

Localized AI Solutions for Equitable Lifelong Learning in the Davao City

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Abstract. The integration of Artificial Intelligence (AI) into lifelong learning offers both opportunities and challenges. This paper explores how AI can be effectively incorporated into online education systems to create sustainable, inclusive, and scalable lifelong learning models. The study identifies gaps in current AI research in education, especially in the context of equitable access and ethical governance, and proposes strategies for responsible AI adoption in lifelong learning frameworks. By addressing the need for equity, inclusion, and sustainability, this paper aims to contribute to shaping the future of education in the era of AI. It specifically focuses on the development of a prototype AI system tailored for the educational needs of Davao City, with an emphasis on linguistic and cultural inclusivity.

Keywords: Artificial Intelligence · Lifelong Learning · Inclusivity · Sustainability · Education Systems

1 Introduction

1.1 Hook Statement

The rapid advancement of Artificial Intelligence (AI) presents a paradigm shift in the way we approach education. As we enter the digital era, AI-driven personalized learning holds immense promise to transform the educational landscape. However, its true potential can only be fully realized when it addresses the systemic barriers that hinder equitable access, particularly in culturally diverse communities like Davao City, Philippines. By localizing AI solutions to meet the unique linguistic and cultural needs of these communities, AI can empower students and educators alike, creating more inclusive and relevant learning experiences. This paper will focus on developing a prototype of an AI-based Virtual Assistant tailored to these specific needs.

1.2 Background of Study

AI has already begun to revolutionize various sectors, and education is no exception. Platforms like Coursera, edX, and Khan Academy have opened up vast opportunities for learners globally. Yet, despite the potential of AI to transform education, its application remains underutilized, especially in countries with diverse socio-economic and cultural landscapes like the Philippines. In particular, Davao City faces challenges in adopting AI for education due to its linguistic diversity and the need for localized content that resonates with the local culture. With over 170 languages spoken across the country, AI solutions tailored to local dialects such as Bisaya, in addition to English, are crucial to ensuring inclusivity and accessibility. This study aims to bridge these gaps by developing a prototype AI system that enhances the educational experience and empowers teachers, especially those with busy schedules, by supporting them in delivering personalized and culturally relevant learning materials to students.

1.3 Problem Statement

Despite the growing adoption of Artificial Intelligence (AI) in educational platforms, there remains a significant gap in providing equitable, culturally relevant, and inclusive learning experiences in Davao City. Current AI-driven educational technologies often fail to address the specific needs of learners in this region, particularly in terms of language, local culture, and content accessibility. The core problem lies in how to integrate AI into the educational framework in Davao City, ensuring that it is tailored to meet the linguistic and cultural diversity of the local population, specifically through the incorporation of Bisaya and English language options. Additionally, there is a need for an AI system that supports formal education environments, enhancing engagement through personalized learning and interactive elements. This paper focuses on developing a prototype for such a system that can be further refined and tested in real-world educational settings, with the potential for future scalability.

1.4 Differentiation

Unlike traditional AI-driven educational models that often overlook local contexts, this paper proposes a prototype Virtual Assistant AI solution specifically designed for the educational needs of Davao City. The solution aims to bridge gaps in educational accessibility by creating AI-powered platforms and content tailored to the linguistic and cultural needs of Filipino learners, particularly those who speak Bisaya and English. This prototype will serve as a virtual teacher, capable of teaching and answering questions in both languages, ensuring it remains relevant and accessible to learners in the region. The proposed system includes several innovative features: [1] Material Upload System: Teachers can upload lesson materials such as PDFs, PowerPoints, videos, text, or audio files, with options to add notes or key points for the AI to highlight during the lesson.

[2] AI Lesson Presenter: The system transforms uploaded materials into structured lessons using Text-to-Speech (TTS) in Bisaya for verbal presentations, supporting multimedia elements like slide presentations. [3] Instant Language Switching: Enables users to toggle between English and Bisaya seamlessly, without interrupting the flow of the lesson. [4] Scheduling Feature: Allows teachers to set specific dates and times for lessons, with automated notifications sent to students. [5] Live or Pre-Recorded Lesson Options: Provides real-time or pre-generated lessons for flexible access. [6] Interactive Elements: Students can ask questions via chat or voice, with the AI responding in either Bisaya or English. [7] User Management System: Allows secure sign-ins for both students and instructors, with dashboards for managing lessons, tracking engagement, and more. The prototype will focus on developing these core features and will be tested in controlled settings before full deployment.

1.5 Significance

This study holds significant value as it seeks to establish a comprehensive framework for integrating Artificial Intelligence (AI) into the Philippine education system, with a particular focus on Davao City. By emphasizing the localization of educational content and providing AI-driven tools tailored to the specific needs of both teachers and students, this research contributes to the broader discourse on AI's role in transforming education, particularly in developing countries. The proposed Virtual Assistant AI prototype has the potential to revolutionize the learning experience in Davao City, enhancing accessibility, cultural relevance, and support for educators, while empowering both learners and teachers with innovative tools that foster equitable and sustainable educational outcomes. The development of this prototype will be a significant first step toward the larger goal of implementing such AI-driven systems on a broader scale.

1.6 Objectives

The objectives of this study are multifaceted, focusing on the development and implementation of a prototype Virtual Assistant AI tailored specifically for the educational needs of Davao City. The first objective is to develop a prototype of the Virtual Assistant AI that can serve as an effective, culturally relevant educational tool in formal learning environments in Davao City. This AI will be designed to provide educational content that resonates with the local culture and context, ensuring that students can engage with material in a way that feels familiar and relevant to their daily lives. Secondly, the study seeks to incorporate a comprehensive language translation feature within the AI system, enabling seamless communication in both Bisaya and English. This feature will allow students to choose their preferred language for learning, ensuring greater inclusivity and accessibility for learners from diverse linguistic backgrounds. Another key objective is to design the AI system to function in a dynamic and interactive manner, allowing it to answer students' questions, offer explanations, and adapt to the specific learning needs of each student. The prototype will also

be designed to provide personalized teaching strategies and assessment features. Finally, the study aims to create a scalable and sustainable model for the integration of the Virtual Assistant AI prototype into various schools and community centers across Davao City, with a flexible framework that can be replicated in other regions with similar challenges. The development of this prototype will provide insights into the feasibility of broader deployment in the future, with a focus on ethical deployment and data privacy considerations.

2 Review of Related Literature

2.1 Introduction to the Review

The purpose of this literature review is to explore existing research on AI applications in education, with a particular focus on their potential to provide equitable and inclusive learning opportunities. This review will examine studies related to AI-powered educational tools, challenges in their implementation, and the specific context of the Philippines, particularly in urban areas like Davao City. The scope includes literature from the past decade, utilizing a variety of methodologies, including case studies, experiments, and systematic reviews. The review is organized thematically, covering historical development, theoretical frameworks, major findings, and identifying research gaps.

2.2 Thematic Discussion of Literature

Historical Background The use of AI in education dates back to the 1960s, with early developments in computer-assisted instruction. Over time, AI technologies evolved to include adaptive learning systems, intelligent tutoring systems, and AI-based educational content. More recently, Massive Open Online Courses (MOOCs) have gained popularity, offering open access to courses. Despite these advancements, the integration of AI in education has often overlooked local needs and cultural contexts. In the Philippines, the integration of AI-driven educational tools has faced challenges primarily in ensuring the content is localized to reflect the linguistic and cultural diversity of learners, rather than barriers like internet access. Davao City, in particular, has a strong urban infrastructure that supports AI-based education systems, yet there is a need for culturally relevant and linguistically inclusive AI tools that can engage Filipino students, especially those who speak Bisaya alongside English.

Conceptual/Theoretical Frameworks Several educational theories provide a foundation for the use of AI in education. Constructivist learning theories, for example, emphasize the importance of personalized, learner-centered education, which aligns well with AI's ability to provide individualized learning experiences. Furthermore, theories of social inclusion and equity are essential for understanding how AI can democratize education, ensuring that marginalized communities are not left behind in the digital divide. In the case of Davao City, AI solutions

should focus on inclusivity, particularly by addressing linguistic diversity, thus ensuring that all students, regardless of their background, can access quality education.

Key Findings & Trends Studies indicate that AI can significantly enhance learning outcomes by personalizing education according to the individual learner's needs. Adaptive learning platforms such as DreamBox and Squirrel AI use AI to tailor content to students' progress, improving engagement and performance. However, to be effective, these AI tools must be culturally relevant. Research shows that AI solutions that do not consider the local context can struggle to engage learners. For example, Davao City, with its significant population of Bisaya speakers, would benefit from AI tools that can integrate and adapt to the local dialect and culture. AI platforms tailored to this context have the potential to enhance the learning experience, making it more engaging and accessible for students in Davao City.

Methodologies Used in Prior Studies Common methodologies in AI education research include experimental designs, case studies, and pilot programs. Many studies focus on evaluating the effectiveness of adaptive learning platforms through controlled experiments or longitudinal studies. Other studies use qualitative methods, such as interviews and surveys, to understand the perceptions of teachers and students regarding the integration of AI in educational settings. These methods can provide valuable insights into how AI tools are perceived and how they might be effectively implemented in the context of Davao City.

Contradictory Findings/Debates While AI has shown promise in personalizing learning, debates exist about its scalability and ethical implications. Some studies suggest that AI could exacerbate educational inequalities if not carefully implemented, particularly in regions where resources are limited. Concerns about data privacy and algorithmic bias in AI systems have also sparked discussions on the ethical use of AI in education. In Davao City, the challenge is less about internet access or infrastructure and more about ensuring that AI solutions are ethically designed to avoid biases and reflect the cultural values and linguistic diversity of the students.

Research Gaps A key gap in current literature is the lack of research on the localization of AI educational tools for specific contexts, such as the Philippines. Few studies have explored the integration of AI in educational settings where the focus is on culturally relevant content, and even fewer have addressed how AI can be used to meet the specific linguistic and cultural needs of students in urban centers like Davao City. Most research on AI education focuses on technological implementation without considering the need for content localization to reflect diverse linguistic and cultural settings.

3 Methodology

The study adopted a system development research approach, utilizing the Software Development Life Cycle (SDLC) as the guiding framework. The SDLC provided a structured and systematic process for the development and evaluation of the AI prototype, which was essential for maintaining consistency and quality in the design of educational technologies. The SDLC framework was applied to guide the conceptualization and evaluation of the prototype's components, ensuring that the AI system prototype effectively addressed the educational needs of Davao City. The research analyzed each stage of the SDLC—requirement gathering, design, implementation, testing, and deployment—while focusing on how these stages were executed to create an effective and accessible educational tool prototype.

To enhance flexibility and adaptability throughout the SDLC, an Agile and Iterative approach was incorporated. These methodologies allowed for continuous feedback and iterative development, ensuring that the prototype evolved in response to the changing needs of students and educators. By using these approaches, the prototype was progressively refined, tested, and updated, enabling a more responsive and user-centered development process.

Data for system requirements were gathered through a combination of interviews, surveys, and document analysis. These methods provided a comprehensive understanding of the needs and expectations of stakeholders, including educators and students, which was crucial for designing a prototype AI system that met the educational challenges in Davao City. Interviews and surveys were conducted to collect detailed insights into the specific needs of teachers and students regarding AI-based learning tools. Document analysis was used to review existing educational materials, frameworks, and policies to understand how the prototype AI system could integrate with or enhance current educational practices. Feedback was collected during the requirement gathering, design, and testing phases to ensure that the proposed prototype system was user-centered and culturally appropriate for the community.

Participants were purposively selected to provide insights based on their role and expertise. Educators offered their perspectives on how the system should align with teaching goals and how it could be incorporated into their instructional practices. Students, particularly those from diverse linguistic and cultural backgrounds, provided feedback on how accessible and engaging the system was. This purposive sampling method ensured that the feedback was representative of the target users and their specific needs.

Data analysis was conducted through both qualitative and quantitative methods. Thematic analysis was applied to qualitative data from interviews, surveys, and user feedback to identify key themes regarding the prototype's usability, effectiveness, and cultural relevance. Statistical analysis was used to assess how

well the prototype’s proposed features met the educational needs of students and teachers in Davao City. Functional testing, usability testing, and performance analysis were conducted to assess the potential effectiveness of the AI prototype if it were to be developed. The results of these analyses informed the recommendations for the prototype AI system’s design, ensuring that it provided an inclusive and effective learning experience for the students of Davao City.

4 Results and Discussion

The findings of this study reveal a strong demand from both students and teachers in Davao City for an AI-powered educational system that emphasizes **personalized learning paths**, **instant language switching** between English and Bisaya, and **interactive features** such as real-time Q&A. Survey responses from students highlighted features like interactive AI tutors, voice-based communication, and content presented in both English and Bisaya as top priorities. Similarly, teachers expressed a strong interest in automated feedback systems,

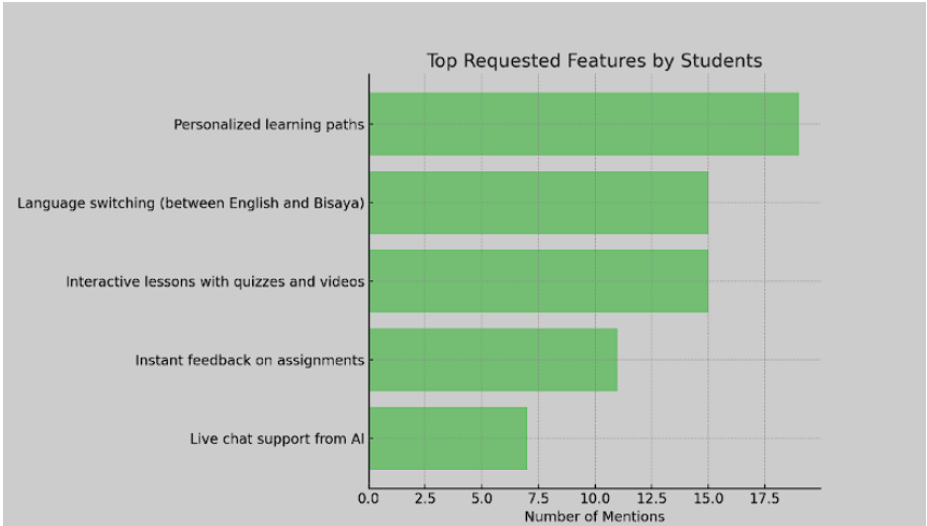


Fig.1. Figure 1. *Most Requested Features for an AI-Powered Educational System According to Student Respondents in Davao City.*

scheduling functionalities, and tools that support lesson material uploads and AI-driven lesson presentation.

These results affirm the relevance of developing an AI-based virtual assistant that not only caters to academic delivery but also enhances accessibility, flexibility, and engagement through localized and culturally appropriate features.

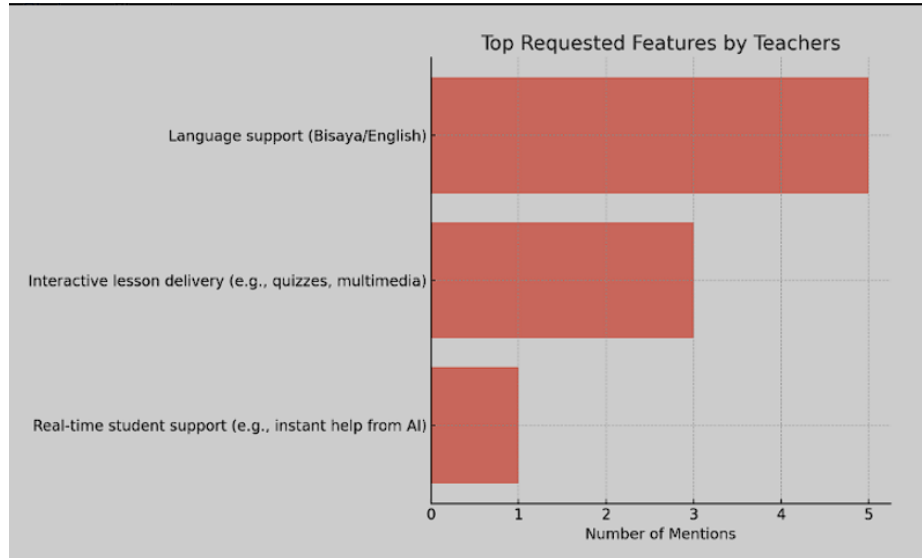


Fig. 2. Figure 2. *Most Requested Features for an AI-Powered Educational System According to Teacher Respondents in Davao City.*

In interpreting these findings, it is clear that the desired features align directly with the research problem, which emphasizes the need for equitable, culturally relevant, and inclusive learning tools in Davao City. The preference for a **bilin-gual AI system** reflects the linguistic diversity of the region and underscores the importance of designing an AI platform that can bridge language barriers. The strong demand for **personalized learning** further validates the core objective of this study—developing an AI assistant capable of adapting to individual learning needs while also supporting educators in their instructional delivery.

Comparing these results with existing literature, there is a notable convergence with global findings on AI in education. Previous studies (e.g., on DreamBox and Squirrel AI) have highlighted the effectiveness of adaptive learning in enhancing engagement and outcomes. However, most existing tools are not contextualized to the Philippine setting. This research contributes by addressing that gap, showing that **localization**—particularly language and cultural relevance—is just as critical as the technology itself. While literature acknowledges the role of AI in democratizing access to education, it rarely addresses multilingual and multicultural communities at the level this study proposes.

The theoretical implications of this study suggest that AI can serve as a powerful agent for inclusive education when it is designed with cultural and linguistic contexts in mind. Practically, the implementation of such a prototype has the potential to support overburdened teachers by automating tasks such as material presentation, assessment, and language translation. It also empowers students

by offering a personalized and engaging learning experience, regardless of their language preference or location. Furthermore, the proposed system has scalability potential not just in Davao City but also in other linguistically diverse regions across the Philippines and Southeast Asia.

Despite these promising findings, the study is not without limitations. The prototype system has not yet undergone full deployment or longitudinal testing in live classroom settings, limiting the assessment of its long-term impact. The sample size of the survey, while targeted and relevant, may not fully capture the diversity of educational needs across all schools in Davao City. Additionally, the prototype is still in its conceptual and developmental stages, and technical limitations—such as voice recognition accuracy for Bisaya or scalability of personalized recommendations—remain challenges that future iterations must address.

5 Conclusion

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