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INTEGRATION OF SPEECH AND SIGN LANGUAGE TRAINING USING THE QUBRAIN PLATFORM FOR DEAF STUDENTS

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Abstract

Communication skills are an important foundation for learning, social interaction, and independence among deaf and hard-of-hearing students. This article describes the implementation of QuBrain, a snakes-and-ladders board game equipped with speech and sign-language challenge cards, to support communication practice in a special school in Malang, Indonesia. A descriptive qualitative approach was used through direct observation, an interview with the accompanying teacher, field notes, and visual documentation. The activity was conducted on 10 November 2025 with two ninth-grade students with hearing impairment. The implementation began with introductory practice in pronunciation and simple signs, followed by a game session in which students responded to speech and sign-language challenges. The observed results indicated increased enthusiasm, participation, willingness to attempt verbal vocabulary, and willingness to demonstrate signs. Peer interaction also appeared when students helped or corrected one another. Nevertheless, the students initially had difficulty with SIBI and required repeated demonstrations and facilitator support. The findings suggest that QuBrain has potential as an interactive and visually accessible learning aid for communication practice. Because the activity involved only two students and lacked pre-post measurement, the findings should be interpreted as descriptive evidence of engagement and participation rather than experimental evidence of effectiveness.

Keywords: QuBrain; deaf and hard-of-hearing students; communication; game-based learning; sign language

1. Introduction

Deaf and hard-of-hearing (DHH) students may face barriers in language use and communication that impact classroom interactions. These difficulties are not limited to spoken language but also extend to the pragmatic use of language, such as following a conversation partner's contributions and organizing information in a coherent sequence (Paatsch & Toe, 2020). Other research indicates that DHH students may experience difficulties with various language components, so instruction must provide support tailored to their communication needs (Pişţav-Akmeşe et al., 2023).

Game-based learning provides an alternative to create more interactive learning activities. A systematic review of 96 studies shows that the use of games for learners with disabilities needs to consider student characteristics, skill objectives, implementation procedures, learning communities, and the role of educators (Tlili et al., 2022). A review of board games also demonstrates the potential of games to support knowledge, interaction, and motivation, although research evidence and contexts remain diverse (Noda et al., 2019).

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In the context of DHH, Shelton and Parlin reported that the use of mobile games in mathematics education is well-received by teachers and students and fosters peer tutoring experiences (Shelton & Parlin, 2016). Games have also been used specifically for sign language learning. Bouzid et al. developed the SignWriting learning game, while Kamnardsiri et al. developed a game-based learning framework for sign language that provides feedback on movements (Bouzid et al., 2016); (Kamnardsiri et al., n.d.).

The development of serious games for children with hearing impairments emphasizes the importance of user needs, pedagogical objectives, game mechanics, and feedback. Cano et al. developed a serious game methodology for children with hearing impairments based on a human-computer interaction approach, while the SELEDE study demonstrated the use of serious games to train specific skills in deaf children (Cano et al., 2016); (Mich et al., 2019). A systematic review of games for the education of deaf students also indicates that games can be part of a learning strategy, but more robust development and evaluation are still needed (Costa & Marcelino, n.d.).

In line with these needs, QuBrain was developed as a Snakes and Ladders board game that integrates SIBI/BISINDO speech cards and sign language cards. Students have the opportunity to say vocabulary words or demonstrate signs when they draw a challenge card. This approach is similar to research on games that combine text, visuals, and sign language. Research on games with natural interactions for Chinese Sign Language demonstrates the potential of serious games in supporting language learning and social etiquette, while research on inclusive AR games emphasizes that accessibility must be an integral part of game design for deaf children (Li et al., 2024); (Westin et al., n.d.).

The novelty of this article lies in its documentation of the implementation of QuBrain in speech and sign language therapy services at a special education school, using a simple board game mechanism to integrate verbal and sign language exercises into interactions among participants. The article does not claim experimental effectiveness because the implementation involved only two students and did not use a pre-post design. The purpose of the article is to describe the implementation process, the students' responses and engagement, as well as the potential and limitations of QuBrain as a communication aid.

2. Method

This study uses a qualitative descriptive approach to describe the process of implementing QuBrain and the students' responses during learning activities. This approach was chosen because the available data consist of observations, interviews, field notes, and documentation, rather than quantitative data from an experimental design.

The activity was conducted at SLB Sumber Dharma, Jl. Candi Jago No. 28, Blimbing Village, Blimbing Subdistrict, Malang City, East Java, on November 17, 2025, from 7:00 a.m. to 10:00 a.m. Western Indonesian Time. The subjects of the implementation consisted of two deaf ninth-grade students at SMPLB, who are referred to in the report by the initials S and W.

Data collection was conducted through direct observation, interviews with the accompanying teacher, field notes, and photo or video documentation. Observations focused on activities, interactions, responses to the cards, willingness to try, and participation. Interviews were used to obtain information regarding the implementation, student

responses, and the potential for future use of the media. Field notes were used to record events during the activity, while documentation served as visual evidence of the implementation.

The implementation procedure consists of four stages. First, students receive an introduction in the form of pronunciation exercises and an introduction to simple sign language. Second, students play QuBrain using a virtual snakes-and-ladders board and dice. Red squares prompt students to pick up a sign language card and demonstrate the corresponding gesture, while yellow squares prompt them to pick up a speech card and say specific vocabulary words. Third, the facilitator provides immediate feedback and corrections on both pronunciation and sign language gestures. Fourth, the activity concludes with a reflection and a brief question-and-answer session..

Data analysis was conducted descriptively by grouping findings into the following aspects: engagement, response, interaction, ability to attempt communication, difficulties, and support needs. Interpretation is limited to the context of application and is therefore not used to make population-wide generalizations or causal conclusions.

3. Results and Discussion

3.1 Result

In the early stages, the facilitator provided pronunciation exercises and an introduction to simple signs. Both students had difficulty understanding SIBI sign language, so some movements had to be demonstrated repeatedly. This situation demonstrates that the use of games does not automatically eliminate the need for explicit instruction and guidance.

When the QuBrain game began, the students' responses became more enthusiastic. The use of a game board, virtual dice, and challenge cards gave the students a direct reason to take their turns and follow instructions. The students tried to say the vocabulary words on the speech cards and demonstrate the signs on the sign cards. The facilitator provided immediate corrections throughout the process.

The most notable changes were seen in their engagement and willingness to try. Students who were initially passive became more confident in saying words and demonstrating signs. Interaction among students was also evident as they helped each other guess, demonstrate, or correct signs. Thus, the game not only resulted in individual activities but also created opportunities for peer-to-peer communication.

QuBrain also provides an opportunity for teachers or facilitators to conduct informal assessments. When students receive a challenge card, facilitators can observe the vocabulary they have mastered, the gestures they still get wrong, and the students' level of confidence in responding. However, the dice mechanism means that the chances of receiving a challenge card are not always evenly distributed.

Another limitation is the number of participants. The activity involves only two students, so group interaction remains limited. The source report also notes that the game may not be as effective when played with very small groups and that some participants may receive unequal practice opportunities due to the random nature of the dice rolls.

3.2 Discussion

The positive response from students to the implementation of QuBrain is consistent with the literature, which indicates that game-based learning can enhance engagement when learning objectives, game mechanics, student characteristics, and facilitator support are designed in harmony (Tlili et al., 2022). In the context of students with hearing and speech impairments (DHH), game-based learning experiences have also been used in mathematics and sign language instruction (Shelton & Parlin, 2016); (Bouzid et al., 2016).

The finding that students were more willing to attempt communication can be understood in light of the game's features, which include turns, challenges, goals, and feedback. A review of board games indicates that game-based activities can support motivation and interaction, although the results are influenced by the intervention design and the context of use (Noda et al., 2019). In special education, serious games have also been reported to create multisensory learning contexts and support the engagement of students with special needs (Papanastasiou et al., 2017).

The integration of verbal and sign language exercises is QuBrain's key strength. Research on sign language learning games shows that games can be used as an interactive learning tool (Bouzid et al., 2016). Research on games with natural interaction for Chinese Sign Language also highlights the importance of integrating language, visuals, interaction, and social context in game design (Li et al., 2024).

The learners' initial difficulty in understanding SIBI indicates that games should be viewed as a supplementary tool, not a substitute for sign language instruction. The need for repeated demonstrations and consistent feedback aligns with research emphasizing accessibility, clear instruction, and design adaptations for deaf students (Westin et al., n.d.); (Cano et al., 2016). Teacher communication strategies also remain important because pragmatic barriers can affect the ability of students with hearing and speech impairments to follow and engage in classroom interactions (Paatsch & Toe, 2020).

More broadly, the literature on education for children with hearing and speech impairments indicates that language and communication support must be provided systematically. Studies on educational interventions for children with hearing and speech impairments emphasize the need for approaches tailored to developmental needs and learning contexts (Albash & Turkestani, 2024), while studies on language development highlight the importance of adequate language support (Jarollahi et al., 2025). Therefore, QuBrain should be integrated into a continuous communication learning program rather than used as a standalone activity.

The findings of this article must be interpreted with methodological limitations in mind. Two students and a single implementation session are insufficient to conclude that QuBrain causally improves communication skills. There were no pre- and post-tests, no comparison group, and no standardized measurements. Therefore, the findings should more accurately be interpreted as preliminary evidence that QuBrain can create opportunities for

practice and increase engagement during activities. Future research should examine changes in communication skills using structured instruments, a larger sample size, and multiple sessions.

4. Conclusion

The implementation of QuBrain at Sumber Dharma Special Education School demonstrates that a board game integrating a snakes-and-ladders board, speech cards, and sign language cards can serve as a potential supportive tool for creating more active and enjoyable communication exercises for deaf students. During the activity, students showed engagement, enthusiasm, and the courage to try out new vocabulary, demonstrate signs, and interact with their peers. The medium also helped facilitators conduct informal observations of the students' abilities and difficulties. However, students still required consistent demonstrations and guidance, particularly in understanding sign language. The very small number of participants and the random nature of the dice roll also limited practice opportunities. Since the implementation did not use a pre-post design and involved only two students per session, this article does not draw experimental conclusions regarding QuBrain's effectiveness. QuBrain is more appropriately positioned as a supportive tool that enriches communication learning. Further development should involve more students, the use of pre-post assessments, a more even distribution of cards, and repeated evaluations to obtain stronger evidence.

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