Unveiling Effective Design Elements and Features for Implementing Augmented Reality in Bicol Mythical Creatures: Teachers' Perspective

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This study examines the integration of Augmented Reality (AR) in teaching Bicol myths, focusing on the perspectives of Araling Panlipunan (AP) teachers in private primary schools in Legazpi City. The integration of AR in educational settings offers a novel approach to preserving and disseminating cultural heritage, particularly in the rich tapestry of Bicolano folklore. The research aims to identify the specific AR design elements and functionalities that SC teachers consider most beneficial and engaging in the classroom.

In this study, a mixed-methods strategy was utilized, integrating quantitative surveys to ascertain teachers' preferences regarding content, technical aspects, and usability, along with open-ended survey questions. This methodology facilitated a thorough collection of data on teachers' preferences, perceived obstacles, and potential approaches for successfully incorporating AR in educational settings. The research results underscore the significance of user-friendly interfaces, culturally precise content depiction, and engaging storytelling techniques. Additionally, teachers pointed out the lack of smartphones and internet access among some students as significant hurdles in the adoption of AR technology.

The findings offer crucial guidance for both developers and educators who seek to develop AR applications for educational use, especially in the realms of culture and mythology. This research aligns technological advancements with educational requirements and cultural authenticity, setting the stage for more immersive and impactful educational experiences in the exploration of Bicol's mythical creatures. This study adds to the growing field of AR in education, offering specific implications for enhancing cultural education in the Philippines and potentially other regions with similar contexts.

Keywords: Augmented Reality, Cultural Heritage, Education, Local Myth, Mythical Creatures.

1. Introduction

The integration of Augmented Reality (AR) into education signifies a transformative convergence of technology and traditional pedagogy, offering innovative approaches to teaching and learning. Augmented Reality introduces virtual data or objects into any indirect-world setting, enriching the user's perception and engagement with the actual world [1]. Research highlights AR's potential to enhance spatial abilities, problem-solving skills, and student motivation, particularly in subjects requiring 3D spatial visualization such as geometry and geography [2]. Furthermore, the utilization of AR in teaching cultural heritage, specifically local myths, aligns technological advancements with educational objectives to preserve cultural narratives and foster a deeper understanding of cultural identity among students. This synergy between technology and cultural education presents a novel method for engaging students and enhancing the educational experience through dynamic and immersive learning environments.

However, despite its promising applications, the integration of AR in education, especially in the context of local myth education, faces significant challenges. There exists a notable gap in comprehensive studies and practical applications of AR in classroom settings, particularly in subjects that explore cultural heritage and mythology. Additionally, the educational curriculum often overlooks the rich narrative landscape of local myths, missing opportunities to connect students more deeply with their cultural heritage. Addressing these gaps by effectively incorporating AR into the education of local myths can revolutionize how cultural narratives are conveyed, making them more accessible, engaging, and relevant to students. Bridging this divide not only has the potential to transform educational practices but also plays a crucial role in the preservation of cultural heritage and the promotion of cultural identity, highlighting the significance of this research in the broader context of educational innovation and cultural preservation.

This study explores the effective design elements and features necessary for implementing Augmented Reality (AR) in teaching Bicol myths, from the perspective of Araling Panlipunan teachers in both public and private schools in the Legazpi City.

2. LITERATURE REVIEW

Augmented Reality in Education

Education continuously evolves to match societal developments and trends. This evolution is driven by the arrival of new learners who bring new needs and expectations[3]. The incorporation of Augmented Reality (AR) in education, reveals a compelling intersection of technology and pedagogy. Several studies have extensively explored the potential of Augmented Reality (AR) and its application in evolving the educational system into a 'smart education' model. These research efforts have delved into how AR can fundamentally transform teaching and learning processes, making them more interactive and engaging [1][4][3][5]. AR has the potential to significantly enhance spatial abilities, problem-solving skills, and student motivation[2][6][7][8][9][10]. Also, Augmented Reality has been proven to enhance the learning outcomes of students and aid in their ability to remember concepts over the long term [11]. Augmented reality enriches real-world environments with virtual

objects, offering a dynamic and immersive learning experience [12]. This technology's versatility across various educational domains, including those requiring 3D spatial visualization like geometry and geography [13], underscores its potential to transform traditional learning paradigms. Yildiz's anticipation of AR's increased application across diverse educational levels and contents further highlights its adaptability and the broadening scope of its impact [12].

The research identifies AR as a catalyst for creating flexible, engaging learning environments that foster excitement, motivation, and active learning. By facilitating active observation and hypothesis formation, AR not only improves educational performance but also enhances social interaction among students.

However, despite the demonstrated benefits of AR in enhancing educational outcomes, a gap in its application within formal education settings remains. It is a necessity for more comprehensive studies and the integration of AR into real classroom practices, particularly at the secondary and university levels [14]. This gap presents an opportunity for educators and researchers to pioneer the use of AR to deliver more effective and engaging educational experiences.

The viability of AR in education is further supported by the reduction in the cost of AR hardware [2]. This growing accessibility makes AR an increasingly practical option for schools and educational institutions, enabling its broader implementation across various educational settings and disciplines.

Local myths and their educational value

Myths are traditional narratives inherent to every ancient culture, designed to elucidate life's grand questions through the exploits of deities and heroes [15][16] and help cultures generate understanding with each other [17]. Also, myths and legends play a crucial role in nurturing children's awareness of history and culture, enabling them to appreciate their society's past achievements while also coming to terms with its historical complexities and contradictions [18]. This conceptualization not only positions myths as a critical vehicle for understanding cultural heritage and moral values [19] but also underscores their role in distilling complex societal norms and human behaviors into comprehensible and relatable stories. Such narratives offer a unique lens through which students can examine and engage with the multifaceted aspects of human nature and societal dynamics.

Building upon this foundation, the legislative backdrop provided by Republic Act No. 10066 emphasizes the Philippine government's commitment to preserving national cultural heritage [20]. This act reinforces the importance of integrating these cultural narratives into broader societal and educational frameworks, ensuring their preservation and relevance for future generations. This legislative support highlights a collective recognition of the importance of cultural narratives, including myths, in maintaining a continuous and vibrant cultural identity.

Delving into the educational sphere, there's a notable disparity in the Philippine educational curriculum, which predominantly focuses on Greek and Roman mythology, thereby overlooking the rich narrative landscape of Philippine mythology [21]. In the Philippines, some private elementary schools incorporate local legends into their History and Social

Studies curriculum. However, this practice is not widely adopted in public schools, particularly in rural areas [22]. This curriculum gap suggests a missed opportunity to connect Filipino students more deeply with their cultural heritage. By incorporating local myths into the curriculum, educators can offer students a more inclusive and representative understanding of their cultural identity, fostering a stronger connection to their historical and cultural roots.

Echoing this sentiment, the functional role of myths in defining relationships with nature, preserving local history, and upholding traditional values amidst globalization's challenges [23]. This perspective underscores the importance of storytelling in cultural preservation, by lamenting the decline of storytelling as a communal and educational practice. By reviving storytelling, particularly through the inclusion of local myths in educational settings, there's an opportunity to facilitate cultural transmission and reinforce communal bonds [15][24].

Further advocating for this integrative approach, folklore, and myths are placed as essential components of intangible cultural heritage, reflecting a society's values, norms, and traditions [25][26]. The inclusion of these narratives in educational curriculums not only promotes cultural education and awareness but also activates a primal connection among students to the collective energy and deeper soul of the world [15]. This educational strategy fosters a sense of identity and community, enriching students' understanding of their cultural heritage.

Importance of incorporating augmented reality in local myth education

According to Ross, the significant shifts in the communication and transmission of folklore with the advent of digital technology [26]. This technological evolution paves the way for innovative strategies to convey and interact with cultural narratives, setting a foundation for the integration of AR into educational practices.

To further elaborate on specific AR strategies, such as re-creation, reconstruction, pigmentation, and viewing animations, which facilitate a holistic and sensory learning experience [14]. These strategies, enabled by diverse media, cater to individual learning preferences and promote a comprehensive understanding of cultural content, underscoring the adaptability and effectiveness of AR in educational settings.

Teaching history often includes different viewpoints, but it can also be boring if not taught in an engaging way [27][28], especially at the primary level [29]. This emphasizes the need for dynamic teaching approaches that can captivate students' interest and encourage a deep, critical engagement with historical studies. The AR's capacity to revitalize history and myth education by transforming these subjects into engaging, interactive experiences [30][31]. Through AR, learners can visualize and interact with historical contexts and mythical narratives in ways that traditional teaching methods cannot match [28]. This engagement is not only more stimulating but also enhances retention by inducing positive emotional responses in learners, making the educational process more memorable and effective.

The extensive use of Mobile Augmented Reality (MAR) in cultural heritage preservation, emphasizes its significance in enhancing user perception and learning [32]. The accessibility of smartphones and mobile AR applications underscores the feasibility of integrating AR into local myth education, offering a practical avenue for bringing cultural narratives to life

in the classroom.

This technological approach is paralleled by the adaptation of Filipino myths into modern pop culture, such as comics and graphic novels [16], illustrating the potential of contemporary media to engage students with traditional stories. This adaptation suggests a broader cultural and educational trend toward making heritage and folklore more accessible and appealing to younger generations.

Boboc supports the argument for AR's educational efficacy with examples of its application in fieldwork learning, demonstrating how AR can enrich learning experiences and outcomes, particularly in understanding historical and cultural content [33].

As we progress through the third decade of the 21st century, innovations in education are increasingly necessary due to the many distractions competing for students' attention. It highlights how digital technologies, especially those that young users are heavily attracted to, can transform the way students learn, suggesting that AR can be a significant part of this transformation.

3. MATERIALS AND METHODS

Research Question

What are the critical design elements and features that Araling Panlipunan teachers in Legazpi City deem essential for the effective integration of AR technology in teaching Bicol Mythical Creatures?

What challenges or barriers do educators perceive in adopting AR technologies for teaching Bicol Mythical Creatures?

What kind of assistance do Araling Panlipunan teachers believe is essential for the successful incorporation of Augmented Reality (AR) technology into their instruction of Bicol Mythical Creatures?

Sample

This research employed a survey-based approach, targeting all "Araling Panlipunan" (AP) or Social Science teachers from public and private elementary schools in Legazpi City, Albay, Philippines. The study's respondents comprised 266 AP teachers representing 47 different elementary schools. The table below shows the number of respondents in each primary school.

Instrument

A mixed-methods approach was employed as the research instrument, combining quantitative surveys with qualitative open-ended questions to garner a comprehensive understanding of teachers' perspectives. The quantitative component involved structured surveys that captured teachers' preferences and priorities regarding the content, technical aspects, and usability features of AR technology. This allowed for the collection of measurable data that was statistically analyzed. The researcher used a Five-Likert scale labeling 1 being "Not Important" and 5 being "Very Important".

The qualitative aspect is used through open-ended questions, providing teachers with the opportunity to express their views in detail, offering nuanced insights into the challenges, potential solutions, and pedagogical implications of integrating AR into teaching Bicolano myths. The combination of these methods enabled a rich, multi-dimensional exploration of the subject matter, ensuring both breadth and depth in the data collected.

The survey questionnaire undergoes pilot testing by selecting Araling Panlipunan teachers and allowing them to answer and check the survey form. It allows researchers to identify and rectify ambiguities, assess the relevance and clarity of questions, and evaluate the survey's length and flow. This step is critical for enhancing the quality of data collected, estimating the time required for completion, and improving respondent engagement by minimizing fatigue. By addressing these aspects, pilot testing significantly contributes to the reliability and validity of the research findings, ensuring that the survey effectively meets its objectives and facilitates accurate data analysis.
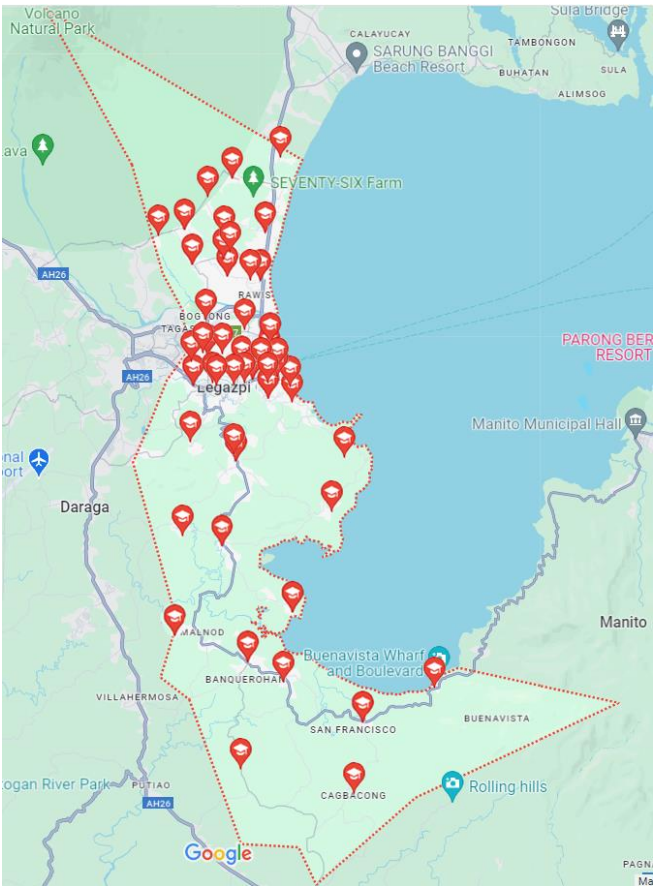

Fig 1. Legazpi City Map

4. RESULT AND DISCUSSION

Creating Mobile Augmented Reality (AR) applications can be straightforward for original ideas. However, adapting this technology to incorporate cultural stories, such as myths, into educational content for young learners presents significant challenges. It's crucial to pinpoint the specific design elements and functionalities that will make the tool effective for educational purposes. To ensure the AR application meets the educational needs of primary students, researchers have focused on consulting with Araling Panlipunan (Social Studies) teachers in Legazpi City, as these educators are most familiar with both the student's requirements and the educational content.

Preferred Key Design Elements and Features

For the question "Which content features would you desire in a mobile AR application focused on Bicolano's mythical creatures?" the respondents rate the seven items based on their preference.

Table 1. Content Features Descriptive Statistics Results

Descriptive Statistics	Valid	Missing	Mean	Std. Deviation	Min	Max
Accurate historical information about Bicolano myths and legends.	266	0	4.52	0.797	1	5
3D visualizations of mythical creatures, or characters	266	0	4.284	0.85	1	5
Augmented reality storytelling experiences.	266	0	4.356	0.844	1	5
Text-based descriptions of mythical creatures, or characters	266	0	4.267	0.876	1	5
Audio narrations or storytelling	266	0	4.333	0.829	1	5
Ability to customize and create new AR experiences	266	0	4.191	0.997	1	5
Integration of quizzes or interactive activities related to Bicolano myths and legends	266	0	4.249	0.926	1	5

The descriptive statistical analysis of the survey data, as shown in Table 1, reveals that respondents consider "Accurate historical information about Bicolano myths and legends" as the most important feature for a mobile AR application focused on Bicolano's mythical creatures. This feature stands out with the highest mean rating of 4.52, clearly indicating its significance to the users. The fact that this rating comes from 266 valid responses, with no missing data, underlines a unanimous and comprehensive agreement on its importance. Furthermore, the relatively low standard deviation of 0.797 points to a strong consensus among the respondents. This high rating emphasizes the value that respondents place on authenticity and accuracy in the portrayal of cultural myths and legends in the AR

application. It suggests that ensuring the historical and cultural accuracy of the content should be a primary focus in the development of the application.

Table 1. Technical Features Descriptive Statistics Results

Descriptive Statistics	Valid	Missing	Mean	Std. Deviation	Min	Max
Smooth and responsive AR interactions	266	0	4.276	0.956	1	5
Accurate tracking of virtual objects in the real world	266	0	4.409	0.786	2	5
Realistic and visually appealing 3D models of mythical creatures, characters, or locations	266	0	4.413	0.797	2	5
Compatibility with a wide range of mobile devices	266	0	4.396	0.784	2	5
Fast loading times for AR experiences	266	0	4.324	0.88	2	5
Does not use up much of mobile data	266	0	4.276	0.993	1	5
Does not consume a lot of mobile storage memory	266	0	4.422	0.826	2	5

The highest-rated feature for Technical Features based on Table 2 is 'Does not consume a lot of mobile storage memory' with a mean of 4.422. This indicates that users place significant importance on the efficiency of the application concerning their device's storage capacity.

The next highest-rated features are 'Realistic and visually appealing 3D models of mythical creatures, characters, or locations' and 'Compatibility with a wide range of mobile devices', both reflecting the importance of visual fidelity and device accessibility in AR experiences. 'Smooth and responsive AR interactions' also score highly, emphasizing the desire for an interactive and seamless user experience. Meanwhile, 'Does not use up much of mobile data' suggests a consideration for the data usage costs associated with the application. Fast loading times, while slightly less critical, still hold considerable value for users, as indicated by its mean score. These preferences collectively highlight a user demand for an AR application that is both high in quality and considerate of device resource constraints, ensuring accessibility and sustainability in usage.

Based on Table 3, the respondents indicated a strong preference for user-centered design and accessibility features. The highest-rated feature was 'Offline mode capability for areas with limited internet connectivity' (mean = 4.549), which suggests a critical need for the application to be functional without constant internet access. Close behind in preference was 'Intuitive and user-friendly interface' (mean = 4.538), followed by 'Clear instructions and guidance on how to use the application' (mean = 4.529), both emphasizing the importance of ease of use. 'Availability of multilingual support' (mean = 4.516) and 'Customizable settings to adapt the AR experiences to different teaching needs' (mean = 4.489) were also highly valued, indicating a need for the application to cater to diverse user groups and educational contexts. The 'Responsive and accurate object recognition/tracking' feature (mean = 4.44), while slightly lower in mean preference, was still considered important, underscoring the desire for technical reliability in interacting with augmented content. The relatively tight range of means and the low standard deviation across all features suggest a consensus on the importance of these attributes in the AR application

Table 2. Usability Features Descriptive Statistics Results

Descriptive Statistics	Valid	Missing	Mean	Std. Deviation	Min	Max
Intuitive and user-friendly interface	266	0	4.538	0.744	2	5
Clear instructions and guidance on how to use the application.	266	0	4.529	0.744	2	5
Availability of multilingual support for diverse user populations	266	0	4.516	0.739	2	5
Customizable settings to adapt the AR experiences to different teaching needs	266	0	4.489	0.757	2	5

Responsive and accurate object recognition/tracking	266	0	4.44	0.8	2	5
Offline mode capability for areas with limited internet connectivity	265	1	4.549	0.744	1	5

Educators Perceived Challenges

The responses from the Araling Panlipunan teachers regarding their anticipated challenges and concerns when using a mobile Augmented Reality (AR) application for teaching Bicolano myths and legends highlight a different set of issues primarily centered around technological accessibility, pedagogical considerations, and content quality.

Technological and Accessibility Concerns:

Access to Technology and Connectivity

A significant concern is the disparity in access to necessary technology. Many students may not have smartphones or devices capable of running AR applications, leading to inequalities in access and participation. Additionally, internet connectivity is a critical issue, especially in rural or remote areas, which affects the application's effectiveness.

Device Compatibility and Technical Requirements

The responses indicate worries about the wide range of device compatibility, from smartphones to tablets, and the technical limitations that might hinder the effective deployment of AR technologies. Issues such as device storage, internet speed, and the physical side effects of prolonged AR use (e.g., eye strain and headaches) were also mentioned.

Maintenance, Updates, and Costs.

The need for regular maintenance and updates to keep the AR application compatible with various operating systems and devices is a concern, alongside the financial implications for both the implementation and the ongoing use of these technologies.

Pedagogical and Content Concerns:

Training and Familiarity

The teachers foresee challenges in their own training and familiarity with the AR application, as well as in preparing instructional materials that integrate AR into the curriculum effectively. This includes not only the technical aspects of using the application but also the pedagogical skills to leverage AR for educational purposes.

Content Accuracy and Cultural Sensitivity

Ensuring the accuracy, authenticity, and cultural sensitivity of the content within the AR application is crucial. This involves careful conceptualization and representation of myths, legends, and cultural elements to avoid misinterpretation and ensure educational integrity.

Engagement vs. Distraction.

While AR applications have the potential to enhance engagement with the material, there is also a risk that they could become a source of distraction. Teachers are concerned about managing students' focus and ensuring that the use of technology enhances learning rather than detracting from it.

Broader Educational and Societal Implications:

Educators Perceived Essential Training or Assistance

The data collected from Araling Panlipunan teachers regarding the necessary training and support for effectively integrating Augmented Reality (AR) technology into teaching Bicol myths and legends can be summarized and discussed under several key themes:

Comprehensive Workshops on AR Technology

Teachers highlighted the importance of hands-on workshops that cover the basics of AR technology, its educational applications, and practical classroom integration strategies. These workshops should provide foundational knowledge and skills, enabling educators to utilize AR technology confidently in their lessons.

Instructional Design Support

There is a need for guidance on designing and structuring lessons or activities that leverage AR to enhance learning outcomes. Teachers are seeking support in integrating AR into their educational content creatively and effectively, ensuring that it complements the learning objectives.

Technical Support

Ongoing technical assistance is crucial for troubleshooting and maintaining AR hardware and software. This support is vital for minimizing disruptions and ensuring the smooth operation of AR technology in the classroom.

Curriculum Integration Strategies

Teachers expressed a desire for specific strategies and examples of how to seamlessly integrate AR into the existing curriculum. This includes aligning AR activities with educational standards and learning objectives to enrich the educational experience.

Resource Materials

Access to resource materials, such as user manuals, educational content, and lesson plans tailored for AR, was identified as necessary. These materials can provide educators with ready-to-use content and inspiration for designing their AR-based lessons.

Collaboration Opportunities

Opportunities to collaborate with other educators or technology experts to share best practices and ideas are valued. This could take the form of peer mentorship programs with teachers experienced in using AR for educational purposes or professional development credits focusing on AR in education.

Customized Training

Customized training sessions addressing the specific needs and challenges of individual schools or educational contexts are also mentioned. Tailoring the training to fit the unique requirements of each teaching environment could enhance the effectiveness of AR integration.

To summarize, the majority of the respondents believe that comprehensive workshops are crucial, indicating a strong preference for in-depth, practical training sessions. Instructional design support and ongoing technical support are also highly valued, which suggests that sustained, multifaceted support mechanisms are important for teachers. Furthermore, collaboration opportunities and strategies for curriculum integration are seen as necessary by the respondents, highlighting the desire for collaborative environments and clear implementation strategies. Access to resources and professional development courses are considered important, which underscores the need for accessible teaching materials and opportunities for skill enhancement in the context of AR technology. A small number of responses suggest the need for offline operation and inclusion of cultural background information in AR applications, which points to a nuanced understanding of local educational contexts and a desire for culturally sensitive materials. These results collectively underscore the educators' desire for comprehensive, ongoing support and resources to effectively integrate AR into their teaching practices.

5. CONCLUSION

The study "Unveiling Effective Design Elements and Features for Implementing Augmented Reality in Bicol Mythical Creatures: Teachers' Perspective" sheds light on the details of incorporating Augmented Reality (AR) technology into educational settings, particularly for the enrichment of lessons on Bicolano mythical creatures. It articulates the preferences, perceived challenges, and necessary support as highlighted by social science teachers, offering a refined understanding of how AR applications can be tailored for educational excellence in teaching cultural and historical content.

Teachers have expressed a strong preference for AR content that upholds accuracy and authenticity in depicting Bicolano myths and legends, signifying the importance of well-researched and culturally respectful representations. This underscores the need for AR applications to be developed with a keen eye on historical integrity and cultural fidelity.

In terms of technical considerations, the study highlights the necessity for AR applications to be efficient with device resources, offering visually compelling content without burdening storage or data usage. Features that enhance user interaction and engagement, such as realistic 3D models and smooth AR interactions, are deemed vital. Moreover, ensuring the application's compatibility across a diverse range of devices emerges as a crucial factor, pointing towards the need for universal access and inclusivity in AR technology deployment.

The emphasis on user-centered design elements, such as offline functionality, intuitive user interfaces, and support for multiple languages, reflects an acute awareness of the varying contexts and backgrounds of learners. This indicates a broader acknowledgment of the need for AR applications to be adaptable and accessible to a wide audience.

Addressing educators' concerns, the paper identifies several challenges in integrating AR technology into the curriculum, including technological accessibility, pedagogical considerations, content quality, and broader issues of equity and inclusion. These highlight the multi-faceted approach required to navigate the complexities of AR technology implementation effectively.

Furthermore, the study calls attention to the critical need for comprehensive training and support for educators, encompassing not just the technical use of AR technology but also its seamless pedagogical integration. This includes fostering environments that encourage collaborative learning and providing resources that aid in curriculum integration, underscoring the importance of equipping teachers with the skills and knowledge necessary to leverage AR technology successfully.

In conclusion, the integration of AR technology in teaching Bicolano myths and legends presents a fertile ground for enhancing educational experiences through immersive learning. However, realizing this potential necessitates a concerted effort to align the development and deployment of AR applications with educators' preferences, challenges, and training needs. Future research directions might explore the effectiveness of AR across different cultural contexts, assess long-term educational impacts, examine the integration of emerging technologies, and develop inclusive design strategies to ensure equitable access to AR-enhanced education. This study thus lays a foundational framework for advancing AR technology in education, advocating for an integrated approach that combines technological innovation with pedagogical strategies and cultural sensitivity.

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