Babyfying Museum Texts for Younger Visitors through Augmented Reality

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ABSTRACT

Museums have long been recognized as a place to study historical objects. However, at the same time, museums are considered unfamiliar to younger visitors due to the complexity of the descriptions of their artifacts. In order to overcome this problem, this research attempted to simplify the museum texts through an application named babyfication. The process of simplification involves three main components: conceptual simplification, modification for simplicity, and summarization of text. For enhancing the comprehension of the museum texts, augmented reality (AR) technology features are utilized in the process. Through a combination of simplified language, vibrant visuals, and interactive elements, this research tried to prove the beneficial outcomes from AR technology in bridging the gap between traditional museum texts and the developmental needs of young children, particularly dealing with their engagement with cultural artifacts. A qualitative research approach and Spradley's data analysis technique were employed to figure out how the descriptive texts of museum artifacts are babyfied. Applying the theory of babyfication from Purnomo et al. (2021) as a ludic adaptation concept, it was revealed that textual, visual, and operative elements, that have been *babyfied* by using AR technology as a medium, tend to be textually simpler, more visually appealing, and make it easier for children to understand the information.

Keywords: babyfication, exhibition text, museum, younger audiences

INTRODUCTION

Museums are often perceived as outdated and uninteresting, particularly for young visitors. This perception stems from the fact that museum services are not typically designed with young audiences in mind. For instance, the language used in descriptions of artifacts is often formal and adult-oriented, which can be overwhelming for children. This issue is not new. MacLulich (1992) argues that visitors are frequently frustrated by overly complex texts. The challenge of writing simple explanatory texts for exhibitions is significant, as even experts may struggle to convey complex ideas in a way that is accessible to a broader audience. He suggests that even specialists who have successfully completed a doctoral thesis may find it challenging to write a simple explanatory text for an exhibition. It takes a certain credibility to write a comprehendible text for visitors and it can make a difference regarding to the point where a museum wants an impact for its popularity and survivability to help it to achieve its goals, especially gaining more visitors from time to time.

Babyfication is a valuable technique to simplify complex or general text into an easily understandable form for younger ages, especially children. In the context where

most museums still use general language to exhibit and describe artifacts or groups of certain objects on display, babyfication aims to make the contents more accessible. Not only are the visitors shown visual displays of artifacts, but also informed by descriptive texts written alongside the artifacts. Museum Keris, located in Surakarta, is one museum that has *babyfied* their exhibition texts explaining their artifacts, a collection of *keris*, a Javanese traditional weapon. The museum created an augmented-reality based application (AR-based app), a 3D technology that uses an individual's perception and comprehension of the real-world environment by overlaying virtual objects onto reality. This app helps younger audiences by *babyfying* the *keris* into an avatar, a virtual character or personified representation, as an icon for the museum. Utilizing this avatar makes the content more relatable and engaging, gradually growing younger visitors' interests in the museum's exhibits.
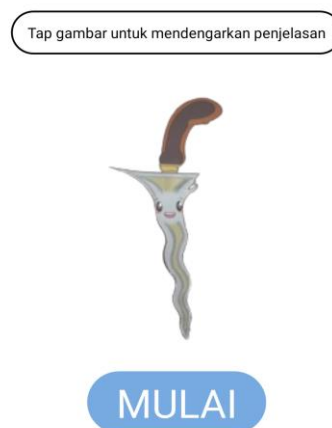

Figure 1: Babyfied icon found in Museum Keris

Based on further examination of the AR-based app created for Museum Keris, this research team found some flaws in the end product and intended to recreate the revised version to be applied to Karst Museum, a geology museum located in Wonogiri, Central Java. The issues identified were that the app only uses formal-oriented Indonesian language audio. It lacks explanations directed towards younger audiences and only utilizing the existing exhibition text. Furthermore, the app only shows one icon, the Museum Keris icon, which has been babyfied into child-friendly language and comprehension as seen in Figure 1. While this icon incorporates aspects and elements to function as an attraction for children, the app falls short in several areas. The formal language audio may be too advanced for young visitors to fully understand. Relying solely on the exhibition texts means the content has not been adapted for a younger reading level. Having just one babyfied icon limits the engaging, child-oriented content available within the application even though it has the aspect and element to attract children's attention.

This example from Museum Keris' AR app simplifies the exhibition texts that also appear as digital texts within the AR-based app. This babyfication feature is not only utilized for visuals on the Museum Keris AR app, but also appears in animation films. The essay *Scooby-Doo, What's Happening to You* by Tera Williams (Jeanine et al. 2009) shows how the Scooby-Doo theme has been simplified to fit the needs of

younger audiences, with these babyfied books tending to attract a younger readership. The article by Feuerstein and Odhiambo (2017) notes a similar phenomenon, showing an increasing trend of babyfication applied to depictions of pets. This pet babyfication is not limited to the United States. Essentially, pets are more often conceptualized and portrayed with child-like, youthful characteristics. This technique aims to engage children's interests and make educational or entertainment contents more accessible to their level of understanding.

Previous studies on babyfication have left a gap regarding the babyfication of exhibition texts for artifacts and geological objects in museums. Exhibition texts are considered an important aspect of a museum because they are the central part of the museum's communication program. The development of thematic exhibitions along with a strong educational purpose has placed the role of exhibition texts at the forefront (Samson 1995, McManus 2000, Schiele 1995, Jacobi et al., Poli 1995 in Ravelli 2007). To prove that babyfication has an effect on increasing children's understanding, the researchers attempt to apply the babyfication of exhibition texts for museum artifacts through AR, targeting younger audiences. Based on this identified gap, as previously stated, this research aimed to answer the question on how the exhibition texts of museum artifacts are babyfied. Therefore, by this research, the researchers attempted to create an application based on this question.

Babyfication is clearly part of the concept of playful adaptation, adapting the text, images, and activities of a work so that it can be enjoyed by younger users such as children (Purnomo et al. 2021). This research applied textual, visual, and audio elements in its approach. The use of visuals such as babyfied icons make it easier for children to recognize the objects being described, as what Foucault (1983) stated: "Without saying anything, a mute and sufficiently recognizable figure expresses the essence of the object; from image, a noun written below receives its 'meaning' or usage rules." Incorporating visually simplified icons and imagery allows children to connect the representations to the real-world objects and concepts. Moreover, the addition of babyfied audio helps learning by giving clear, spoken examples of words and expressions, facilitating comprehension and verbal skills.

LITERATURE REVIEW

The phrase 'museum text' refers to exhibition text which, as Ravelli (2007) explains, it gives meaning to and communicating with its public for an institution or exhibition. Particularly at Karst Museum, similar exhibition texts enhance artifacts' visual meanings but can be overly complex. MacLulich (1992) noted that visitors frequently struggle with such complex museum texts designed for educational purposes without sacrificing explanatory aspects. The texts are proven unfriendly for younger visitors, but simplification emphasizing unbiased interpretation can help. This approach to decoding, known as proairetic decoding, aligns with the goal of creating straightforward readings for children to ensure that "what is read is what is meant" and meet the need for simple content accessible to young audiences. Nikolajeva's (2014) textual simplification technique involves three parts, i.e.: conceptual simplification, modification simplification, and text summarization.

Textual simplification should be child-friendly, which can be achieved by combining it with the theory of babyfication. Purnomo et al. (2017) refer to this as 'ludic writing', that is writing in a playful, gamified manner. It is anticipated that this ludic writing leads to ludic engagement, defined as the fun interaction with learning objects (Gaver et al. 2004). Caillois (2001) classifies four types of games that can create

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this ludic engagement, i.e.: competition (agon), role playing (mimicry), games of chance (alea), and physical/sports games (ilinx). By combining child-friendly ludic writing with complimentary games in the museum setting, it is expected that children are able to learn about exhibits (as learners) through entertaining gameplay (as players) while having memorable experiences (as experiencers). These three requirements of learner, player, and experiencer can potentially be met by applying the theory and techniques of babyfication. Moreover, babyfication involves specific textual modifications typically provided through text summarization, elaborative modification for expression explication, and conceptual simplification.

The field of augmented reality is used as a mediator or amplifier of human actions, often in physical interaction with the surroundings. While this applies to some other forms of systems as well, AR is unique in the sense that it changes the user's perception of the world in which she/he acts, and in that way fundamentally affects the way the user behaves (Nilsson and Johansson, 2007). The use of AR as an interactive learning media in museums is considered more efficient and more quickly for visitors to absorb and digest information than when the exhibition texts are the only means of delivery. Due to the benefits of using AR technology for media information about museum introduction, this research used AR application as one of the instruments. Visitors can receive instant information on unfamiliar surroundings by using marker or location-based AR applications (Han et al. 2013).

Younger museum visitors often take a passive approach, basically exploring exhibits with no interaction. AR is utilized to modify this by allowing them to visualize objects through technology implementation. As users scan a QR (Quick Response) code with their smartphones, the AR application will display the babyfied exhibition text and object intended. QR codes provide access to information and have become popular for their usefulness in accessing content through mobile devices that can be featured and adopted by all museums worldwide.

RESEARCH METHOD

This qualitative research gathered data from the exhibition texts displayed at the Karst Museum located in Wonogiri, Central Java. The collected data were descriptively investigated with purposes. The lingual expressions found can be theoretically classified as unfriendly text types for younger visitors. These expressions, filtered from the exhibition texts, were planned to undergo babyfication by implementing the babyfication theory to better address the museum's younger visitors. The babyfication process also involved transforming the text into an AR-based app. The exhibition texts served as the primary data source and were purposefully investigated through descriptive analysis methods.

The data, consisting of lingual expressions found within the exhibition texts, were theoretically classified as an unfriendly type of text for younger visitors based on their complexity. Specific examples from the exhibition texts that illustrate the need for babyfication include highly technical terminology being defined without visual aids or simplified explanations. Such texts posed significant comprehension challenges for younger museum visitors. By applying engaging exhibition texts, the intended audiences are encouraged to explore deeper knowledge on certain subjects, which matters.

To address this issue, the lingual expressions were subjected to the babyfication process based on Purnomo et al.'s (2021) theory of ludic adaptation. This involved

transforming the text through textual, visual, and operational adaptations to make it more comprehensible for children.

Employing Spradley's (2016) method, the data underwent domain, taxonomy, and componential stages of analysis consecutively. The domain analysis revealed that the exhibition text is not child-friendly. By clarifying indicators to assess child-friendliness, such as language complexity, visual appeal, and interactivity, a framework for creating child-friendly exhibition texts could be developed. As Dean and Edson (1996) explain, object-oriented exhibitions rely more on their collections of artifacts as the focal point to convey stories, whereas narrative-oriented exhibitions concentrate on creating stories utilizing objects to support the depiction or interpretation.

In the taxonomy phase, the exhibition texts were transformed through 'babyfication' technique developed by Purnomo et al. (2021), which conveys the concepts of ludic adaptation through textual, visual, and operational adaptation of a text, so that the texts can be comprehended by younger audiences such as children. In the componential phase, the exhibition texts were transformed into an approved child-friendly 'babyfied' text and the resulting texts were then combined with visual and operative elements into an AR-based application.

In the taxonomy phase, where the adaptation aspects were broken into textual, visual, and operative concepts, the actions taken were collecting the data from the museum, adapting the findings using ludic adaptation principles, and converting them into a concise, compact format for an AR-based app.

By differentiating, classifying, and adapting the exhibition texts to be child-friendly, young visitors can hopefully understand and engage with the museum's collection showcases, which previously relied primarily on text-based exhibition materials as the main learning method.

FINDINGS

The findings presented here provide illumination on the efficacy of babyfication, taking a pivotal focus on the selected exhibition texts that underwent this process in an AR-enhanced setting. The findings reveal empirical evidence supporting ludic adaptation through a systematic examination of the practice, concentrating on three distinct aspects to enhance the comprehensibility of exhibition content for younger audiences. The research focused on three specific aspects: visual appeal, interactivity, and language simplification.

Text Simplification

Text simplification aimed to improve the comprehensibility of exhibition content for younger audiences. According to De Belder and Marie-Francine (2010), most text simplification research aims to make texts appropriate for children's reading levels. Simplification refers to making written information more accessible, especially for visitors with varying educational backgrounds, language proficiencies, and age groups. Siddharthan (2014) found that comprehension can be enhanced for readers with low literacy levels by: (1) substituting difficult words, (2) splitting long sentences, (3) making discourse relations explicit, (4) Avoiding preposed adverbial clauses, and (5) presenting information in cause-effect order. These findings provided motivation for using text simplification as a comprehension aid.

In this investigation, applying babyfication techniques to transform selected exhibition texts into AR-enhanced settings offered significant advantages. The execution focused on converting complex technical language into simpler expressions without compromising essential content. Simplification addressed

comprehension gaps between younger visitors and adults by providing relevant, comprehensible meanings.

Research suggests conceptually-based or abstract instruction provides more benefits than procedurally-based or concrete instruction (Hiebert and LeFevre 1986). Implementing age-appropriate language creates a new approach to learning that is well-suited for children. This practice gives the impression that the museum aims to facilitate and adjust its language to meet visitors' needs, without compromising the intent behind the content. Nurhadi (2003) argues that this contextual approach optimizes learning through understanding, rather than memorization, positioning museums as valuable learning resources. Progressively incorporating these findings using babyfication in an AR context deepens the understanding of its implications and effectiveness. Designing for joy and fun (Hassenzahl 2010) coupled with opportunities like adding new interactive ways to engage with content directly involves children in educational museum experiences. Simplified text holds universal appeal transcending age groups as well as underscoring the importance of adapting content to maximize audience understanding and engagement across visitors.

Table 1 shows the transformations from exhibition texts into babyfied texts.

Table 1: Text Transformation

Exhibition Text	Babyfied Text
Occurance of Limestones Limestone forms from coral colonies that die and compress into CaCO3. With magnesium contamination, it becomes dolomite, Ca (Mg) CO3.	Limestone comes from coral families living together in the sea. When their home changes, they can't live anymore and turn into limestone rocks (CaCO3), like big underwater cookies! If limestone mixes with magnesium, it becomes dolomite, like a rock with a new nickname.
Elevation by Tectonic Activity Limestone, originally on the sea bed, rises to form hills through tectonic uplift.	These rocks can move up from the sea to become tall hills or mountains because the ground moves, like a giant dance. So, limestone starts deep in the sea and can end up high in the sky. Nature's full of fun surprises!

Visual Adaptation

Visual adaptation is a critical component of ludic adaptation, increasing the accessibility and appeal of exhibition content for younger audiences. Adaptation serves a functional role by calibrating the visual system to prevailing conditions, increasing visual coding efficiency (Durgin 2000; Makhijani 2020). By incorporating child-friendly visualizations, younger visitors are stimulated to engage with the content visually before reading descriptions. The findings outline several aspects of visual modification within the ludic adaptation framework as follows:

1. Visual elements
    Color schemes and iconography act as visual cues guiding comprehension. Spatial arrangement and interactive features contribute to dynamic engagement with learning.
2. Design considerations
    Design choices for color, symbols, and interactive elements consider not only aesthetic appeal but also shape cognitive responses in young audiences. Each element influences initial response and comprehension of content by young visitors.
3. Connection to learning
    Analysis reveals a complex yet integral connection between visual stimulation and learning outcomes. Understanding this connection contributes significant knowledge to creating effective, immersive educational spaces.

The concept of visualization implies making something visible and forming mental images (Vealey and Walter, 1993). This underscores the importance of intentional visual design in crafting interactive, impactful museum experiences for diverse visitors. Visual adaptations significantly increase the attractiveness of exhibition contents for children. By employing vibrant colors, friendly character designs, and engaging layouts, museums can capture the attention of young visitors and encourage them to explore further. Interactive elements, such as touchscreens and animated displays, add a dynamic dimension to the learning experience, making it more memorable and enjoyable. Figure 2 is the result of adapting visual aspect of a Karst Museum's collection.

Figure 2: Visual adaptation as an integration of AR app with babyfied text

To maximize children's comprehension of the museum contents that were initially presented through exhibition texts, the visual adaptation aspect was launched by designing the landing page of an AR application. This page serves as the entry point for accessing the museum's collections with simplified textual contents through babyfication. The application's user interface adopts a 'nature' theme to emphasize the museum's focus on geology and stones. This theme aligns with the museum's location in Wonogiri, where *wono* means forest or jungle, and *giri* means mountain

in Javanese. Choosing a nature theme for an app associated with a geology museum located in Wonogiri creates a significant correlation between the app and the museum's contents. This complementary approach aimed to reinforce the educational aspects through visuals and thematic consistency. The nature theme not only complements the museum's subject matter but also contributes to a more immersive and enriching learning experiences for children.

Operative Addition

The integration of AR in educational settings, particularly with babyfication, is crucial for enhancing user interaction and engagement. According to Martínez et al. (2014), AR technology offers new ways of user interaction, incorporating various interactive features within exhibition texts. The visual stimulation provided by AR is closely linked to learning outcomes, emphasizing the importance of a visually engaging environment in educational spaces. These interactive features are designed not only to capture the attention of younger visitors but also to actively engage them in the learning process. The use of AR technology involves scanning the surrounding environment using a camera and displaying digital elements within it for creating a realistic experience. This approach is recommended for future exhibition strategies, as it effectively connects technology with the real environment of the museum for enhancing the learning experience (Rahmawati, Dianhar, and Arifin 2021).
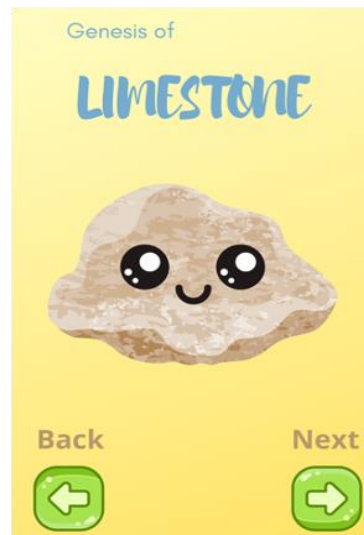

Figure 3: operational additions for the babyfication process

By implementing the three key aspects of the babyfication process, which are text simplification, visual adaptation, and operational additions, it can be stated that they are systematically organized to give clarifications on their empirical evidences and implications. Each component contributes to the enhancement of exhibition content comprehensibility for younger audiences. The exploration undergone in ludic adaptation in AR-driven babyfication goes beyond traditional learning approaches. It introduces the involvement between the children in the learning experiences and the additions of a progressive layers to the interactions that bridge them to the available contents. The operative element applied to the proposed application can be seen in Figure 3.

The collective findings draw attention to the transformative potential of babyfication, especially applied in an AR-enhanced setting. Babyfication, especially in an AR-enhanced context, has the power to bring about significant changes or improvements in the way museums engage with their audiences, particularly younger visitors. The calculated focus on the text simplification, the universal appeal of simplified content, and the interactive nature of ludic adaptation contribute to a nuanced understanding of how museums can adapt and thrive in an evolving educational landscape. It positions museums as a dynamic place to commit the enhancement of the experiences gained by the visitors through innovative and inclusive learning methods. Applying the multifaceted approach of babyfication in an AR app setting showcases the potential to transform a museum into a place where the audience, especially children, get the dynamic benefits of the transformation process of the exhibition texts into a simplified, visually attracted, and technology-based contents.

Figure 4: The narratives and their visual objects that have not been babyfied

Figure 4 is the example of exhibition texts used to describe the pictures which are considered not simple. The collage-style of picture's frames are not simplified and modified to child-friendly visualization yet due to its usage and synergy combined to the complex and exhibition texts. The fonts are also not as big as it can be properly read by children, not to mention that it is placed higher than children's average heights. From these two points alone, it is urgent to change the mechanism for displaying the pictures and delivering the information, especially for children.

By creating the application, the researchers are sincerely cruising to take the AR learning program to a higher usage. The issues brought the researchers to articulate the pivotal significance of adhering to the user-centric design principles and educational alignment in the conception of an innovative AR learning tool for presenting an exciting prospect for an enhanced educational journey for young visitors to the museum.

The narrative of exhibition text that has been simplified can be observed in Figure 5, and more detailed illustrations of geological objects in panels were then made because children frequently examine illustrations more closely and *see* details in pictures that *skipping* and *scanning* adults miss (Kiefer 1995). Visual modification techniques were employed for the images mentioned in the exhibition texts, creating visuals with a babyfication approach to make the contents appealing to children. As an example, one of the faunas that can thrive in karst regions, such as snails typically found around coastal coral rocks, is depicted in a babyfied manner.

Figure 5: The narratives and their objects that have been babyfied

The snail is designed with soft color choices and big eyes to represent it in an adorable way. There were also applications of visual modification to the illustrations of flora. As shown in Figure 5, there are illustrations of bamboo, banyan trees, and teak wood in a cartoon style, featuring soft and colorful tones that are child-friendly.

Figure 6: The exhibition text of karst genesis

The lack of appeal for children is due to two factors, realistic images and formal-oriented descriptions. Realistic images may not hold children's attention as strong as colorful, simplified, or stylized visuals. In other words, children are frequently drawn to these three visual characteristics. They are frequently drawn to colorful and imaginative representations. Furthermore, the term formal-oriented description implies that the accompanying information or text is too formal or technical for a younger audience. Children typically respond better to language that is simple, playful, and easy to understand, as it resonates more with their developmental stage.

Figure 7: The babyfied visualization and narrative of karst genesis

Picture slicing a giant rock sandwich filled with caves and secret tunnels. That's a cross-section of karstified carbonates.

Figure 7 is an example of how complex geological concepts of karst genesis as explained in Figure 6 can be simplified and made engaging for young learners through visual storytelling. By incorporating colorful and relatable elements, such as funny characters and a sunny sky, the image effectively captures children's attention and helps them understand the concept of karst formation. This approach aligns with research suggesting that color can enhance learning efficiency and that visually appealing content can improve children's interest and engagement (Vetter, Ward, and Shapiro 1995; Keller and Grimm 2005). The friendly impression created by the image is intended to foster a positive attitude towards the subject matter, emphasizing the importance of making educational content both visually appealing and relatable for young audiences.

DISCUSSION

The Problems of Babyfication in Children's Comprehension

Babyfication, the technique of adapting complex texts into child-friendly language (Purnomo et al. 2021), presents significant challenges when applied to museum and exhibition contents. Although the goal is to enhance children's understanding, the success of simplified texts can vary depending on individual factors such as educational background, language proficiency, and age group (De Belder and Marie-Francine 2010). Research on reading comprehension processes in children highlights the complexity of extracting and constructing meaning from written and auditory texts (Snow and Group 2002; Education 2005). While babyfication aims to improve accessibility, studies have shown that oversimplified or ludic texts may inadvertently create new barriers to comprehension by omitting crucial contextual information or presenting content in an overly reductive manner (Jurafsky 1996). The textual, visual, and interactive aspects of babyfied content are integrated into an AR product aimed at enhancing children's understanding of museum exhibitions (Samson 1995; McManus 2000; Schiele 1995; Jacobi et al. 1995; Ravelli 2007).

In the AR of Karst Museum, the babyfied design features simplified text, interactive audio with child-friendly intonation, and visually appealing image elements aligned with the ludic concept to attract and engage young audiences (Purnomo et al. 2021). However, adjustments are needed across these three aspects to accommodate children's varying interpretations of visual elements and the lack of specific benchmarks for ludic values tailored to different educational backgrounds, language proficiencies, and age groups. However, the effectiveness of AR in facilitating children's comprehension depends on the careful integration of textual, visual, and interactive elements tailored to diverse educational and linguistic backgrounds (Purnomo et al. 2021).

Figure 8: The QR code of babyfication application

While simplifying exhibition texts aims to enhance children's comprehension, it does not directly address challenges posed by diverse educational levels and cultural backgrounds. Although English is widely used for learning activities, children's engagement depends on their linguistic familiarity and cultural relevance of the content. AR technology presents accessibility barriers. AR apps require compatible devices and infrastructure, potentially excluding children without access to such technology from fully experiencing simplified museum exhibits.

Table 2: Strategies for Targeting the Museum's Segment

	Text Simplification	Visual Modification	Operative Addition
Narrative	✔	✔	✔
Objects	✔	✔	✔

The QR code in Figure 8 is corresponded to a product based on AR app targeting to the museum's segment utilizing several strategies that already included in Table 2 such as text simplification, visual modification, and operative addition aiming and covering up the narrative (exhibition texts) and objects (visually seen collections) displayed in the museum. The QR code above should be scanned in order to show the simplification elements and enhance the reader's comprehension and experience.

CONCLUSION The perception of the museums as outdated and uninteresting to common people, especially for young visitors, stems from their failure to cater to younger audiences. This Failure can be fatal because one of the functions of a museum is to educate the people and one of the main demographics of education is young people. This failure is evident in the use of formal and complex language in artifact descriptions that leads to frustrating many visitors. To make museums more engaging for youths, all information should be accessible to them. Utilizing simplified descriptive texts,

visuals, and AR applications can enhance the comprehension and interests of younger visitors, like the concept referred to as babyfication. This research aimed to demonstrate the effectiveness of this approach in making museums more appealing to the youth. The lacking appeal of museums for children can be attributed to realistic images and formal-oriented descriptions. By using babyfication, the museum can cater more to younger visitors and make them interested in visiting museums more often.

The Babyfication method through AR technology has proven to be able to enhance children's understanding of museum exhibition texts. By utilizing such a technology that suits to children's comprehension level, it can be said that children now have the tool to help them understand the museum collections more clearly than the former conventional texts. Children are hoped to enjoy their visits to museums not only by watching the collections, but also understand the history behind the artifacts. However, adaptations across textual, visual, and operational aspects are necessary to effectively engage the target audience. In the created AR product, text simplification and interactive audio that feature child-friendly intonation, are utilized. In addition, visually enhanced babyfied elements prove more appealing than the original visuals.

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