



GAMIFICATION OF WEST KALIMANTAN LOCAL WISDOM THROUGH A VISUAL-INTERACTIVE INTERFACE: DEVELOPMENT OF AN INCLUSIVE EDUGAME FOR DEAF STUDENTS

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Abstract

This study aims to develop an inclusive cooking-themed edugame based on West Kalimantan culture for deaf students through the integration of a visual-interactive interface, a BISINDO avatar, and local cultural content. The development employed the ADDIE model, comprising needs analysis, interface design, and Unity-based prototype creation involving 3D modeling, rigging, and initial integration of BISINDO animation. The edugame was designed to be interactive, multimodal, and readily accessible in accordance with the characteristics of users with special needs. The implementation and validation results indicate that the edugame falls within the highly feasible category, with an acceptance rate of 80.94%. Overall, the edugame received positive user responses regarding readability, interactivity, clarity of instructions, and the appropriateness of its cultural content. This study demonstrates that the integration of gamification, BISINDO, and local wisdom has the potential to serve as an inclusive and adaptive learning strategy for deaf students.

Keywords: Gamification, Deaf Students, BISINDO, West Kalimantan Local Wisdom, Inclusive Edugame

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INTRODUCTION

The local wisdom of West Kalimantan constitutes an integral part of Indonesia's cultural heritage, encompassing traditional cuisine, weaving motifs, dances, and folklore that represent the social identity and ancestral values of the community (Satyaningrum et al., 2024). However, the tide of globalization and the scarcity of educational innovation threaten the sustainability of this culture, particularly for young people with limited access, such as deaf students in Special Schools (Sekolah Luar Biasa/SLB). Deaf children encounter various difficulties in the development of language and literacy skills (Alothman, 2021), including gaps in cultural literacy. Furthermore, traditional learning



methods underscore the importance of communication strategies that do not rely solely on verbal communication in order to enhance the comprehension of deaf students (Kurniawati et al., 2021). According to INESCO IITE (2025), the use of technology and digital innovation can strengthen access to education for persons with disabilities

Inclusive learning media are required so that cultural content can be conveyed in a visual, interactive, and readily accessible manner for students with special needs. Gamification technology employing a visual-interactive interface has been shown to enhance engagement and information retention among deaf students (Ganis et al., 2023). Gamification in learning also exerts a positive impact by providing an enjoyable learning experience while supporting the government's inclusive education policy (Kedah, 2023). In addition, gamification can strengthen the relationship between students and teachers and stimulate creativity (Sheng Mei & Surat, 2021). Nevertheless, edugame development in Indonesia remains dominated by general learning content, with few instances that accommodate the needs of students with disabilities or incorporate local content.

Several prior studies have developed BISINDO animations for simple sentences (Yanti et al., 2024) as well as the BISINDOKU educational game for the introduction of sign language (Duwi Saputra & Widyananda Putra, 2024). Although several studies have developed sign-language-based learning media or educational games grounded in local wisdom (Nurdiana & Asmah, 2022), such development has been carried out separately and has not yet integrated the elements of gamification, a visual-interactive interface, and local cultural content within a single medium that addresses the accessibility needs of deaf students. Consequently, a research gap persists regarding the development of inclusive edugames that combine sign language and local cultural literacy in an integrated manner. Figure 1 presents the BISINDO manual alphabet that underlies the sign-language conventions referenced throughout this study.

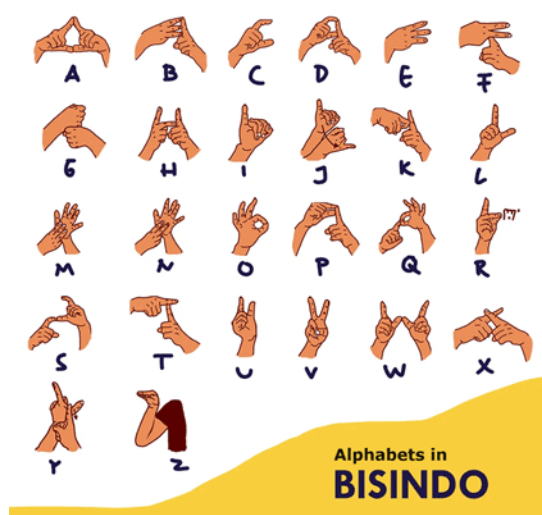


Figure 1. The Alphabet in BISINDO Sign Language (Rakhmat, 2024)

The novelty of this study lies in the integration of five principal aspects: (1) the incorporation of West Kalimantan cultural content in the form of a cooking-themed visual narrative, (2) the use of a contextual BISINDO avatar, (3) the application of a visual-interactive interface to enhance the accessibility of deaf students, (4) a multimodal ADDIE development approach, and (5) the integration of Unity technology with BISINDO animation. This combination of aspects has not been extensively explored in previous research; therefore, the present study has the potential to contribute both to the field of inclusive education and to digital cultural preservation.

This study enriches the literature on the development of inclusive learning media based on gamification and multimodality. From a practical standpoint, it provides an alternative medium that

SLB teachers can employ to strengthen the cultural literacy of deaf students. Based on the foregoing discussion, the research question that arises is how to design an inclusive tactile-visual edugame capable of effectively introducing West Kalimantan local wisdom to deaf students. Accordingly, this study aims to develop a cooking-themed edugame featuring West Kalimantan specialties, such as Kue Bingka, as a means of adaptive cultural literacy for deaf students.

On the basis of this background and the needs analysis, a number of core problems exist in developing inclusive learning media suited to the characteristics of deaf students, particularly within the context of West Kalimantan cultural literacy. These problems include the limited availability of learning media that integrate local cultural elements, the restricted access of deaf students to text- and audio-based information, the absence of a contextual BISINDO avatar, and the scarcity of gamification media that account for the tactile-visual needs of deaf learners.

METHOD

This study adopts a Research and Development (R&D) approach based on the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). This model was selected for its flexibility in developing technology-based learning media for deaf students (Nursyirwan & Husnul, 2022). The research subjects were deaf students at a Special School (SLB) in the city of Pontianak, together with teachers and BISINDO experts who served as validators. Data were collected through interviews, observation, a literature review, and validation questionnaires. The overall stages of this research are illustrated in Figure 2.

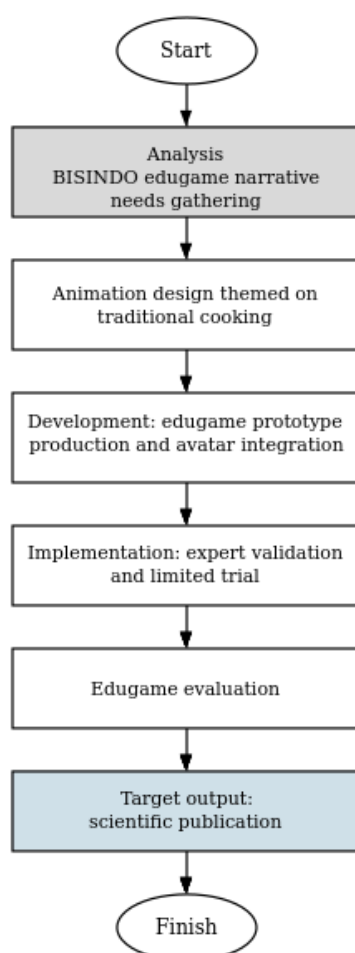


Figure 2. Stages of the Edugame Research Implementation

The development strategy focused on integrating a visual-interactive interface with a multimodal approach, whose principal components comprised BISINDO avatar animation, high-contrast visuals, and touch-based interaction.

This study employed the Research and Development (R&D) method with the ADDIE model, which comprises five stages: Analysis, Design, Development, Implementation, and Evaluation. In the Analysis stage, needs were identified through observation and interviews with SLB teachers. The Design stage produced the game storyboard, the high-contrast visual interface design, and the initial design of the BISINDO avatar. The Development stage was carried out using Blender and Unity to construct a prototype of the cooking-themed West Kalimantan edugame. Subsequently, the Implementation stage involved a limited trial with 15 deaf students. The Evaluation stage was conducted through expert validation and analysis of user responses as the basis for refining the prototype. Initial sketches of the principal characters developed during the Design stage are presented in Figure 3.



Figure 3. Sketches of the characters within the game

Research data were obtained through observation, interviews, a literature review, and a Likert-scale questionnaire. Data analysis was performed using the media feasibility percentage, by comparing the obtained score with the maximum possible score and was subsequently interpreted according to the media feasibility level categories. The data analysis technique employed the validation percentage formula (Sari & Wulandari, 2020).

$$R = \frac{S}{N} \times 100\% \quad (1)$$

where R = validation result, S = obtained score, and N = maximum score. The results were interpreted using the media feasibility criteria (Sevtia et al., 2022) as presented in Table 1.

Table 1. Media Feasibility Criteria

Percentage	Feasibility Level
80.1% - 100%	Strongly Agree
70.1% - 80%	Agree
50.1% - 70%	Somewhat Disagree
0% - 21%	Disagree

RESULTS AND DISCUSSION

The product implemented in this study remains a prototype that already incorporates the core game functions, although several BISINDO animations and gameplay variations are still undergoing refinement. Accordingly, the implementation results obtained represent a preliminary evaluation of

the usability and user acceptance of the developed prototype. This edugame was specifically designed for deaf students by integrating sign-language animation that adheres to BISINDO guidelines, thereby supporting the delivery of content through a visual approach that is more readily accessible to users.

Analysis Stage

In the analysis stage, the research focused on identifying system requirements so that the developed edugame would genuinely correspond to the needs of deaf students. The analysis was conducted through a literature review, interviews with teachers, and limited observation at a Special School (SLB). The results indicated that an inclusive West Kalimantan culture-based edugame integrating a 3D BISINDO avatar is strongly needed to support a multimodal, interactive, and deaf-friendly learning process. Teachers emphasized the importance of learning media that not only convey academic content but also integrate local cultural literacy so that students become more familiar with their regional identity (Anim et al., 2025; Herdian et al., 2024).

The identified functional requirements comprised the integration of a 3D BISINDO avatar to display sign language, West Kalimantan culture-based mini-games, an interactive cooking tutorial, a level-and-challenge system of progressively increasing complexity, score-based assessment, and rewards in the form of points or badges. Meanwhile, the non-functional requirements emphasized stable application performance, a user-friendly and inclusive interface, accessibility for deaf students, and compatibility with Windows-based desktop devices (Aziz & Othman, 2023). The edugame must also be operable offline so that it remains usable even without an internet connection.

Design Stage

Based on the needs analysis results, the design stage focused on designing an edugame with West Kalimantan local cultural content themed around cooking the traditional dish Kue Bingka. This design aimed to produce an initial blueprint that could serve as a reference in the development of a BISINDO-based inclusive edugame (Murni & Murcahyanto, 2024). The initial design produced encompassed several principal components, namely:

- A game-interaction storyboard depicting the flow of a simple cooking activity, from ingredient selection and the preparation process through to the serving of the dish.
- A user interface (UI/UX) design employing a high-contrast visual approach, equipped with simple icons to facilitate comprehension by deaf students and to maintain interaction consistency.
- An initial design of the BISINDO avatar, visualizing simple sign-language movements related to cooking activities.

The initial interface design is shown in Figure 4, which represents the visual appearance of the edugame together with the interactive elements to be used by students during the learning process.



Figure 4. Interface design of the cooking edugame

Development Stage (Initial Initiation)

The initial implementation of the edugame development was carried out using the Unity platform. A provisional prototype was successfully realized, comprising the edugame's main page with a dish-menu selection and the initial integration of the BISINDO avatar in the form of simple static animation. In addition, the research team completed the 3D modeling of several principal components, namely the chef character, the kitchen layout, traditional West Kalimantan food objects (such as Kue Bingka), and cooking utensils. To support the animation aspect of the application, bones and rigging were added to the characters so that their movements could be visualized more naturally.

During this application-development stage, the determination of sign-language movements was initiated on the basis of input from BISINDO experts, to be subsequently integrated into the 3D avatar as an interactive learning medium. These results indicate that, although still in its early phase, the edugame development has entered a concrete stage that will continue to be refined in subsequent phases so that it can function in accordance with the intended learning objectives.

In the ensuing development, the research successfully commenced the initial implementation of the edugame. The components already realized include the following:

a. 3D Modeling of Characters and Environment

The team created 3D models of the main character (chef), the kitchen layout, traditional West Kalimantan food objects such as Kue Bingka, and cooking utensils (oven, containers, and other kitchen equipment) using the Blender application. These modeling results constitute the principal assets that will subsequently be used in the cooking-simulation gameplay. These 3D models are shown in Figure 5.

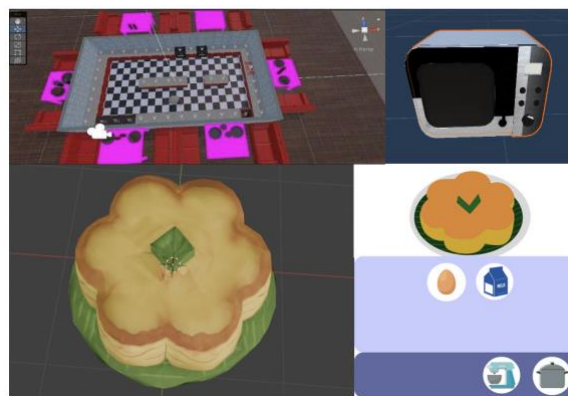


Figure 5. 3D Modeling of the Characters and Their Environment

b. Rigging and Bone Structure

The main character and the BISINDO avatar underwent a rigging process with the addition of bones so that they could be moved more naturally. This process forms the basis for the creation of interactive animation in the subsequent stage. The rigging process is illustrated in Figure 6.

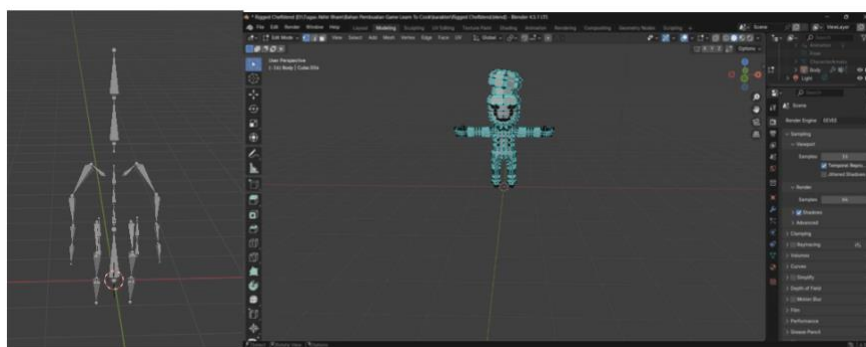


Figure 6. The rigging process for the 3D character

c. Integration of BISINDO Sign-Language Movements (Initial)

The initial stage of creating sign-language animation was carried out by constructing dedicated rigging on the hand model using the Blender application. Several basic sign movements have been tested, although not all BISINDO movements have yet been realized, as they remain in the process of development and validation together with sign-language experts. Figure 7 illustrates the process of creating this sign-language animation.



Figure 7. Creation of the sign-language animation

d. Initial Interface and Game Prototype

A simple prototype has been implemented using Unity, comprising a main page with a dish-menu selection, a display of cooking ingredients, and an illustration of a simple cooking process. This demonstrates that the system is already operable in a preliminary form, although it still requires refinement. The resulting gameplay screen is shown in Figure 8.



Figure 8. Implementation on the Gameplay Screen

With regard to the achievements of this stage, the application development exhibits significant progress, although it is not yet fully finalized. The subsequent focus is to complete the BISINDO movement animations in full, refine the gameplay interaction, and integrate all components into an edugame prototype that can be trialed by users. The resulting sign-language animations are presented in Figure 9.

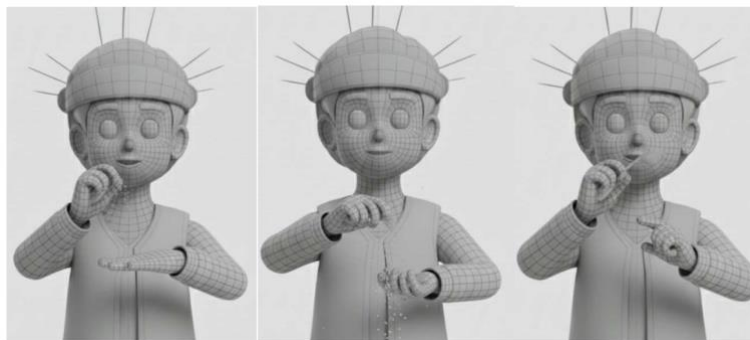


Figure 9. Results of the Sign-Language Animation

Finally, in the Evaluation stage, an analysis of user feedback was conducted; the evaluation was carried out through the analysis of user feedback and the results of expert validation as the basis for refining the prototype. Revisions were made to enhance interactivity, the accuracy of the sign movements, and the overall user experience.

The output of this study consists of an interactive edugame suitable for use as an inclusive learning medium, together with a scientific publication or research report prepared by the principal investigator and the research team members. The principal target achievement indicators are the feasibility of the edugame based on validation by experts and users, as well as its effectiveness in supporting the learning of deaf students.

In this research development stage, the system was designed using Unity technology and a BISINDO avatar adapted to West Kalimantan culture in terms of narrative, expression, and local context. Interactive educational games assist deaf children in learning by providing additional feedback that supports learning and the introduction of local wisdom through sign language. The conversion of textual or pictorial material into an interactive form has been shown to enhance their comprehension and skills, so that the development of learning resources supporting the learning needs of deaf students (Alfiani Septiyaningtyas et al., 2024). This approach has been shown to be effective in enhancing the comprehension and information retention of deaf students by combining visual and tactile channels, consistent with the findings of the study by Francisco and Padilla (2023), and it demonstrates that visual-, multimodal-, and BISINDO-based learning media can support the learning process of deaf students (Rusilowati et al., 2020). Meanwhile, the findings of this study reinforce the evidence concerning the importance of integrating interactive and visual elements within sign-language learning media (Duwi Saputra & Widyananda Putra, 2024). Nevertheless, in contrast to the studies by (Yanti et al., 2024), (Nurdiana & Asmah, 2022), the present study integrates the elements of gamification, a BISINDO avatar, and West Kalimantan local wisdom within a single inclusive edugame prototype. In this way, the study extends the body of research on the development of inclusive learning media by integrating the aspects of accessibility, gamification, and local wisdom within a single edugame platform designed for deaf students.

e. Implementation

The problem-solving strategy in this study was carried out by designing an edugame that not only introduces local culture but also attends to accessibility through an immersive and disability-friendly medium, particularly for deaf users. The implementation stage was conducted by trialing the edugame prototype; the implementation aimed to assess usability, ease of interaction, and the effectiveness of the visual-interactive interface and BISINDO animation in conveying West Kalimantan cultural content. The trial was conducted on a limited basis with 15 primary-level students under teacher supervision. Figure 10 shows the sign-language animation implemented within the game interface.

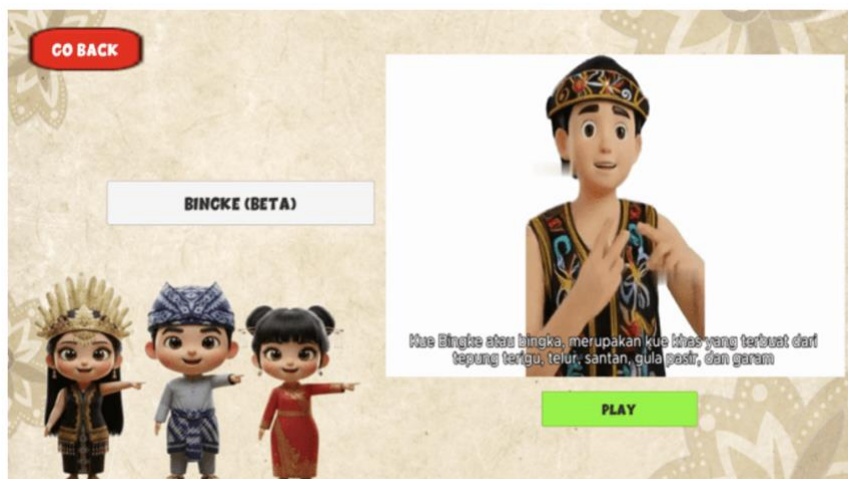


Figure 10. Implementation of Sign-Language Animation in the Game

At this stage, students were asked to play the Kue Bingka cooking-themed edugame, from selecting ingredients and following visual instructions to observing BISINDO gestures and completing the mini-games. Throughout this process, structured observation was conducted to record students' responses to the high-contrast visuals, navigation, BISINDO gestures, and level of engagement. Figure 11 shows students playing the cooking-themed edugame during the trial.



Figure 11. Playing the Cooking Game

The teachers provided assessments using a validation sheet covering media feasibility, clarity of cultural content, accuracy of the sign language, and the suitability of the edugame to the learning characteristics of deaf students. The initial implementation results showed that students were able to understand the flow of the game, recognize basic BISINDO gestures, and display enthusiasm in completing the stages of the game. The teachers also provided input regarding the need to adjust several sign animations to appear more natural and to add mini-game variations in order to enhance learning stimulation.

The edugame testing involved 15 respondents consisting of deaf students as the primary users. The validation instrument comprised 18 statement items using a 1–5 Likert scale, ranging from Strongly Disagree (SD) to Strongly Agree (SA). The complete response results are presented in Table 2.

Table 2. Respondents' Results on the Likert Scale

No.	Statement	SD	D	N	A	SA
1	I find the game engaging to play.	0	0	2	11	7
2	I enjoy playing this game.	0	1	5	8	6
3	I have the desire to play this game again.	0	0	4	11	5
4	I can easily understand how to play this game.	0	0	6	8	6
5	I can easily start this game.	0	1	3	10	6
6	I can easily understand the game instructions.	0	0	2	12	6
7	I can easily complete a level and proceed to the next level.	0	0	5	10	5
8	I can easily recognize the environment display within the game.	1	0	5	9	5
9	I can easily recognize the feature buttons within the game.	0	1	4	10	5
10	I can recognize the “life” and “coin” indicators in the game.	0	0	8	9	3
11	I can easily stop the game whenever I wish.	0	0	3	12	5
12	The character movements within the game are appropriate and support the gameplay.	0	2	6	5	7
13	The movement of the animation within the game are appropriate and support the gameplay.	0	0	7	6	7
14	I can find new challenges in every level of the game.	0	0	2	9	9
15	I feel challenged to complete this game.	0	1	2	10	7
16	Do you feel that this game helps you understand the basics of cooking?	0	2	3	10	5
17	How would you rate the game?	0	0	1	10	9

Based on the recapitulation, an overall total score of 1,376 was obtained, whereas the maximum possible score was 1,700. Accordingly, the media feasibility percentage was calculated as follows Equation 2.

$$R = \frac{1376}{1700} \times 100\% = 80.94\% \quad (2)$$

These results indicate that users provided a highly positive assessment of the developed edugame. With reference to the media feasibility criteria, the score of 80.94% falls within the range of 80.1%–100%, which is categorized as “Strongly Agree.” This indicates that the value belongs to the “Strongly Agree” category, meaning that the media is declared highly feasible for use. Table 3 presents the full recapitulation of response frequencies and percentages.

Table 3. Recapitulation of Response Frequencies and Percentages

Category	Frequency	Percentage
Strongly Disagree	1	0.26%
Disagree	8	2.35%
Neutral	68	20.00%
Agree	160	47.06%
Strongly Agree	103	30.29%
Total	340	100%

The predominance of responses in the Agree (47.06%) and Strongly Agree (30.29%) categories indicates that deaf students provided positive responses regarding the visual appearance, ease of navigation, comprehension of instructions, animation, and learning benefits. Accordingly, this edugame can be used as a supporting medium for local cultural learning among students with special needs.

CONCLUSION

This study successfully developed an inclusive cooking-themed edugame featuring West Kalimantan specialties, designed specifically for deaf students by integrating a visual-interactive interface, a BISINDO avatar, and local cultural content. Development using the ADDIE model produced an edugame prototype capable of presenting cultural content in an interactive, multimodal, and readily accessible manner suited to the characteristics of users with special needs. The implementation and validation results indicate that this edugame falls within the highly feasible category, with a user acceptance rate of 80.94%, and that 77.78% of respondents provided Agree and Strongly Agree ratings on the aspects of readability, interactivity, clarity of instructions, and appropriateness of cultural content.

The developed edugame proved effective in enhancing the learning engagement of deaf students, assisting them in understanding cooking content through BISINDO sign support, and strengthening West Kalimantan cultural literacy in an engaging and comprehensible manner. These findings affirm that the integration of gamification, BISINDO, and local cultural content constitutes an inclusive, adaptive learning approach relevant to the needs of deaf students in the digital era. Further development is required to refine the quality of the BISINDO animation, to add variations in challenges and game levels, and to broaden the scope of cultural content, so that its use as a learning medium can become increasingly optimal and exert a broader impact within inclusive education settings.

REFERENCES

- Alfiani Septiyaningtyas, R., Premana, A., & Irawan, B. (2024). Penerapan game edukasi untuk mengenalkan SIBI kepada anak berkebutuhan khusus (tunarungu) berbasis Android. *JATI (Jurnal Mahasiswa Teknik Informatika)*, 8(4), 7597–7603. <https://doi.org/10.36040/jati.v8i4.10338>
- Alothman, D. A. A. (2021). Language and Literacy of Deaf Children. *Psychology and Education*, 1(58), 799–819. <https://doi.org/10.17762/pae.v58i1.832>
- Anim, A., Permatasari, P. L., Sirait, S., Manulang, M. T. A., & Iona, B. N. (2025). Pemanfaatan budaya lokal dalam pembelajaran matematika melalui media scrapbook untuk meningkatkan literasi matematika siswa di SLB Swasta Osakali Asahan. *Jurnal Pemberdayaan Sosial Dan Teknologi Masyarakat*, 5(1), 68. <https://doi.org/10.54314/jpstm.v5i1.2728>

- Aziz, M., & Othman, A. (2023). Evolution and trends in sign language avatar systems: Unveiling a 40-year journey via systematic review. *Multimodal Technologies and Interaction*, 7(10), 97. <https://doi.org/10.3390/mti7100097>
- Duwi Saputra, L., & Widyananda Putra, R. (2024). Perancangan aplikasi permainan “BISINDOKU” sebagai media komunikasi pengenalan bahasa isyarat. *Kartala*, 3(1), 12–26. <https://doi.org/10.36080/kvs.v3i1.127>
- Francisco, M. P. B. U., & Padilla, P. P. (2023). Using multimodal approach in teaching literacy to Deaf college students. *Reading and Writing*, 37, 1035–1057. <https://doi.org/10.1007/s11145-023-10440-4>
- Ganis, F., Gulli, A., Fontana, F., & Serafin, S. (2023). The role of haptics in training and games for hearing-impaired individuals: A systematic review. *Multimodal Technologies and Interaction*, 8(1), 1. <https://doi.org/10.3390/mti8010001>
- Herdian, M. A. N., Anatasya, S., Wahyu, W., Nur, S. A., & Hamidah, S. (2024). Eksplorasi efektivitas media-media pembelajaran bahasa Indonesia pada anak tunarungu: Kajian literatur. *Jurnal Pendidikan, Bahasa Dan Budaya*, 3(2), 102–121. <https://doi.org/10.55606/jpbb.v3i2.3099>
- INESCO IITE. (2025). Innovative technologies for inclusive education: A review of best practices from global resource centers [Digital technologies]. *UNESCO Institute for Information Technologies in Education*. <https://iite.unesco.org/publications/technologies-for-inclusive-education-a-review-of-best-practices/>
- Kedah, Z. (2023). Inovasi penerapan teknik gamifikasi terhadap pembelajaran Kampus Merdeka. *Jurnal MENTARI: Manajemen, Pendidikan Dan Teknologi Informasi*, 1(2), 133–143. <https://doi.org/10.33050/mentari.v1i2.259>
- Kurniawati, F. X., Suwandi, S., & Faridi, A. (2021). Teacher’s verbal and non-verbal language in teaching narrative text reading comprehension through KWL strategy to deaf students. *The Journal of Educational Development*, 9(2), 118–127. <https://doi.org/10.15294/jed.v9i2.66130>
- Murni, R. K., & Murcahyanto, H. (2024). Peran vital bahasa isyarat Indonesia dalam membangun komunikasi dan integrasi sosial anak tuli. *Jurnal KIBASP (Kajian Bahasa, Sastra dan Pengajaran)*, 8(1), 80–92. <https://doi.org/10.31539/kibasp.v8i1.10103>
- Nurdiana, R., & Asmah, S. N. (2022). Game edukasi matematika “Tang Mane Bakoel Saprahan” dengan konteks kearifan lokal Melayu Kalimantan Barat. *JPMI (Jurnal Pendidikan Matematika Indonesia)*, 7(1), 1. <https://doi.org/10.26737/jpmi.v7i1.2695>
- Nursyirwan, V. I., & Husnul, N. R. I. (2022). Gamification-based assisted learning video development in basic statistics for deaf students. *Daya Matematis : Jurnal Inovasi Pendidikan Matematika*, 10(3), 185–196. <https://doi.org/10.26858/jdm.v10i3.37853>
- Rakhmat, M. Z. (2024). Mengenal bahasa isyarat di Indonesia BISINDO dan SIBI [Openlibrary]. *Telkom University Open Library*. <https://openlibrary.telkomuniversity.ac.id/home/information/id/339.html>
- Rusilowati, A., Sulhadi, S., Purwaningtyas, S. A., & Perwitasari, A. D. (2020). Improving self-learning for deaf students in SMPLB through use of BISINDO video in heat and temperature. *Jurnal Pendidikan Fisika Indonesia*, 16(2), 102–110. <https://doi.org/10.15294/jpfi.v16i2.19581>
- Satyaningrum, R., Mubaligh, A., & Fitriani, L. (2024). Kearifan lokal dalam perspektif budaya Kalimantan Barat. *Sosial Horizon: Jurnal Pendidikan Sosial*, 11(3). <https://doi.org/10.31571/sosial.v11i3.8382>
- Sevtia, A. F., Taufik, M., & Doyan, A. (2022). Pengembangan media pembelajaran fisika berbasis Google Sites untuk meningkatkan kemampuan penguasaan konsep dan berpikir kritis peserta didik SMA. *Jurnal Ilmiah Profesi Pendidikan*, 7(3), 1167–1173. <https://doi.org/10.29303/jipp.v7i3.743>

- Sheng Mei, A. P., & Surat, S. (2021). Tinjauan sistematik: Persepsi guru terhadap penggunaan gamifikasi. *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, 6(12), 125–136. <https://doi.org/10.47405/mjssh.v6i12.1208>
- Yanti, A. I. D., Wardhana, M. I., Wardani, N. K., & Hidayat, K. (2024). Penerapan bahasa isyarat BISINDO pada kalimat sederhana berbasis animasi 3D. *Gestalt: Jurnal Desain Komunikasi Visual*, 6(2), 17–30. <https://doi.org/https://doi.org/10.33005/gestalt.v6i2.226>