level of satisfaction with the system

transportation usage, such as angkot and motorcycle taxis (ojek), including the recognition of vehicle engine sounds, driver interactions, and navigation within real-world environments.

c. Local Cultural Activities: Introduction to Jember's local culture, including daily community activities and other cultural practices delivered through audio descriptions and interactive simulations.
d. Daily Activities: Simulations of everyday activities, such as shopping at a minimarket, going to school, interacting with neighbors, and engaging in other social activities.

This ethnographic approach makes learning more contextual and relevant to students' daily lives, thereby enhancing their comprehension and adaptive abilities in real-world settings. Neto et al. (2020) emphasized the importance of inclusive design in developing educational games for individuals with visual impairments, highlighting that such games should integrate accessibility, educational value, and playability. The game "*Em Busca do Santo Grau*" serves as an example of successful implementation, integrating audio elements as a primary feature to assist visually impaired learners in developing spatial orientation skills and in completing challenges.

Product Testing Results

Product testing was conducted at SLB Negeri Jember, involving 10 students with visual impairments, 5 teachers, and 10 parents. The testing phase was conducted over two weeks, employing various testing scenarios designed to evaluate the effectiveness of the system across multiple dimensions (Table 3).

The test results indicated that PELITA received positive responses from all user groups. Students demonstrated a very high level of enthusiasm when using the system, with an average motivation score of 4.6 out 5. Teachers reported that PELITA facilitated the delivery of instructional materials in a more interactive manner and enabled easier monitoring of students' learning progress than before. Parents also expressed positive perceptions, noting that their children became more enthusiastic about learning after using PELITA. The qualitative feedback collected during the testing phase included the following:

1. From Students
   "The game is very enjoyable; I can learn while playing. The audio was clear and easy to understand. I want to play again!"
2. From Teachers
   "PELITA is very helpful in the teaching process. Students are more enthusiastic and find it easier to understand the materials. The system is also easy to operate."
3. From Parents
   "My child is now more enthusiastic about learning. He often talks about the games he plays at school. Thank you for creating this tool."

Da Silva et al. (2020) demonstrated that audio-based games are effective in enhancing cognitive abilities, working memory, and decision-making skills, while also motivating students to become more actively engaged in the learning process. The results of the PELITA evaluation are consistent with these findings, showing a significant increase in students' engagement and learning motivation.

Comparison with Other Learning Media

To identify the advantages of PELITA compared with existing instructional media used in special schools (SLB), a comparative analysis was conducted against commonly employed conventional learning media (Table 4).

Impact on Learning Outcomes

Pre-test and post-test measurements were conducted to assess the impact of PELITA on students' learning outcomes across several dimensions. The assessments were administered before and after a two-week intervention, during which PELITA was used in three learning sessions per week, each lasting 60 minutes (Table 5).

The evaluation results demonstrate that PELITA significantly improved cognitive, psychomotor, affective, and social abilities among visually impaired

DOI: https://dx.doi.org/10.30656/jpmwp.v10i1.11645

Table 4. Comparison PELITA with other learning media

Aspect	PELITA	Conventional Media	Advantages of PELITA
Interactivity	Very high (gamification-based)	Low (one-way)	More engaging and enjoyable
Personalization	Adaptable to individual needs	Limited	More effective for diverse learners
Feedback	Real-time and immediate	Delayed	Accelerates the learning process
Student Motivation	Very high	Moderate	Learners are more motivated to engage in learning
Skill Development	Orientation, motor, social, and communication skills	Limited to specific aspects	More comprehensive skill development
Accessibility	Specifically designed for learners with visual impairments	Often lacks accessibility features	Easier and more inclusive to use
Technology Integration	Modern and innovative	Conventional	Prepares students for a technology-driven era
Cultural Context	Integrated (ethnographic approach)	General	More relevant to everyday life contexts

Table 5. Pre-test and post-test results of learning outcomes using PELITA

Measured Aspect	Pre-test Mean	Post-test Mean	Improvement
Spatial Orientation Ability	6.2	8.5	37.1%
Motor Skills	6.8	8.3	22.1%
Listening Ability	7.0	8.7	24.3%
Problem-Solving	6.5	8.4	29.2%
Self-Confidence	6.3	8.6	36.5%
Social Interaction	6.7	8.2	22.4%
Learning Motivation	6.4	8.9	39.1%
Overall Learning Outcomes	6.6	8.5	28.8%

students. The highest improvement was observed in learning motivation (39.1%), followed by spatial orientation ability (37.1%), and self-confidence (36.5%). These findings indicate that the integration of gamification and ethnographic learning scenarios successfully creates a more engaging and meaningful learning experience than conventional classroom methods. Through interactive audio feedback, contextual daily life simulations, and progressive challenges, students became more active, motivated, and confident during learning activities.

The increase in spatial orientation ability from 6.2 to 8.5 confirms that stereo audio navigation and environmental sound simulations effectively helped students recognize directions, distances, and their surrounding environments. Meanwhile, motor skills improved by 22.1% owing to repeated interaction with the joystick and touchpad controls, which strengthened tactile coordination and movement precision. Listening ability also increased by 24.3%, showing that immersive audio instructions enhanced the auditory concentration and comprehension. In addition, problem-solving ability improved by 29.2% as students were required to complete mission-based tasks and make independent decisions during gameplay.

A substantial increase in self-confidence (36.5%) indicates that immediate feedback and achievement-based challenges encouraged students to participate more actively and independently in the learning process. Social interaction was also improved by 22.4% through collaborative and communication-based scenarios embedded in the ethnographic approach. Overall learning outcomes increased by 28.8%, demonstrating that PELITA effectively combines assistive technology, gamification, and contextual learning to support holistic learning experiences for students with visual impairment. These findings suggest that ethnography-based gamification can be an innovative and scalable solution for strengthening inclusive education practices in special education schools.

Ivascu et al. (2023) provide evidence that audio-based games can effectively train spatial orientation and navigation skills among students with visual impairments while also offering more immersive and contextually relevant learning experiences. The evaluation results of PELITA corroborated these

DOI: https://dx.doi.org/10.30656/jpmwp.v10i1.11645

findings, as evidenced by the significant improvement in students' spatial orientation abilities.

Advantages of the PELITA Innovation

Based on the development and evaluation results, several key advantages of the PELITA innovation can be identified.

1. Targeted Inclusivity
   PELITA is specifically designed to address the learning needs of students with visual impairments and provide equitable access to high-quality education. Its interactive features and content are adapted to real-world applications, making the learning experience more relevant and meaningful.
2. Advanced Technology Integration
   By leveraging state-of-the-art technologies, PELITA helps overcome the barriers to information access and learning resources commonly encountered by students with visual impairments. The platform enables learners to interact with digital technologies and develop the essential digital competencies required in the modern era.
3. Meaningful Ethnographic Approach
   The ethnographic approach adopted in PELITA allows students with visual impairments to explore and understand their surroundings in a deeper and more meaningful manner. This approach not only enhances knowledge acquisition but also fosters the development of social and emotional skills essential for daily life.
4. Comprehensive Skill Development
   PELITA extends beyond cognitive development by comprehensively supporting the development of orientation, motor, mobility, social skills, and communication skills. This holistic approach ensures that students acquire the multidimensional competencies necessary for independent living in the community.
5. Enhanced Motivation and Engagement
   The implementation of gamification through the Octalysis Framework has proven effective in increasing students' motivation and engagement in the learning process. Learners become more enthusiastic and actively involved in the learning activities.
6. Support for Educators
   PELITA benefits not only students but also educators by facilitating more effective content delivery, enabling continuous monitoring of student progress, and supporting the development of innovative instructional strategies.

CONCLUSION

The development and implementation of PELITA successfully demonstrated the potential of gamification-based assistive technology in supporting inclusive education for visually impaired students at SLB Negeri Jember, Indonesia. Through the integration of the Octalysis Framework and ethnographic learning scenarios, PELITA provided an interactive audio-based learning experience that significantly improved students' spatial orientation ability (37.1%), learning motivation (39.1%), self-confidence (36.5%), problem-solving ability (29.2%), listening ability (24.3%), motor skills (22.1%), and social interaction (22.4%). In addition, students, teachers, and parents responded positively to the innovation, indicating that PELITA effectively enhanced student engagement and participation in the learning process.

Despite these positive outcomes, this initiative was limited to one special education school with a relatively small number of participants and still requires continuous maintenance, teacher training, and further content development to optimize its implementation. Therefore, future community service activities should focus on expanding the implementation of PELITA to other regions and special education schools, developing more adaptive and diverse learning content, and strengthening collaboration among schools, universities, local governments, and community organizations to ensure the sustainability and scalability of this innovation. As a sustainability plan, the development team will conduct periodic teacher training, update ethnographic learning content based on local contexts, establish partnerships with educational stakeholders for wider dissemination, and develop a more affordable and replicable version of PELITA to support its long-term implementation in inclusive educational environments.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to the Institute for Research and Community Service (*Lembaga Penelitian dan Pengabdian kepada Masyarakat* / LPPM) of Universitas Jember for providing financial support for this community service program through the 2025 community service grant scheme.

The authors also extend their appreciation to SLBN Branjangan for their collaboration, support, and active participation throughout the implementation of this program. Special thanks are addressed to the teachers, students, and all parties involved for their valuable contributions and enthusiasm in supporting inclusive and innovative learning activities.

REFERENCES

Adnan, F., Putra, J. A., Agustiningsih, M. D., Oktaviana, E., & Robi'atul Adawiyah, N. A. (2025). Exploring the usability of platforms for individuals with visual

impairments: a systematic literature review. Frontiers in Computer Science, 7, 1601621. https://doi.org/10.3389/fcomp.2025.160162

Arifa, F. N. (2024). Tantangan dalam mewujudkan pendidikan inklusif. *Info Singkat, XVI*, 3, 21-25. https://www.academia.edu/115534294/2024_3_Tantangan_dalam_Mewujudkan_Pendidikan_Inklusif

Arriani, F., Agustiawati, A., Rizki, A., Widiyanti, R., Wibowo, S., Herawati, F., & Tulalessy, C. (2021). *Panduan Pelaksanaan Pendidikan Inklusif*. Badan Standar, Kurikulum, dan Asesmen Pendidikan Kementerian Pendidikan Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi. Jakarta. https://repositori.kemendikdasmen.go.id/24970/1/Panduan_Inklusif.pdf

Chou, Y. K. (2019). *Actionable gamification: Beyond points, badges, and leaderboards*. Packt Publishing Ltd. https://books.google.co.id/books?hl=id&lr=&id=9ZfBDwAAQBAJ

Daemei, A. B., Lovreglio, R., Feng, Z., Paes, D., & Miller, C. (2025). Gamification for air quality education: A systematic literature review. *Building and Environment*, *270*, 112526. https://doi.org/10.1016/j.buildenv.2025.112526

da Silva, F.N.N., Gonçalves, B.P., Santos, M.S., Gomes, R.P., de Oliveira, J.M.L., & de Alenca, D.B. (2020). Audio Games as A Ludic Tool for Visually Impaired Students in Elementary School. *International Journal of Development Research*. 10(06): 37051-37056. https://doi.org/10.37118/ijdr.19249.06.2020

Direktorat Analisis dan Pengembangan Statistik (2023). *Analisis Tematik Kependudukan Indonesia Fertilitas Remaja, Kematian Maternal, Kematian Bayi, dan Penyandang Disabilitas*. Badan Pusat Statistik. Jakarta. https://www.bps.go.id/id/publication/2023/09/28/f9d33e0982c5b537b4af7483

Fajri, N., Ramadhan, M., Palani, H. & Yazid, E. (2021). *Kajian Disabilitas, Tinjauan Peningkatan Akses dan Taraf Hidup Penyandang Disabilitas Indonesia: Aspek Sosio Ekonomi dan Yuridis*. Staf Ahli Menteri Bidang Sosial dan Penanggulangan Kemiskinan, Kementerian PPN/Bappenas. Jakarta. https://perpustakaan.bappenas.go.id/e-library/file_upload/koleksi/dokumenbappenas/file/Staf%20Ahli%20Menteri%20Bidang%20Sosial%20dan%20Penanggulangan%20Kemiskinan/Kajian%20Disabilitas%20-%20Tinjauan%20Peningkatan%20Akses%20dan%20Taraf%20Hidup%20Penyandang%20Disabilitas%20Indonesia%20Aspek%20%20Sosioekonomi%20dan%20Yuridis.pdf

Fauzan, A. (2023). *Kemenko PMK: Kini Sudah 44 Ribu Sekolah Inklusi di Tahun 2023*. Antaranews. https://www.antaranews.com/berita/3758190/kemenko-pmk-kini-sudah-44-ribu-sekolah-inklusi-di-tahun-2023

Ivascu, S., Moldoveanu, F., Moldoveanu, A., Morar, A., Tugulea, A. M., & Asavei, V. (2023). Flying a quadcopter—An audio entertainment and training game for the visually impaired. *Applied Sciences*, *13*(11), 6769. https://doi.org/10.3390/app13116769

Kementerian Kesehatan (2023). *Survei Kesehatan Indonesia (SKI) 2023 dalam Angka*. Kementerian Kesehatan Badan Kebijakan Pembangunan Kesehatan. Indonesia. https://www.badankebijakan.kemkes.go.id/hasil-ski-2023/

Mohanty, S., & Christopher B, P. (2023). A bibliometric analysis of the use of the Gamification Octalysis Framework in training: evidence from Web of Science. *Humanities and Social Sciences Communications*, *10*(1), 1-14. https://doi.org/10.1057/s41599-023-02243-3

Neto, L. V., Fontoura Junior, P. H., Bordini, R. A., Otsuka, J. L., & Beder, D. M. (2020). Design and implementation of an educational game considering issues for visually impaired people inclusion. *Smart Learning Environments*, *7*(1), 4. https://doi.org/10.1186/s40561-019-0103-4

Rainer, P. (2023). *Jumlah Sekolah Luar Biasa di Indonesia Tahun 2022, Jawa Timur Puncaki Daftar*. Goodstats. https://data.goodstats.id/statistic/jumlah-sekolah-luar-biasa-di-indonesia-tahun-2022-jawa-timur-puncaki-daftar-fAhgu

Saputra, A. (2018). Kebijakan Pemerintah Terhadap Pendidikan Inklusif. *Golden Age: Jurnal Ilmiah Tumbuh Kembang Anak Usia Dini*, *1*(3), 1-15. https://doi.org/10.14421/jga.2016.13-01

Solihah, D. S., Herawati, N. I., & Taufik, I. N. (2024). Manajemen Penyelenggaraan Program Pendidikan Inklusif di Sekolah Dasar. *Jurnal Inovasi Pendidikan Dan Pembelajaran Sekolah Dasar*, *8*(1), 80-93. https://ejournal.unp.ac.id/index.php/jippsd/article/view/126272

Yukaichou. (2024). The Octalysis Framework for Gamification & Behavioral Design. https://yukaichou.com/gamification-examples/octalysis-gamification-framework/