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Research paper doi: 10.30822/arteks.v10i1.3578

Immersive installation of proverbs for the hearing impaired

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ARTICLE INFO

Article history:
Received July 05, 2024
Received in revised form Sept. 21, 2024
Accepted January 20, 2025
Available online April 01, 2025

Keywords:
Hearing impaired
Immersive installation
Malaya folklore
Oral tradition
Proverbs

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ABSTRACT

Proverbs is a folklore known as oral tradition and has been handed down orally from generation to generation. Proverbs are vital in Malay culture, regulating people's lives and containing history, advice, life lessons and education. Due to the passage of proverbs orally in past years, the main issue in this paper is to make people with hearing impairment feel included and better understand the meaning behind Malay Proverbs. This paper emphasises the potential of immersive installation to bridge the gap, ensuring accessibility for all users and fostering greater community engagement while appreciating Malay Proverbs. Immersive installations often include noise elements, tactile experiences, vibrations, and scents. This research has two objectives: (1) to examine that proverbs are effectively communicated and understood by hearing-impaired individuals through immersive technology and (2) to analyse space design principles for the hearing-impaired community. This study's research method is a qualitative study that identifies the aims and suggestions based on data acquired from literature reviews, gaps in the literature, case studies, and observations. Through this research, it may contribute to the development of inclusive and accessible environments for the hearing impaired while also advancing the understanding of Malay Proverbs.

Introduction

Oral tradition is known as the storytelling technique of folklore and is often combined with moral principles. The Malay term for folklore is 'budaya rakyat.' Folklore is known as 'budaya rakyat' in Malay. According to Kamus Dewan Bahasa dan Pustaka, 'budaya rakyat ' refers to a group's practices, stories, clothes, and behavior inside a country (Osman 1988). Oral tradition is a significant part of Malay culture influencing people's lives. They serve a crucial function in preserving cultural traditions. Oral traditions convey knowledge, cultural and social values, and a shared history. According to Unesco, oral traditions comprise various verbal types, including proverbs, riddles, stories, nursery rhymes, legends, myths, epic songs and poetry, charms, prayers, chants, songs, and dramatic performances. The development of oral tradition serves several goals, including entertainment, education, and historical context. Even if the stories were recounted and periodically changed, their core themes and aims stayed the same, making the moral teachings and good values apparent and understood (Kateb 2008; Banda et al. 2024).

Because the oral traditions were not recorded or written down then, some were passed down orally (Rahim 2013; Osman 1988). If we look at the broad perspective, people with hearing disability will be excluded as hearing limits the communication between them. Immersive installations that bring oral traditions like proverbs to life through multi-sensory

experiences are a powerful way to break down communication barriers and foster a greater sense of inclusion for the hearing-impaired community in appreciating oral tradition. The issue derived from this paper is that the hearing-impaired community needs a better understanding of the meaning behind Malay Proverbs and the design of inaccessible spaces in Malaysia.

An immersive installation using technologies like projection mapping, AR, VR, and multimodal interfaces can effectively teach proverbs to deaf and hard-of-hearing individuals by creating engaging, multi-sensory experiences. Projection mapping can animate visual proverbs, making them dynamic and interactive (Spence and Gao 2024). AR can overlay digital content onto the real world, enhancing the contextual presentation of proverbs (Girotto et al. 2024). VR can immerse visitors in visual narratives, conveying proverbs' meaning and cultural significance (Shehade and Stylianou-Lambert 2020; Kersting et al. 2024; Marques et al. 2023). Multimodal interfaces, incorporating visual, tactile, and sensory elements such as captioning, sign language interpretation, and vibrotactile feedback, ensure accessibility and deeper engagement (Creed et al. 2024; Dritsas et al. 2025; S. Sharma et al. 2025). These combined technologies can make proverbs more comprehensible and culturally relevant for the deaf community (Vogel and Korte 2024; Guillemin, Gillam, and Brookes 2005).

Given that hearing-impaired people are the minority yet the highest category among Persons with Disabilities in the nation based on the Official Portal Public Services Commission of Malaysia, their nature is typically understudied. The majority of recent research on Malaysian deaf individuals focuses on learning (Zainuddin et al. 2009), education (Lee et al. 2021; Miles et al. 2018; Nasir and Efendi 2016), religion (Ghadim et al. 2013; Mokhtar and Omar 2018), and technology (Chuan et al. 2017; Wong and Khong 2011). However, research on the social aspects of the hearing-impaired population, such as their interactions with the hearing community, needs to be more extensive. There are mild to profound categories of deafness based on the World Health Organisation (WHO), as in table 1, that can affect both or one ear. The category of deafness is based on the degree of loss, which has different effects on hearing. At the moment, over 1.5 billion individuals, almost 20% of the world population, have hearing loss, with 430 million of them having debilitating hearing loss. By 2050, approximately 700 million individuals will experience debilitating hearing loss (WHO 2021; AlSamhori et al. 2024).

Table 1. The classification of hearing loss and degree of severity according to WHO

Category of deafness	Degree of loss (Decibel)	Effect on hearing
Mild	25-40	Difficulty in hearing a noisy environment
Moderate	41-60	Inability to hear whisper
Severe	61-80	Inability to understand soft, moderate and loud speech
Profound	>81	Unable to understand even very loud speech

Source: Official Portal Myhealth Minister of Health Malaysia 2024

The question that arises from this current research is as follows:

1. Why is the use of immersive installation for proverbs important?
2. What design principles are required to create an indoor space for the hearing-impaired community?

The objectives of the research are as follows:

1. To examine that proverbs are effectively communicated and understood by hearing-impaired individuals through immersive technology.
2. To analyse space design principles for the hearing-impaired community.

Hearing-impaired people can identify and reduce confusion about the beautiful meaning behind Malay Folklore in the current listening situation through immersive installation of proverbs. Some academics, such as Hu (2007), firmly believe that folk literature is inappropriate to preserve because doing so devalues it and contradicts its primary qualities of orality. However, some scholars believe that folk literature can be preserved somehow without causing pollution, for example, by employing digital strategies (Polukhina et al. 2025; Adom et al. 2022). One technique to raise the environmental awareness of people with hearing impairments is to create indoor space for the immersive installation of proverbs (Adom, Chukwuere, and Addo 2022).

Table 2. Theoretical framework

Research issue	
The hearing-impaired community lacks a better understanding of the meaning behind Malay Proverbs and the design of inaccessible spaces in Malaysia.	
Research aim	
To emphasise the potential of immersive installation to bridge the gap, ensuring accessibility for all users and fostering greater community engagement while appreciating Malay Proverbs.	
Research objectives	**Research methodology**
To examine that proverbs are effectively communicated and understood by hearing impaired individuals through immersive technology.	Data collection • Case studies • DeafSpace Design
To analyse space design principles for the hearing-impaired community.	Data analysis Immersive installation of proverbs for the hearing impaired and creating a space following the design principles for the hearing-impaired

Literature review

Proverbs then represent a treasure trove of information about the language in which they occur, the views of the people who use them, and the ways in which those users conceive the world in which they live (Musa 2016).

Oral tradition is only complete with the proverb genre. Proverbs are highly significant culturally and linguistically in the Malay-speaking areas. They reflect the wisdom and folklore of the Malay population (Siti Nabilah Yusuf et al. 2023). Proverbs have been used since the beginning of time to teach morals and customs to youth, honor leaders, and adequately document the past (Adom, Chukwuere, and Addo 2022). The intricacy and beauty of Malay proverbs have mesmerized numerous people. Ismet and Rebecca Fanany of Deakin University in Australia, studies on Malay proverbs, noted that Malay people often use proverbs. They noticed that proverbs continue to be a reliable source for preserving the informational aspects of the Malay oral tradition, particularly about preserving antiquated and uncommon vocabulary. They believe that proverbs are also beneficial for comprehending the Malay perspective on the world and how they react to their surroundings (Hamawiya, Mohd Esa, and Ahmad H. Osman 2024). Researchers have always studied Malay proverbs from a variety of angles, including language literacy, semantic inquisitive analysis, teaching, and learning (Md Nasir and Subet 2019; 2023).

This paper investigates the immersive installation of Malay Proverbs for deaf individuals in Malaysia's interior design context. The words "immersive," "installation," and "Malay proverbs" were taken into consideration to form the concept. To improve the world by 2030, the United Nations has recently included preserving cultural heritage's intangible and tangible components to the list of sustainable development goals (El Faouri and Sibley 2024; A. Sharma and Aulakh 2023; ICOMOS 2021; Giliberto and Labadi 2022; Xiao et al. 2018). The proverbs need to be digitised, if not completely replaced, by visuals obtained through other senses for those who are hard of hearing. The purpose of digitalization is to make the digital native aware that, although there is still a dearth of substantial research being done, Malay proverbs are a vital tool for capturing the sense and revealing how Malay civilization has captured the interest of researchers (Siti Nabilah Yusuf et al. 2023).

Immersive digital experiences present historical art, literature, and museum exhibits to a younger, more tech-savvy audience in an intriguing and relevant style. Digital material is frequently displayed as a never-ending movie on the walls, floor, and ceiling. The interaction might take several forms. For example, at 'Harry Potter: The Exhibition' in New York City, people may engage with the stories directly by employing concealed motion sensors. In addition, there is another immersive exhibit in the region called "National Geographic's Beyond King Tut the Immersive Experience." Digital settings may provide exceptional immersive experiences where people engage with familiar imaginative realms and characters, much like entering into favorite choices (Dwivedi et al. 2022; Won et al. 2023; Papadopoulou, Mystakidis, and Tsinakos 2024).

Figure 1. Marauder's Map as part of Harry Potter the Exhibition in NYC
Source: (Heather Gallagher, n.d.)

Figure 2. National geographic's Beyond King Tut the Immersive Experience in NYC
Source: (Archdaily 2024)

The visual contextual design will deepen Malay language knowledge through learning moments. Immersive installation technology can be used to explain these Malay proverbs to the hearing-impaired community in a better way. The immersive installation has demonstrated significant benefits for this community, mainly through multimodal interaction systems incorporating sign language, facial expressions, and visual aids. It can be part of a basic understanding of the learning of the Malay language by a minority group in Malaysia, as most hearing-impaired people in Malaysia are the Chinese ethnic groups (Romli, Timmer, and Dawes 2024). The belief that the Malay world must be prepared to adapt to communication and information technology for Malay culture remains relevant in the present and contributes to restoring the spirit of affection and respect for the Malay language and culture has been affirmed (Merican 2015; Rouhi 2016).

This paper further focuses on primary interfaces between people with hearing disability and the built environment, which are Sensory Reach, Space and Proximity, Mobility and Proximity, Light and Color, and Acoustics. According to Gallaudet University, Washington, DC, United States, Campus Design and Planning, deaf individuals live in a sensory world where vision and touch are spatial awareness and orientation modalities. Our world, designed mainly by and for ordinary people, provides some unexpected problems that extraordinary people have overcome by tailoring their surroundings to their way of living. When deaf people gather, they commonly rearrange the furniture to form a "conversation circle" with clear sightlines so that everyone may join in the visual talk. Meetings frequently start with people adjusting window shades, illumination, and seats to establish ideal conditions for visual communication while minimizing eye fatigue. Deaf homes frequently cut new wall apertures and add mirrors and lighting in critical spots to increase sensory awareness and preserve a visual connection among family members. These practical acts of creating a deaf place are strong cultural traditions that were never formally recognized in providing the basics of a Universal Design for deaf experiences. Thus, DeafSpace Design Guidelines (Edwards and Harold 2014; Blacutt and Roche 2020) research provides vital insights into the relationship between senses and the form of physical environment and cultural identity, from which society may benefit greatly.

Methods

This paper used a qualitative approach to finalise the result. The author uses an observation method on selected case studies to determine the potential of the immersive installation of proverbs for the hearing-impaired. There are two chosen case studies: (1) Borneo Cultures Museum, Kuching, Sarawak, and (2) National Folk Museum, South Korea. An immersive installation in Borneo Cultures Museum in Kuching serves users by providing an interactive, multi-sensory experience that showcases the rich heritage, traditions, and folklore of Borneo's diverse communities. Next, The National Folk Museum of South Korea offers an engaging and interactive experience that vividly brings to life Korea's traditional customs, daily life, and cultural heritage. Hansel Bauman of Gallaudet University established five design criteria based on the DeafSpace Design criteria in 2005. The five aspects are sensory reach, space and closeness, mobility and proximity, acoustics, and light and color. Using the DeafSpace design strategy as a basic guideline with the data acquired from the case study will improve the design strategy for the hearing impaired, resulting in a better-built environment.

Case study
Case study 1: Borneo Cultures Museum, Kuching, Sarawak

The Borneo Cultures Museum is located in the heart of Kuching, adjacent to Padang Merdeka. This five-story structure is constructed in a

contemporary style, and its distinctive architectural characteristics represent Sarawak's unique traditional crafts and rich cultural history.

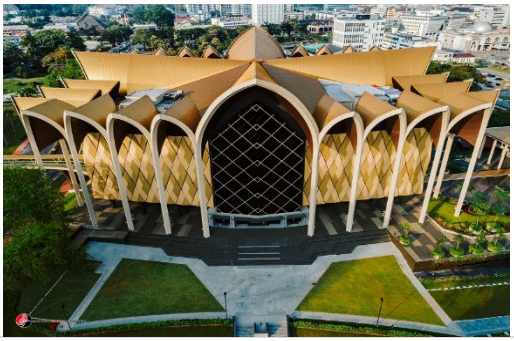


Figure 3. Borneo Cultures Museum, Kuching, Sarawak
Source: (Sarawak Museum Department 2021)

Case study 2: National Folk Museum, South Korea

The exhibits at this museum show visitors how ordinary individuals lived in the past and present, including the lifestyles and customs of regular Koreans during a time when the country was primarily agricultural. Christie laser projectors-imposed deities from Korean folktales and The Mysterious Village into existence in an immersive digital exhibition at Korea's National Folk Museum.

Figure 4. National Folk Museum, South Korea
Source: (The Seoul Guide 2023)

DeafSpace design guidelines

The DeafSpace Project developed the DeafSpace Guidelines, a set of more than 150 architectural design characteristics that address the five critical interaction points between hearing-impaired people and the built environment.

Table 3. DeafSpace Design Guidelines by Hansel Bauman

Design principles	Diagram	Features	Location
Sensory reach	 *Florian, M. F. (2024, June 6). archdaily.com*	Utilise visual, vibratory, tactile, social cues	Gallaudet University, Washington, DC, United States
Space and proximity	 *Florian, M. F. (2024, June 6). archdaily.com*	Open space, transparent wall, large opening, sliding panel, pedestals and shelves round/ horseshoe-shaped table and arrangement.	Gallaudet University, Washington, DC, United States
Mobility and proximity	 *Florian, M. F. (2024, June 6). archdaily.com*	Minimise hazards, easy circulation, wider sidewalks, ramp, fluid movement.	Gallaudet University, Washington, DC, United States
Light and Color	 *Florian, M. F. (2024, June 6). archdaily.com*	Proper lighting, more on natural daylight with sun louvres, glare-free, shaded circular spaces, contrast colour with skin tone.	The Frank Barnes School for Deaf Children
Acoustics	 *Florian, M. F. (2024, June 6). archdaily.com*	Proper acoustic wall, allows vibrational cues and minimise distraction, sound absorption, insulation and diffusion.	Gallaudet University, Washington, DC, United States

Source: (Archdaily 2024)

Results and discussion

Traditional ways of delivering Malay Proverbs are oral. It has been identified that immersive technology installation in space could get access to all, including hearing-impaired people. People who are deaf need a range of accessible education methods that use visual cues and written language. As a result of the recent rise in popularity of Information and Communication Technologies (ICTs), assistive technologies for deaf communication have evolved tremendously (Rodríguez-Correa et al. 2023; Hameed 2007). This article considered two case studies that have begun digitizing and virtualizing their subject

matter to increase the quality of visitor experience, which are summarized in table 3.

Table 4. List of case studies that are digitizing and virtualizing their contents

Location	Virtualizing of digital cultures
Borneo Cultures Museum, Kuching, Sarawak	Immersive projecting display, Augmented Reality, audio visual technology, combination of visual, tactile, and auditory elements
National Folk Museum, South Korea	Projection mapping, Virtual Reality, and interactive touchscreens

The Borneo Cultures Museum in Kuching uses immersive displays to present a thorough overview of Borneo's rich cultural past. Most museums in Malaysia that use Augmented Reality are still in the initial stages of implementing virtual technology, while the Borneo Cultural Museum has adopted 30% interactive displays (Fauzi, Sharif, and Razak 2022). These works efficiently combine visual, tactile, and audio aspects to provide visitors with a multisensory experience. One of the primary conclusions is that immersive techniques dramatically improve visitor engagement and learning. The museum communicates complex cultural histories using digital storytelling, interactive exhibits, and augmented reality (AR). The end-user feedback highlights the effectiveness of these methods in making the cultural content more relatable and memorable. The Borneo Cultures Museum stands out for its emphasis on local community engagement in exhibit creation and presentation. This participative method maintains authenticity and enhances the visitor experience by including a variety of viewpoints and voices from Borneo's indigenous populations. According to the research, this technique maintains the cultural heritage and instills pride and ownership in local communities (Nasruddin et al. 2019).

Figure 5. Immersive environments and multisensory experiences in Borneo Cultures Museum, Kuching
Source: (GSM 2022)

The National Folk Museum of Korea excels at showcasing the country's traditional traditions and daily life through cutting-edge immersive exhibitions. The museum uses projection mapping, virtual reality (VR), and interactive touchscreens to give visitors a compelling and participatory experience of historical events and cultural practices. One noteworthy conclusion is that these technologies improve the educational value of displays by making complicated historical and cultural knowledge more accessible to a broader audience (Abdulrahaman et al. 2020). The National Folk Museum of Korea specializes in exhibiting the country's traditional traditions and daily life through cutting-edge immersive installations. The museum's emphasis on interactive learning is especially effective in engaging young people and promoting family visits. Hands-on activities and digital interactions allow visitors to learn about Korean folklore and traditions in an entertaining and instructive setting. The study also emphasizes using multimedia features to accommodate varied learning styles and preferences. This strategy improves tourist happiness and fosters better knowledge and respect for Korea's cultural history (Armutcu et al. 2023).

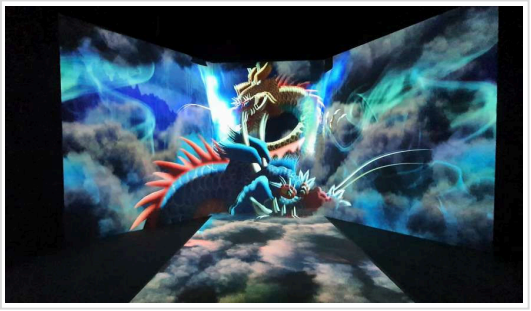
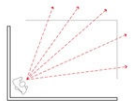
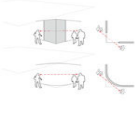


Figure 6. The Mysterious Village immersive digital exhibition in National Folk Museum, South Korea
Source: (Christie Digital 2022)

The DeafSpace standards, created by architect Hansel Bauman, provide a valuable foundation for creating immersive art exhibits that successfully transmit folklore to the deaf and hard-of-hearing communities. Key elements such as increasing spatial awareness, improving visual communication, and incorporating assistive technology are critical to making these exhibits accessible and entertaining for deaf people. For example, an open floor layout with unobstructed sightlines allows sign language users to express themselves freely. At the same time, vibrotactile

feedback and captioning guarantee that folklore narratives are understandable across many sensory channels. Color, lighting, and materiality can generate visual contrast while reducing distracting noises. Importantly, actively integrating the local deaf population in the design phase allows for more tailored installations to their individual requirements and cultural preferences. DeafSpace design principles may transform into spaces that preserve and communicate traditional stories in an inclusive, meaningful way for the hearing-impaired.

Table 5. Gallaudet University's DeafSpace Principles by Hansel Bauman

Design principles	Diagram	Brief
Sensory reach	 *https://gallaudet.edu/campus-design-facilities/campus-design-and-planning/deafspace/*	Spatial orientation and understanding what is happening in the environment are critical to retaining a sense of wellness. Deaf individuals use their remarkable ability to react to visual and tactile clues to "hear" events in their surroundings that many hearing people would miss. These indicators include vibrations, shadow movement, and detecting slight variations in others' expressions. Designers can help deaf individuals improve their direction and navigation by promoting spatial awareness 'in 360 degrees'.
Space and proximity	 *https://gallaudet.edu/campus-design-facilities/campus-design-and-planning/deafspace/*	To achieve excellent visual communication, signers stand at a distance where they can see facial emotions and the entire extent of the signer's "signing space." As a result, the space between two signers is usually greater than in a spoken dialogue. As the number of chat groups increases, so does the distance between individuals, allowing for more apparent relationships for everybody. The need for space considerably impacts the layout of furniture in the room.
Mobility and proximity	 *https://gallaudet.edu/campus-design-facilities/campus-design-and-planning/deafspace/*	Signers usually maintain a greater distance when communicating to provide clear visual communication. The signers also shift their gaze between engagement and their environment, scanning for hazards and ensuring proper alignment. If one person detects even the tiniest threat, they tell their buddy, modify, and proceed uninterrupted. Singers can move through space without interruption when circulation and gathering places are appropriately designed.
Light and color	 *https://gallaudet.edu/campus-design-facilities/campus-design-and-planning/deafspace/*	Backlighting, glare, and shadow patterns are examples of poor lighting conditions that hinder visual communication and contribute to eye fatigue, resulting in a lack of focus and even physical tiredness. A gentle, diffused light "sensitive to deaf eyes" can be produced by adjusting lighting and architectural daylighting controls. Additionally, color may be utilized to emphasize sign language and contrast skin tones, which helps with visual navigation.
Acoustics	 *https://gallaudet.edu/campus-design-facilities/campus-design-and-planning/deafspace/*	Hearing-impaired people may have varying hearing capabilities, and many need assistive technology such as cochlear implants or hearing aids to increase sound. These devices often intensify reflected sound waves, which may be irritating and painful. Designers should consider this and attempt to reduce sources of reverberation and background noise.

Source: (Gallaudet University 2024)

Conclusions

To ensure accessibility for all users in learning local culture and tradition, immersive installation for proverbs is a critical combination. It could be realised by having the immersive installation of proverbs in interior spaces that follow the design principles for the deaf community. When

designing a space, especially for a hearing-impaired community, the design principles can be implemented through sensory reach, space and proximity, mobility and proximity, acoustics, and light and colours. These elements have a significant impact on all the users in interior space. This will help to enhance the universal interior design that also involves growing the local folklore through a digital educational experience. The case studies demonstrated the importance of immersive installations for proverbs, prompting the creation of interior spaces and design aspects that improve the accessibility and inclusivity of these experiences. The purpose of developing immersive proverb installations was to create multi-sensory, interactive experiences that could effectively communicate the meaning and cultural significance of these traditional expressions of proverbs to the hearing-impaired community.

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Author(s) contribution

Nur Faqihah Adnan contributed to the research concepts preparation, methodologies, investigations, data analysis, visualization, articles drafting and revisions.

Syarmila Hany Haron contribute to the research concepts preparation and literature reviews, data analysis, of article drafts preparation and validation.

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