

ABSTRACT

Title of Thesis:

EXPLORING THE ROLE OF GENERATIVE
ARTIFICIAL INTELLIGENCE IN
CULTURALLY RELEVANT
STORYTELLING FOR NATIVE LANGUAGE
LEARNING AMONG CHILDREN.

Dinesh Kumar Nanduri,
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Thesis Directed By:

Professor Diana E. Marsh,
College of Information Studies

In an era marked by the rapid disappearance of languages, UNESCO warns that nearly half of the world's linguistic heritage might soon become dormant. Despite its current health, Telugu has seen a decline in usage, reduced focus in India's educational systems, and overshadowing by dominant global languages. This thesis explores Generative Artificial Intelligence (GenAI) to counter this trend, focusing on its application in native language learning for children, key carriers of their ancestral tongues. Through scoping reviews and participatory design sessions with young Telugu-speaking learners and their guardians, the study investigates GenAI's role in enhancing language learning tailored to individual and cultural contexts. It highlights storytelling as a potent mechanism for language acquisition, facilitated by GenAI's ability to personalize learning experiences and bridge generational gaps. The research also addresses ethical considerations vital for designing GenAI tools, promoting inclusivity, bias mitigation, and cultural integrity protection. It showcases a future where technology helps prevent linguistic dormancy and empowers children to celebrate human language and cultural diversity.

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NATIVE LANGUAGE LEARNING AMONG CHILDREN

by

Dinesh Kumar Nanduri

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Advisory Committee:

Professor Diana E. Marsh, Chair
Professor Elizabeth M. Bonsignore
Professor Jason Aston
Professor Joel Chan

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Dedication

This thesis is lovingly dedicated to my Late uncle, Thatavarthi Surya Krishna Bhagawan (Bhagwan babai), who showed me the way to understand my cultural roots. Through the delicacies of our food, the spark of creativity, the laughter in jokes, the wit in sarcasm, the solemnity of rituals, the joy of festivals, and the warmth of community living, he gracefully showed me the richness of our heritage. Babai, your jovial lifestyle, and memories continue to guide our family. Thank you for everything. May your soul rest in peace. Om Shanti.

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Table of Contents

Dedication	ii
Acknowledgements	iii
Table of Contents	iv
List of Figures	vi
Chapter 1: Introduction	1
1.1 Background and Context	1
1.2 Thesis Outline	6
Chapter 2: Related Work	7
2.1 Indigenous Languages and Technology	8
2.2 Challenges of Technology in language Revitalization Efforts	12
2.2.1 Algorithmic Justice and Ethical Considerations	12
2.2.2 Decolonizing Methodologies	14
2.2.3 Data Sovereignty	16
2.3 Storytelling as a Tool for Language Learning	18
2.4 Emerging Opportunities	22
2.5 Research Questions	24
Chapter 3: Scoping Review	27
3.1 Scoping Review – Data Collection Methodology	27
3.1.1 Title and Abstract Screening	29
3.1.2 Content screening using ChatGPT	30
3.2 Scoping Review – Analysis Methodology	32
3.3 Scoping Review Findings	39
3.1.1 Theme A: Contextual personalization of AI Learning Tools	41
3.1.2 Theme B: Bridging Cultural and Generational Gaps with AI	44
3.1.3 Theme C: Interactive, Immersive and Multimodal AI Learning Environments	47
3.1.4 Ethical, Culturally Responsive and Community Driven Implementation .	49
3.1.5 Overcoming Training Biases to Culturally Competent AI	56
Chapter 4: Design Sessions	59
4.1 Design Sessions – Data Collection Methodology	59
4.2 Design Sessions – Analysis Methodology	65
4.3 Design Sessions Findings	68
4.3.1 Children’s Design Preferences	68
4.3.2. Comparative analysis of children’s design thinking in India vs USA	73
4.3.3. Cultural Relevance and Engagement with Parents	76
4.4 Analysis of Research Findings	82
4.5 Why these findings matter in the context of Literature	89
Chapter 5: Discussion	92
5.1 Design Recommendations	92
5.2 AI-Driven Language Revitalization Efforts	99
5.3 Limitations	105
5.4 Future Studies	107
5.5 Reflecting back and across on literature and what it means	111

Chapter 6: Conclusion.....	113
6.1 Summary of key findings.....	114
6.2 Research contributions.....	117
Appendices.....	120
Appendix A: KidsTeam Participatory Design Session Plan – USA.....	120
Appendix B: KidsTeam Participatory Design Session Plan – India.....	124
Appendix C: Interviews with parents and elders – India.....	128
Bibliography	130

List of Figures

Figure 1: PRISMA chart about review phases.....	28
Figure 2: ChatGPT precisely extracts and cites key points from academic articles	31
Figure 3: Capturing ‘Question of the Day’ responses	62
Figure 4: Storyboarding – write a story about your cultural artifact	63
Figure 5: Pie Chart showing the distribution of children's story types	68
Figure 6: Participant hoped for AI to assist in enhancing handwriting skills and text alignment	70
Figure 7: A participant desired for AI to animate and color their drawings in a lifelike manner.	71
Figure 8: A participant explores with AI how cultural items are made to tell their story	87
Figure 9: Concept design for a storybook app featuring Voice-Text Hybrid AI interaction.....	93
Figure 10: Conceptual design for AI-powered writing assistance.....	97

Chapter 1: Introduction

1.1 Background and Context

Dalmatian was one of the first languages to sleep, as the last known speaker, Antonio Udina, died in 1898. This marked one of the earliest cases of language dormancy that was both well-documented and widely recognized by linguistic scholars, particularly through the works of Matteo Bartoli (Maiden et al, 2016). This event not only signifies the loss of a unique means of communication, a Romance language, but also the erasure of an entire cultural legacy, one intricately tied to the Croatian coast's unique history of maritime practices extending across the Mediterranean basin (Božanić, 2007). Similarly, as of 2017, the disappearance of the Taushiro language from the Amazon region in Peru represents not just the loss of a language but a closure to a gateway into unique cultural and ecological knowledge. If Taushiro had survived, it could potentially have offered profound insights into sustainable living, medicinal plant uses, and the Amazonian ecosystem's intricacies (Camara-Leret et al., 2021).

These losses signify more than the fading of a dialect; it represents the loss of a worldview, replete with traditions, social norms, and a profound bond with the environment. They underscore the role of language as more than just a tool for communication; it is a carrier of history, culture, and collective memory. Over the past century, thousands of languages have approached dormancy as their populations have increasingly adopted the more "universal" languages of Chinese, Spanish, and English. This globalization of communication has resulted in linguistic homogenization; the ten most common languages in the world are now spoken by 49 percent of the world's population.

This process has been accelerated by the infiltration of television, print, film, radio, and the internet into previously isolated cultures, a transition that has connected disparate regions of the globe by replacing native tongues with global ones (Kramer, 2019).

According to UNESCO, there are nearly 7000 languages spoken worldwide, of which around 3000 languages are in danger of disappearing before the end of the century. The period from 1950 to 2010 alone witnessed the disappearance of 230 languages, underscoring a distressing trend (UNESCO Atlas of the World's Languages in Danger, 2010). The pace at which languages are fading is alarming, with a language dying every two weeks as its last speakers pass away. Projections suggest a grim future, with 50 to 90 percent of the current languages expected to be lost by the next century (Strochlic, 2018). These numbers paint a stark picture of linguistic diversity under threat, highlighting an urgent need for concerted revitalization efforts.

Despite being the 17th largest spoken language in the world (Zeidan, 2023), Telugu has seen a concerning decline in its use, now slipped to fourth rank in India in the number of speakers according to census data (Suares, 2018). This trend can be attributed to various factors, including a lack of emphasis in the educational systems across India, the overshadowing impact of dominant global languages like English, and the failure of successive governments to foster a love for the mother tongue among younger generations (Varma, 2019). In daily conversations, the influence of English is pronounced, with many Telugu speakers adopting English words for common terms. For example, phrases like "Can you please wait for me at the shop," typically use the English words "wait," "shop," and "please" instead of their Telugu equivalents, which would sound more respectful and culturally rich. The media has also played a role by resorting to 'Telugisation,' where

English words are adapted into Telugu, leading to the unrestrained entry of these foreign terms (Rangarajan, 2012). While Telugu remains a vibrant part of India's linguistic heritage, its evolution reflects broader trends affecting many world languages today, where younger generations may drift towards globally dominant languages for practical reasons, often at the expense of their own linguistic and cultural uniqueness

In this context, technological advancements have emerged as a beacon of hope for revitalization of languages. The resurgence of the Hebrew language serves as a compelling illustration of how technology can breathe life back into languages on the brink of oblivion. The revival of the Hebrew was propelled by strategic technological and infrastructure utilization during its era. The instrumental roles of print media, such as newspapers and books, in spreading and normalizing the language, along with the establishment of Hebrew-speaking educational institutions, underscored the value of pedagogical resources in language immersion. Additionally, nascent audio-visual aids and the burgeoning use of radio broadcasts expanded Hebrew's reach beyond traditional educational settings (Shalom and Nir-Sagiv, 2007). These efforts, supported by organized community and social movements, leveraged the available technology of the time to successfully rejuvenate Hebrew. After 2000 years as a dormant and liturgical language, these initiatives transformed Hebrew into a dynamic, living form of communication, now spoken by 15 million people globally after 67 years of these revitalization efforts (Molaie, 2018; Yang, 2023).

In today's digital era, the fusion of technology and Artificial Intelligence (AI) has revolutionized the field of language revitalization. This innovative amalgamation provides unparalleled opportunities for revitalizing linguistic diversity and bridging the gap between past and future

generations. Digital archives, databases, and online platforms have become cornerstones in documenting linguistic resources, ensuring the accessibility of ancestral tongues to dispersed communities worldwide. Websites and digital dictionaries facilitate the widespread sharing of language resources, while language learning applications like Duolingo and Rosetta Stone extend interactive, engaging pathways for learning at individual paces, including courses in endangered languages.

One noteworthy example is the revitalization effort of the Māori language in New Zealand. The use of television and radio broadcasts in Māori, alongside educational programs, and mobile apps like "Te Aka Māori Dictionary" and "Kōrerorero," (Ware et al., 2018) has significantly contributed to increasing the language's visibility and usage among the younger generation. Similarly, the Navajo Nation in United States has adopted technology for language revitalization, with innovative tools like the "Navajo Toddler" app by Tinkr Labs, targeting children aged two to nine with interactive visual flashcards, audio, and gameplay lessons for the Navajo language. This exemplifies technology's role in adapting to and supporting the diverse linguistic needs (Begay, 2013).

AI technologies stand at the forefront of this transformative era, enhancing efforts to revive languages on the brink of endangerment. They offer tailored, interactive learning experiences, enabling personalized learning journeys through applications that adjust to users' proficiency levels. Virtual assistants and chatbots, programmed in endangered languages, simulate conversational practice, making language acquisition more engaging and practical. Moreover, AI's

capacity to generate new linguistic content—from sentences to stories—expands educational resources for language learners and speakers, further enriching the linguistic landscape.

This synergy between language and AI not only counters the tide of language disappearances but also ensures its survival. By integrating these advanced tools, the modern approach is reshaping how we breathe new life into the world's linguistic heritage, making the languages more accessible, engaging, and effective than ever before.

The potential of AI to contribute to language revitalization is vast and largely untapped. There still are both the challenges and the groundbreaking opportunities these technologies present. The ethical considerations, the need for vast amounts of data to train AI models without algorithmic bias, and the importance of community involvement are all critical factors that shape the landscape of using AI. Yet, the promise these technologies hold to actively revive the world's endangered languages offers hope.

To push the boundaries of my research, I aim to explore the potential of AI in mitigating the risk of language endangerment. Central to this investigation was a personal quest: to understand how I might shield my native tongue, Telugu, from becoming endangered and to ascertain whether the strategies developed could be adapted to other languages. This thesis explores to discover the most effective and ethical ways AI can be used to enhance language learning and how it can be tailored to address the unique requirements of children to learn their native language, thereby uncovering the challenges and opportunities presented by it in language revitalization.

1.2 Thesis Outline

My thesis is organized as follows: Chapter 2, "Related Works," explores the nexus of Indigenous Knowledge Systems and technology, addressing the challenges technology poses in language revitalization and the pivotal role of storytelling in language learning. This chapter also identifies crucial opportunities for expansion in the existing literature, setting the stage for the research questions. In Chapter 3, "Methodology", details the methods employed in this study, covering the scoping review and Design session's data collection and analysis procedures. Chapter 4, "Results," presents the study's findings, identifying key themes, challenges, and insights. It also presents an analysis of the research findings and integrates these themes into design preferences, elucidating why these findings are significant within the broader literature context. Chapter 5, "Discussion," delves into the implications of these findings for language learning and revitalization, offering design recommendations and reflecting on future research directions and the study's limitations within the context of existing literature. The thesis concludes with Chapter 6, "Conclusion," which summarizes the main findings and outlines the research contributions. This thesis structure ensures a comprehensive exploration of the subject matter, offering valuable insights and contributing to the ongoing dialogue on AI's role in preserving and revitalizing languages through innovative educational methodologies.

Chapter 2: Related Work

Children involved in language revitalization efforts face unique challenges that stem largely from the gap between traditional language use and modern societal norms. One of the primary issues is the difficulty of integrating the endangered language into their daily lives, especially when their immediate family and community may predominantly use a more dominant language. This situation often results in limited exposure and fewer practical applications of the language, making it hard for children to see its relevance and maintain interest. Additionally, there may be a lack of resources such as engaging educational materials or trained educators who are fluent in the language. Furthermore, children might experience a cultural disconnect if the language is not paired with relevant cultural practices and narratives, which are crucial for fostering a deeper connection with their heritage. These factors combined can make the learning process feel more like an academic exercise rather than a meaningful cultural revival.

In this section of my thesis, I navigate the intersection of indigenous knowledge systems and the efforts to revitalize endangered languages through technology. I examine how communities leverage digital tools in their quest to preserve linguistic heritage, while also confronting the challenges that technology presents. This includes navigating issues of algorithmic justice, ethical considerations in tech use, the importance of decolonizing methodologies, and the crucial aspect of data sovereignty. Additionally, I delve into the role of storytelling as an effective tool for language learning, highlighting how cultural and heritage factors influence and are influenced by it in revitalization efforts. The discussion extends to the impact of Human-Computer Interaction (HCI) and human-centered design in creating educational tools that resonate with learners.

Following this review of existing literature, I identify emerging opportunities at the intersection of these fields and propose research questions aimed at furthering our understanding of methodologies in language revitalization using technology.

2.1 Indigenous Languages and Technology

At the forefront of this technological revolution is the "NganasanMe" app, designed specifically for the Nganasan community in Siberia. This application exemplifies how digital platforms can tailor educational content to the unique linguistic and cultural needs of Indigenous communities. By integrating interactive language lessons with culturally rich games and quizzes, "NganasanMe" not only facilitates language learning but also embeds the language into the daily lives of the community, especially among younger members. Beyond its educational value, the app serves as a digital repository, preserving the linguistic and cultural heritage of the Nganasan people through audiovisual materials featuring native speakers and traditional expressions, thereby enabling intergenerational knowledge transfer (Burova et al., 2021).

This innovative approach to language learning and preservation is also echoed in the work of Yogarajan et al. (2023), who highlight the necessity of integrating Māori perspectives within technological solutions in New Zealand. Their critique of existing debiasing methods in pretrained language models (PLMs) underscores the importance of developing inclusive, culturally sensitive technologies that can accurately represent Indigenous languages and cultures. These technologies range from digital storytelling platforms to virtual reality experiences, all aimed at enhancing language education and revitalization efforts. Furthermore, the potential of collaborative online

platforms is emphasized, offering spaces for interaction among learners and fluent speakers, thereby fostering a supportive community for language revitalization.

The importance of Indigenous methodologies in this context cannot be overstated. By centering the perspectives and experiences of Indigenous peoples, researchers like Walter and Sunaina (2019) showcase how Indigenous worldviews can enrich data-driven projects, such as those undertaken by the Albuquerque Area Southwest Tribal Epidemiology Centre. This means that the questions asked, the methods of data collection and analysis, and the interpretation of findings are all deeply rooted in Indigenous ways of knowing and understanding the world. Indigenous methodologies acknowledge and respect Indigenous knowledge systems, recognizing them as legitimate sources of knowledge. This respect challenges the dominant epistemological and methodological assumptions that privilege Western forms of knowledge and ways of knowing. Research conducted within Indigenous methodologies is highly sensitive to cultural protocols and ethical considerations. It emphasizes the importance of obtaining informed consent, ensuring confidentiality, and respecting the intellectual and cultural property rights of Indigenous peoples. Applied to language revitalization, these methodologies not only enhance our understanding of language usage but also advocate for the development of resources that respect Indigenous cultural sovereignty, empowering communities to control the narrative and dissemination of their linguistic heritage.

The dialogue between Indigenous and non-Indigenous groups further enriches this landscape. Collaborations aimed at infusing Indigenous epistemologies into educational materials and digital platforms are pivotal. The Alaska Native Languages Archive (ANLA) and the Brian Deer

classification system serve as prime examples of integrating Indigenous knowledge into educational and archival frameworks. Moreover, the adoption of digital platforms like Facebook by Indigenous communities, such as the Texas Band of Yaqui Indians, highlights a movement towards digital inclusion and the preservation of linguistic heritage (Duarte and Belarde-Lewis, 2015).

Hermes et al.'s (2012) examination of the Ojibwe language project initiative demonstrates how digital tools can act as catalysts for cultural and linguistic renewal, that employs multimedia language software that accommodates diverse learning preferences. The project's use of a design-based research (DBR) methodology ensures that technological developments are responsive to community needs, while the effort to indigenize technology highlights the importance of aligning digital tools with Indigenous pedagogies and values.

In exploring various strategies for language revitalization, Sherry-Kirk (2014) highlights the effectiveness of immersion programs, augmented reality (AR) resources, and innovative teaching methods. The role of the internet and social media in disseminating Indigenous languages underscores the potential of technology to transcend geographical barriers and engage Indigenous youth in language learning. Empirical research linking language learning to cultural identity further emphasizes the profound impact of language reclamation on individual and community well-being.

The study by Qadri et al. (2023) offers a community-centered perspective on the challenges and opportunities presented by text-to-image (T2I) models in accurately representing cultural nuances

within the context of South Asian cultures. T2I models, despite their potential for creativity and representation, the study found the models' inability to grasp the complexity and diversity of cultural representations, leading to a range of issues that include essentialist and cliched portrayals, the amplification of “outsider gaze”, and the erasure or mis categorization of cultural identities. This research underscores the necessity of empowering cultural representations within AI technologies, advocating for a participatory approach to technology development that ensures authentic cultural portrayal.

Lastly, Barrett's (2015) exploration into the integration of technology with language revitalization through art and ontology suggests new pathways for employing digital tools in language learning and preservation. The discussion on the methexical relationship and performative nature of Indigenous art practices indicates the potential for digital platforms to document and share cultural practices, thus aiding in language revitalization efforts.

Together, these efforts paint a vivid picture of the dynamic interplay between technology, language revitalization, and cultural preservation. By weaving together the threads of innovation, collaboration, and respect for Indigenous knowledge, we are crafting a digital tapestry that not only preserves languages but also empowers Indigenous communities to celebrate and transmit their rich cultural heritage to future generations.

2.2 Challenges of Technology in language Revitalization Efforts

The rapid advancement and integration of technology in educational systems offers unprecedented opportunities for enhancing language learning experiences and outcomes. Yet, this integration is fraught with challenges that necessitate a nuanced understanding and innovative solutions. Exploring these challenges through the lens of various authors who have delved into the intricacies of technology in educational contexts, offers insights into the problems faced and the methodologies employed to address them.

2.2.1 Algorithmic Justice and Ethical Considerations

A critical narrative emerges around the challenge of algorithmic justice, revealing a complex landscape where technology's potential intersects with ethical considerations. At the heart of this discourse is the digital divide highlighted by Chen and Abdul-Mageed (2022), who point to the stark underrepresentation of Indigenous languages in natural language processing (NLP) applications. This underrepresentation not only signals a gap in accessibility for Indigenous communities but also raises broader concerns about the biases entrenched within AI systems. Such biases, as further explicated by Li and Xu (2021) and Tang et al. (2023), risk perpetuating stereotypes and fostering unfair treatment among diverse subgroups, thus magnifying the ethical dilemmas associated with the use and collection of data from Indigenous and marginalized communities without their consent or consideration of the research's.

In response to these challenges, a spectrum of solutions has been proposed, embodying a collective endeavor to bridge the digital divide and address the ethical quandaries inherent in AI-driven language learning tools. For instance, Chen and Abdul-Mageed (2022) champion the development

of Machine Translation (MT) models for Indigenous languages using bilingual and multilingual pretrained models in a transfer learning setting. This innovative approach seeks not only to augment the digital presence of these languages but also to ensure their representation is both meaningful and accurate. Complementing this, Li and Xu (2021) introduce the concept of leveraging generative artworks to encapsulate diverse ethical perspectives and counterfactual scenarios, thereby equipping AI developers and researchers with the tools to recognize and rectify biases.

This ethical landscape is further complicated by the advent of social Generative Artificial Intelligence (GenAI) in education, as introduced by Sharples (2023). The promise of GenAI comes with a cautionary note on the imperative to anchor AI systems in universal human rights principles, a sentiment echoed by Zastudil et al. (2023) through their exploration of GenAI tools' perceptions and potential pitfalls in educational settings. Here, the spotlight turns to academic integrity and the pressing need for pedagogical strategies that promote responsible AI use. Salawu (2006) shifts the narrative to the media's pivotal role in African language preservation, confronting the technological and modernity-driven decline in African language usage. Salawu's advocacy for indigenous language media underscores an ethical commitment to nurturing African languages via media channels.

Ghosh and La (2023) delve into the ethical and safety concerns shadowing the deployment of GenAI across sectors, including education. They propose a Dual Governance framework that synergizes centralized regulatory measures with community-driven safety protocols to navigate the ethical minefield associated with AI technologies. This framework aims to foster an AI

ecosystem that is equitable and culturally respectful, aligning with the ethical imperatives underscored by Mager et al. (2023) in the context of machine translation for Indigenous languages. Mager et al. advocate for active community engagement in the translation process, ensuring translations are not only linguistically accurate but also culturally resonant.

2.2.2 Decolonizing Methodologies

Within the academic discourse on language learning technologies, a compelling narrative unfolds around the imperative to decolonize methodologies, prioritizing Indigenous perspectives and epistemologies. This narrative journey, underpinned by scholarly contributions, highlights the challenges posed by conventional technological practices and the transformative potential of indigenous-informed approaches.

Littletree et al. (2020) initiates this discourse by shedding light on Indigenous Knowledge Organization (IKO) practices. They advocate for systems that not only acknowledge but also respect Indigenous ways of knowing, thereby challenging the colonial frameworks that have traditionally underpinned academic and technological domains.

This call for a paradigm shift is resonant with Simpson's (2007) exploration of refusal as a potent method to foreground Indigenous voices within research. This approach is grounded in the principle of selectively engaging with certain aspects of inquiry while intentionally declining to participate in or disclose other aspects. This methodological stance is not just about saying no; it is a profound exercise of sovereignty and self-determination, enabling Indigenous peoples to control how they are represented and what information about them is shared and prioritized. This

approach is not just about limiting access or withholding information; it's about asserting control over the representation of Indigenous peoples, their stories, and their knowledge, thereby contributing to a more respectful and reciprocal research paradigm. It acts as a mechanism for protecting Indigenous knowledge and practices from being commodified or misrepresented by external entities, including researchers and state powers. Simpson illustrates how the Kahnawakero:non (people of Kahnawake) consistently refused the authority of the state and external researchers by asserting their rights and identity through daily encounters. This refusal is a declaration of sovereignty, emphasizing "this is who we are, this who you are, these are my rights".

The methodology of decolonizing through refusal also critiques and moves away from statist forms of recognition, highlighting the importance of listening, situating each subject within their own historical context, and recognizing when to stop. It underscores the significance of generating knowledge that is home-grown, dignified by local history, and not necessarily juridical.

Further advancing this discourse, Hongladarom and Bandasak (2023) contribute to the conversation by discussing non-Western AI ethics guidelines. Their work on integrating diverse cultural elements within AI ethics guidelines champions the intercultural ethics of technology. By advocating for the inclusion of non-Western perspectives in the development of AI, they contribute to the broader effort to decolonize technology, challenging the dominance of Western-centric narratives and practices.

2.2.3 Data Sovereignty

The introduction of GenAI in educational settings brings to light concerns regarding the ownership and control of educational data and content. Chiu (2023) emphasizes the necessity for educational institutions to develop policies that reflect GenAI's capabilities and limitations, ensuring that the use of GenAI respects the data sovereignty of educational content alongside the students' and teachers' rights to their own data. The recommendation for future research on AI literacy tests, particularly focusing on AI ethics and machine learning, presents a pathway to understanding and addressing issues related to data sovereignty in educational contexts.

The potential decontextualization and appropriation of Indigenous languages and stories by digital archives represent another significant challenge. Cushman (2013) advocates for the collaborative development of digital archives with Indigenous communities to ensure these platforms serve the needs and preferences of the communities they represent. This collaborative approach supports the principle of data sovereignty, ensuring that Indigenous peoples retain control over how their languages and stories are presented and used.

Furthermore, the use of AI and algorithms often involves collecting and analyzing large amounts of data, raising concerns about who controls and has access to the data used and generated by these systems. Privacy violations and the indiscriminate use of data by GenAI models without regard for consent further complicate the landscape. The Dual Governance framework proposed by Ghosh and Lakshmi (2023) integrates both top-down, centralized government regulation and bottom-up, decentralized community safety efforts. This approach creates a regulatory landscape that sets minimum standards for AI systems, requiring compliance with these standards while

simultaneously providing opportunities for stakeholders, including users and experts, to contribute to the ongoing assessment methodologies and improve AI systems. Key components of the Dual Governance approach include public feedback, expert review, community audits, and research, which collectively aim to strike a balance between regulatory oversight and community-driven safety initiatives. This approach emphasizes the need for a dynamic and adaptable regulatory framework that can respond to the fast-paced evolution of AI technologies, ensuring safety, ethical considerations, and innovation coexist in a balanced ecosystem.

Shifting to the broader issues of sovereignty and self-determination in the face of ongoing settler colonialism, highlighted by the risk of Indigenous data being misused, appropriated, or controlled by non-Indigenous entities. Upholding data sovereignty in this context requires ensuring that Indigenous communities have control over their data, including language and cultural information. This involves creating frameworks and policies that recognize and protect the rights of Indigenous peoples to own, control, access, and possess data that pertains to their communities.

Addressing the challenges related to the collection, preservation, cataloging, classification, and access to Indigenous knowledge calls for the encouragement of Knowledge Organization (KO) systems that respect and reflect Indigenous perspectives. Littletree et al. (2020) advocate for principles of reciprocity, responsibility, and respect in handling knowledge, supporting the sovereignty of Indigenous communities over their knowledge, and ensuring their autonomy in the face of modern nation-state interests and capitalist frameworks.

2.3 Storytelling as a Tool for Language Learning

The ancient art of storytelling, a cornerstone of human communication, has evolved to become a pivotal pedagogical tool in language development across diverse cultures and epochs. According to Lucarevschi (2016), storytelling transcends mere narration, emerging as a dynamic medium that significantly bolsters language acquisition and revitalization. This pedagogical prowess is rooted in storytelling's ability to captivate learners, weaving the learning process into memorable and engaging experiences. Such involvement not only attracts learners' attention but also deepens their connection with the language, making the educational journey both enjoyable and impactful.

Within the sphere of second language (L2) acquisition, the multifaceted benefits of storytelling come to the fore. Lucarevschi's (2016) review illuminates storytelling's capacity to hone specific language skills—reading, listening, speaking—or to enhance receptive and productive skills holistically through contextualized activities. A notable strategy involves learners in storytelling, transforming them from passive listeners to active participants. This shift not only enriches their linguistic proficiency but also immerses them in the cultural narratives of the language, thereby making language learning more meaningful and directly contributing to language revitalization efforts.

The integration of GenAI into language learning heralds a new era for storytelling in education. GenAI's ability to craft coherent, engaging narratives introduces a novel storytelling approach, providing tailored learning experiences that meet learners' linguistic and cultural needs. This technological leap holds significant promise for language learning and revitalization, transforming storytelling into a more accessible and interactive endeavor. Through AI-generated stories that are

both linguistically rich and culturally pertinent, educators can offer immersive narrative experiences that foster language acquisition in novel and effective ways.

Storytelling, in essence, serves not just as a vehicle for information transmission but as a profound medium for embedding language within the cultural and social fabrics that define human existence. The importance of storytelling in language revitalization becomes particularly evident when considering how narratives encapsulate the subtleties of language—its idioms, rhythms, and cultural nuances—that standard language instruction might overlook. The structural and archetypal elements inherent in narratives provide a natural conduit for blending language learning with the exploration of cultural values and traditions (Wang et al., 2023; Sharples, 2023).

Axelrod and Kahn (2019) further illuminate storytelling's role in language education through their examination of intergenerational storytelling sessions within families. These narratives, often centered around migration histories, not only transmit cultural knowledge but also situate personal and communal experiences within broader socio-economic contexts. Such storytelling acts as a generational bridge, enriching language learning by rooting it in the learners' cultural backgrounds and personal histories, thus highlighting storytelling's capacity as a timeless educational tool.

The potential of AI to revolutionize storytelling in language education is explored by Zastudil et al. (2023) and Tseng et al. (2021), who underscore AI's ability to generate captivating narratives. This technological innovation supports the creation of stories that are not only linguistically comprehensive and culturally resonant but also customizable to the learner's level of proficiency. AI's generative prowess enables the crafting of diverse narratives that mirror the cultural heritage

of languages, thereby supporting their revitalization. By weaving specific cultural motifs into stories, AI facilitates a deeper connection between learners and the language, enhancing their appreciation and understanding of its cultural context.

User Experience (UX) design plays a crucial role in making educational tools more accessible and engaging for language learners. By employing UX design principles, developers can create intuitive interfaces that facilitate easier navigation and interaction, thereby reducing the cognitive load on learners. For example, participatory design studies, such as the one conducted by Wei et al. (2023), highlight the importance of user-centered design approaches in understanding the specific needs of users, in their case, to facilitate inter-generational communication using virtual reality (VR). These principles can be directly applied to designing educational tools for language learners, ensuring the tools are tailored to meet learners' specific needs and preferences. The design of educational tools, particularly for child and youth learners, must consider the cognitive, physical, and socio-emotional needs of this demographic. Research has shown that incorporating interactive and immersive elements, such as VR and embodied avatars, can significantly enhance the learning experience. For instance, Wei et al. (2023) found that VR affords casual and equal communication, which can be particularly beneficial in a learning context, as it encourages learners to communicate more freely and naturally. This principle can be extended to language learning, where creating a relaxed and engaging environment is crucial for effective learning.

The integration of design with AI in educational tools marks a significant leap towards crafting personalized learning journeys. AI's capability to dynamically analyze and adapt to a learner's

performance promises an education tailored to the individual's unique needs, spotlighting strengths, and addressing weaknesses. As Motlagh et al. (2023) illuminate, AI's role extends beyond mere automation of repetitive tasks; it offers bespoke support, elevating the language learning process in both efficiency and effectiveness. Yet, this technological advancement beckons a cautious approach to ethical considerations, ensuring that AI-enhanced tools prioritize the learner's welfare and educational growth at their core.

Winfield and Blackmore (2021) and Vidrih and Mayahi (2023) delve into the role of AI in creating interactive storytelling experiences, illustrating how "Storybots" can mimic human-like narrative cultures and social learning processes. This approach demonstrates AI's potential to simulate complex social interactions and cultural transmissions, offering immersive storytelling experiences that mirror human engagement. Furthermore, the application of GenAI in crafting marketing narratives suggests that AI-driven storytelling techniques used in commercial settings could be adapted for educational purposes. This adaptation promises to enrich language learning with captivating, narrative-driven content, underscoring the transformative impact of AI on storytelling as a pedagogical strategy.

2.4 Emerging Opportunities

The integration of GenAI into language learning, particularly through the lens of culturally relevant storytelling for children, represents an evolving frontier in educational technology. This section navigates the emerging opportunities GenAI offers, focusing on its application in non-Western Indigenous contexts to support language acquisition and cultural immersion among young learners. The exploration of GenAI in these settings is not only about harnessing technological advancements but also about embedding these tools within the rich tapestry of Indigenous cultures and languages, thus contributing to their revitalization and preservation.

At the heart of this discussion is the profound impact storytelling has on language development, as highlighted by Lucarevski (2016), who posits storytelling as a dynamic medium that significantly enhances language acquisition. This effectiveness is attributed to storytelling's inherently engaging, memorable, and enjoyable nature, which not only captivates learners' attention but also actively involves them in the learning process. In the context of GenAI, this traditional pedagogical tool sees a promising transformation, offering personalized and adaptive learning experiences that cater to the linguistic and cultural needs of learners.

The advent of GenAI in storytelling introduces novel approaches to language education. As explored by Wang et al. (2023) and Sharples (2023), GenAI's capability to generate coherent and engaging narratives presents a unique opportunity to embed language learning within the cultural and social contexts that define human experience. This technological leap holds significant promise for language learning and revitalization, making storytelling more accessible and interactive. By utilizing AI to craft stories that are linguistically rich and culturally relevant,

educators can create immersive narrative experiences that captivate learners and facilitate language acquisition in innovative and effective manners.

However, the integration of GenAI into language learning tools raises critical considerations regarding cultural responsiveness and ethical implications. Axelrod and Kahn (2019) provide insights into the potential of storytelling to act as a conduit for transmitting cultural knowledge and language across generations. Their analysis underscores the importance of developing GenAI tools that are not only linguistically comprehensive but also deeply rooted in the cultural narratives of the communities they aim to serve. This involves a careful balance between leveraging technological innovations and respecting the cultural integrity and data sovereignty of communities.

Moreover, the exploration of design preferences and needs of children when interacting with AI-driven story creation tools reveals a critical area of focus. Research by Winfield and Blackmore (2021) and Vidrih and Mayahi (2023) delves into the role of AI in facilitating interactive storytelling experiences, suggesting that understanding how children perceive and engage with these tools can inform the development of child-friendly interfaces that support language learning through engaging, narrative-driven content.

The evolving field of Human-Computer Interaction (HCI) and user-centered design significantly impacts the development of educational tools that resonate with language learners. These methodologies focus on creating user-friendly, engaging, and effective learning experiences by understanding and prioritizing the needs and preferences of the users, especially child and youth

learners. The integration of HCI and user-centered design principles into educational tools, particularly with the advent of AI, has opened new avenues for personalized learning experiences that can adapt to the individual learner's pace, style, and needs.

The exploration of GenAI in language learning through culturally relevant storytelling among children in non-Western Indigenous contexts presents a rich area for future research and development. The potential of GenAI to enhance language acquisition and cultural immersion, coupled with the need for culturally responsive and ethical approaches, underscores the importance of this technological integration. As educational technologies evolve, the focus on creating GenAI tools that respect and amplify Indigenous voices and narratives will be crucial in fostering meaningful and impactful language learning experiences for young learners.

2.5 Research Questions

From this burgeoning field of inquiry, two pivotal research questions emerge, each seeking to unravel the complexities and potentials of GenAI in pedagogical practices tailored to communities and the unique design preferences of children engaged in AI-driven storytelling.

Research Question 1: What are the best practices for integrating GenAI into various pedagogical language learning approaches in Non-Western Indigenous contexts?

- 1.a) How is this work being done in culturally responsive, ethical, and community-driven ways?
- 1.b) How have communities or designers overcome training data biases to culturally competent GenAI?

The global educational landscape stands at a critical juncture, with AI promising to revolutionize language learning in ways previously unimagined. Yet, the incorporation of GenAI within pedagogical contexts raises pressing questions about cultural responsiveness, ethical deployment, and overcoming inherent biases within AI technologies. The significance of this inquiry lies in its potential to identify strategies that not only leverage AI for educational enhancement but do so in a manner that respects and preserves the rich linguistic diversity and cultural integrity of Indigenous communities. Works by Motlagh et al. (2023), Sharples (2023), and Latif et al. (2023) underscore the importance of this endeavor, highlighting the urgent need for educational tools that are both technologically advanced and culturally attuned.

Research Question 2: What are the design preferences and needs of children when interacting with AI-driven story creation tools in a language-learning context?

2.a) How do children perceive the cultural relevance of GenAI imagery in their stories?

2.b) What role can collaboration between children and their elders shape the cultural depth and authenticity of the narratives?

2.c) How can we incorporate the key findings from 'best practices' in design preferences for a child-friendly language learning solution?

The exploration of GenAI's potential in language learning necessitates a nuanced understanding of the end-users—children. This research question delves into the heart of children's interactions with AI-driven storytelling tools, seeking to uncover how these technologies can be designed to meet their educational and cultural needs. The significance of this question extends beyond the

technical realm, touching on the profound impacts of cultural relevance, intergenerational collaboration, and user-friendly design on the language learning process. Insights from this inquiry promise to inform the development of AI tools that are not only effective in language instruction but also deeply resonant with the cultural identities and preferences of young learners.

As we venture further into the exploration of GenAI's role in language learning and cultural storytelling, the research questions outlined above serve as beacons guiding the way toward innovative, culturally sensitive educational practices. The significance of these inquiries, rooted in the need for culturally responsive technology and user-centered design, sets the stage for the subsequent sections of this study, which will delve into the methodologies and findings that bring these research questions to life.

Chapter 3: Scoping Review

In tackling the first research question on effective practices for integrating GenAI into language learning, this study embarked on a scoping review to identify key themes that could illuminate this integration within non-Western Indigenous contexts. The scoping review utilizes an innovative methodology by integrating ChatGPT4 as a tool for filtering research papers and serving as a virtual peer reviewer. This approach is meticulously validated through manual checks and compared with traditional thematic analysis to confirm the robustness and accuracy of the findings.

3.1 Scoping Review – Data Collection Methodology

To explore how GenAI is being integrated into pedagogical language learning approaches within non-Western Indigenous contexts, this study employed a scoping review as its methodological approach. This choice was pivotal for meticulously sifting through the evolving landscape of educational technology over the last decade (2013-2023), aiming to capture the nuanced interplay between AI advancements and pedagogical methods. This endeavor involved searching through databases that cover the fields of Human-Computer Interaction (HCI), AI Technology, Education, and Language Revitalization—namely ACM, arXiv, ERIC, and Living Languages—resulting in 978 initial findings, each offering insights into the integration of GenAI with language education.

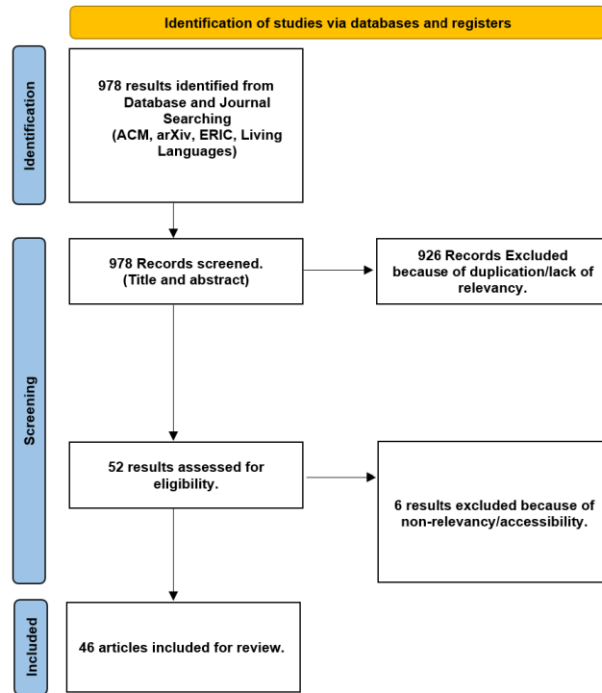


Figure 1: PRISMA chart about review phases

3.1.1 Keywords

The screening process through which these findings were filtered was composed of rigorously selected keywords and combinations crafted to encapsulate the entirety of the research focus:

- ("AI" OR "Artificial Intelligence") AND ("Pedagogical" OR "Language learning" OR "Language education").
- ("Text-to-image" OR "Generative models" OR "Generative AI") AND ("Language learning" OR "Language education").
- ("AI" OR "Artificial Intelligence") AND ("Non-Western" OR "Indigenous" OR "Indigenous education").
- ("AI" OR "Artificial Intelligence") AND ("Non-Western" OR "Indigenous" OR "Indigenous education").

- ("AI" OR "Artificial Intelligence") AND ("Language learning" OR "Language education") AND ("Culturally-responsive" OR "Ethical AI" OR "Community-driven AI" OR "Training data biases" OR "Culturally-competent AI")
- ("Culturally-responsive" OR "Ethical AI" OR "Community-driven AI" OR "Training data biases" OR "Culturally-competent AI")
- ("Text to Image" OR "Generative AI") AND ("Children" OR "Child").
- ("Culturally relevant" OR "Cultural storytelling" OR "Indigenous stories") AND ("Children" OR "Child" OR "Young learners").
- ("Culturally relevant" OR "Cultural storytelling" OR "Indigenous stories") AND ("Children" OR "Child" OR "Young learners") AND ("Language learning" OR "Language education" OR "non-western").

3.1.2 Title and Abstract Screening

Title screening ensured that only those titles indicating a direct relevance to language learning, AI, pedagogy, and ethical considerations in the context of AI or education were considered. This stage filtered out titles lacking mention of critical keywords such as “Language learning”, “AI”, “Reading”, “Pedagogical”, “Design”, “Ethics”, “Storytelling”, and those not reflecting storytelling in non-Western languages or cultures.

Subsequently, abstract screening delved deeper, discarding studies not discussing language learning or pedagogical practices in education, ensuring that each selected paper held potential insights into the integration of AI in language learning contexts.

3.1.3 Content screening using ChatGPT

To distill the essence of each paper, the study harnessed ChatGPT, particularly employing the GPT-4 plugin AI PDF. This tool enabled the uploading of PDFs of the chosen articles for a detailed content analysis. This innovative approach allowed for a nuanced content screening, querying the AI with specifically formulated questions/prompts that demanded the articles to reveal their contributions. To ensure accuracy and mitigate the risk of AI-generated inaccuracies, the prompts were strategically designed to elicit direct citations from the articles, aligning closely with the research questions and thematic focus of the study. Below was the prompt used to find the content from each paper:

1. *“What are the practices/work/frameworks from this paper that can be integrated into pedagogical native language learning practices that can utilize generative ai in non-western native language learning? Provide examples from the paper if any. Cite from the paper for the content you write.*
2. *How does the paper tackle ethical challenges? What solutions does it provide? Provide examples from the paper if any. Cite from the paper for the content you write.*
3. *Give me details on the Indigenous context and how the paper provided solutions for it? Provide examples from the paper if any. Cite from the paper for the content you write.*
4. *How does the paper tackle ai model training bias challenges? what solutions does it provide? provide examples from the paper if any. Cite from the paper for the content you write.*
5. *How is the work being done in community driven ways? Cite from the paper for content you write.”*

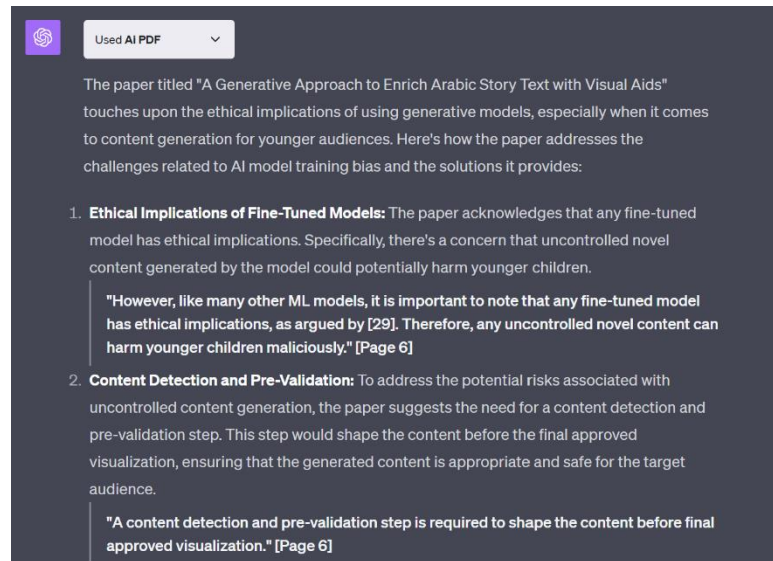


Figure 2: ChatGPT precisely extracts and cites key points from academic articles

This phase was critical for ensuring that the selected articles offered substantial insights into at least three of these areas, aligning with the research's thematic focus.

Through this meticulous process, repeated across each database, the initial corpus was refined to 46 articles that met the stringent criteria for inclusion. These articles spanned across a spectrum of prestigious journals, each contributing valuable insights into the realms of HCI, AI technology, education, and language revitalization. The journals covered include:

- Journal on Computing and Cultural Heritage
- International Journal of Inclusive Education
- Computer Assisted Language Learning
- Language Learning & Technology
- Educational Technology & Society
- Journal of University Teaching & Learning Practice

- International Journal of Educational Technology in Higher Education
- Journal of University Teaching & Learning Practice
- Languages Faculty Publications
- Journal of Artificial Intelligence and Robotics
- Journal of English and Applied Linguistics

This methodological narrative not only underscores the study's commitment to a thorough and systematic exploration of the field but also sets a robust foundation for delving into the complexities of GenAI's role in enhancing language learning experiences, guided by a deep understanding of cultural sensitivity and pedagogical efficacy.

3.2 Scoping Review – Analysis Methodology

From the 46 filtered articles relevant to my research focus, I initially conducted a manual thematic analysis. I started with a sample set of three articles to identify common themes through coding. The coding process was structured to ensure a comprehensive exploration of themes. Initially, I performed an open coding on a selected subset of three articles to identify preliminary themes. This involved reading through the texts and marking segments that conveyed key ideas or concepts, assigning labels to these segments that encapsulated their essence. I organized the data using a hierarchical coding framework that distilled key concepts from the articles into three tiers of specificity.

The first tier established broad categories such as 'AI aid' and 'Language learning,' which represented the general subject matter of the research corpus. Delving into the second tier, I honed

in on more specific elements like 'pedagogy' and 'visual aids,' offering insights into particular facets of the broader categories. It was at the third and most detailed level that the discussions from the second level were distilled into specific thematic expressions. The third-level coding was the most refined, pinpointing very specific factors within the second-level codes, such as 'T2I models in South Asia' which dealt with the nuances of AI's replication of cultural elements and the potential biases therein. These specific instances provided tangible examples of the broader codes and pointed towards overarching patterns across multiple articles. Through an iterative process applied across 15 sets covering all 46 articles, this coding structure allowed me to identify and substantiate prevalent themes. The recurring patterns and narratives woven throughout the data brought forth the themes - 'AI's role in adaptive learning,' supported by 13 articles, and its utilization in 'Gamification for language learning,' supported by 18 articles.

These themes represented the "big ideas," the connective tissue linking numerous smaller, coded observations into a cohesive narrative. The first theme, adaptive learning, evolved from codes related to AI's personalization capabilities and the recognition of its potential to tailor educational content to individual learning styles. The second theme, AI in gamification, came out of codes discussing AI's ability to engage learners through game-like scenarios, enhancing the learning experience through interactive and immersive methods. Throughout this iterative coding process, each paper could either reinforce the existing codes or introduce nuances that might evolve into a new theme. Through constant comparison and analysis, the themes of adaptive learning and gamification in AI-supported language learning were consistently supported, reflecting the broader trends and insights within the literature.

To validate these findings, I employed ChatGPT as a virtual peer reviewer, repeating the entire process with AI assistance through its GPT-4 plugin AI PDF. To initiate this endeavor, I designed a specific prompt aimed at uncovering themes related to the first research question. This initial prompt was systematically applied to a set of three articles and repeated across all 46 selected articles.

Prompt to ChatGPT: *“Please conduct a thorough thematic analysis of the attached papers, which focus on the use of generative AI in culturally relevant storytelling for language learning among children. Specifically, I am looking for themes and insights that address the following research question:*

1. Best practices for integrating generative AI into pedagogical language learning approaches in non-Western Indigenous contexts. This includes identifying effective strategies, tools, and methodologies reported in the papers.

1.a) Analysis of culturally-responsive, ethical, and community-driven approaches. Highlight any practices or case studies that emphasize cultural sensitivity, ethical considerations, and active community involvement in the AI integration process.

1.b) Insights into overcoming training data biases and barriers to culturally-competent AI. Look for discussions or findings related to challenges in AI development, particularly around data representation and bias, and how these challenges are being addressed or mitigated.

For each theme you identify, please provide detailed citations from the papers, including author names, paper titles, and specific sections or page numbers where these themes are discussed. I am

also interested in any comparative analysis you can offer between the papers regarding these themes.

Additionally, summarize the key findings and note any gaps in the literature or emerging trends based on the themes you find. Your analysis will contribute to understanding how AI can be effectively and ethically used in language learning contexts, especially in non-Western and Indigenous settings.

Write the themes as Theme A, Theme B, Theme C and so on for the themes you find."

This analysis transcended the mere identification of themes; it was deeply rooted in a commitment to ensuring the accuracy and relevance of the findings. To achieve this, every theme that emerged from ChatGPT's initial analysis underwent a thorough manual cross-checking process. I delved into the selected articles, scrutinizing each page to confirm the presence of the themes identified by the AI. This step was crucial, not just as a form of validation but as a means to anchor the thematic findings in the concrete evidence provided by the literature. By meticulously verifying each theme within the context of the articles, I ensured that the thematic conclusions drawn were not only based on the AI's computational analysis but were also deeply grounded in the scholarly work itself.

Following the identification of themes across 15 distinct sets of articles, I undertook a thorough manual thematic analysis to discover recurring patterns within these themes, pinpointing the three most commonly occurring themes across the collective sets. To complement and validate this manual analysis, I subsequently turned to ChatGPT once again, this time feeding it the entire compilation of themes identified from the 15 sets. The aim was to utilize the AI's analytical

capabilities to independently identify the primary themes, thereby providing an additional layer of verification to the themes I had manually discovered.

This dual approach—combining my manual thematic analysis with the computational analysis offered by ChatGPT—ensured a robust validation process. It highlighted the synergy between human analytical rigor and AI's pattern-recognition capabilities, ultimately reinforcing the integrity and depth of the thematic findings.

Prompt to ChatGPT:

“Now that we have themes of all the selected papers, I want you to perform this action by taking the data as the themes that you have provided above for the papers.

Action: Integration and Synthesis of Themes:

Consolidation: After each batch analysis, you'll have a set of themes. The key is to consolidate these themes across all batches. This involves looking for commonalities, patterns, and connections between the themes from different sets.

Mapping to Research Questions: As themes are identified, map them to your main research question and sub-questions. This will help you see which themes directly address specific aspects of your research.

Organizing Themes: Organize these themes in a way that they logically flow and build upon each other. Some themes might be more foundational and broader, while others could be more specific and detailed.

Refinement and Filtering: As more themes emerge, refine and filter them. Some themes might merge, while others might split into sub-themes. Focus on themes that are most relevant to your research questions.

Cumulative Analysis: After all batches are analyzed, do a cumulative review. This is where you look at all the themes together, ensuring they form a coherent narrative and comprehensively address your research question.

Research question:

- 1. What are the best practices for integrating text-to-image generative AI into various pedagogical language learning approaches in non-Western Indigenous contexts?*
 - 1.a. How is this work being done in culturally responsive, ethical, and community-driven ways?*
 - 1.b. How have communities or designers overcome training data biases or other barriers to culturally competent AI?"*

The themes identified in the initial manual thematic analysis were consistent, albeit referred to with different nomenclature, and I was able to discover an additional theme through ChatGPT's analysis: Bridging generational and cultural gaps, supported by 16 articles. From the thematic analysis of 46 articles, a manual and AI-assisted consolidation process filtered into three predominant themes:

Theme A: Contextual Personalization of AI Learning Tools emerged as a significant theme, supported by 27 articles. This theme delves into the current pedagogical practices in non-Western contexts, often marked by traditional methods that may overlook the unique cultural and individual

needs of students. The articles under this theme underscore the transformative potential of integrating contextual personalization within AI learning tools, highlighting how such an approach can significantly enhance the educational experience by tailoring content to fit the individual learner's context, thereby addressing the need for a more adaptive and personalized learning environment.

Theme B: Bridging Cultural and Generational Gaps with AI was a recurring theme supported by 16 articles. These studies illuminated the capabilities of AI in narrowing the divides between different cultures and generations within educational settings. The theme articulates how AI can serve as a bridge, facilitating cultural preservation and intergenerational interaction, thereby enriching the learning landscape with diverse cultural insights, and fostering a sense of inclusivity among learners from various backgrounds.

Theme C: Interactive, Immersive, and Multimodal AI Learning Environments was substantiated by 18 articles, focusing on the role of virtual reality, conversational agents, gamification, and content generation in creating engaging learning experiences. This theme encapsulates the shift towards more dynamic and immersive educational environments facilitated by AI technologies. It points to the increasing adoption of interactive platforms that offer learners a more engaging, realistic, and comprehensive learning journey, enhancing both the appeal and effectiveness of language learning.

Each of these themes, derived from a rigorous analysis of the literature, collectively paints a picture of the evolving landscape of AI in education. They reflect a move towards more personalized,

culturally sensitive, and immersive learning experiences, underscoring the profound impact of AI technologies in reshaping pedagogical approaches, particularly in the context of language learning within non-Western Indigenous settings.

3.3 Scoping Review Findings

Current pedagogical practices in language learning are increasingly scrutinized for their effectiveness in the modern educational landscape. Traditional approaches, heavily reliant on grammatical accuracy and rote memorization, often fall short in fostering a deep appreciation for language and culture. This methodology's limitations become particularly evident as it struggles against the tide of globalization and the encroachment of dominant languages like English, which threaten the survival of native languages and, by extension, cultural identities (Sumo and Bah, 2021). The focus on linguistic structures over communicative competence and cultural nuances leads to a superficial understanding of language, neglecting its role as a carrier of identity and culture. Moreover, such approaches have not kept pace with technological advancements, rendering them less effective in engaging the digital-native generation (Cheng and Wa, 2023; Huang et al., 2023).

Recognizing these challenges presents an opportunity to reimagine language learning pedagogies that emphasize language appreciation, cultural identity, and the intrinsic link between language and culture. Innovative methodologies, such as those highlighted by Belda-Medina (2022) through Digital Storytelling in EFL classrooms, showcase the potential of pedagogies that integrate cultural narratives and creativity, enabling learners to explore and express the cultural contexts of their target language. Similarly, Bjarnason (2023) stresses the importance of culturally responsive

teaching and the utilization of authentic resources, which can significantly enhance learners' motivation and engagement, thus promoting a deeper connection with the language and its cultural heritage. These approaches suggest a paradigm shift from conventional language teaching methods towards more holistic, culture-centered pedagogies that recognize the importance of cultural immersion for effective language learning.

The integration of technology, particularly AI, offers a promising avenue to overcome the limitations of traditional language learning approaches. AI's potential to create personalized and adaptive learning experiences addresses the diverse needs of learners, making language learning more engaging and effective (Huang et al., 2023). AI-enhanced platforms can simulate real-life conversations and cultural contexts, providing practical experience that not only aids in language acquisition but also enriches learners' cultural understanding (Sumo and Bah, 2021). For example, the use of AI in platforms like Glossika demonstrates how technology can tailor language learning to individual needs, focusing on fluency and conversational skills in a culturally engaging manner (Sumo and Bah, 2021). Furthermore, the work of Eager and Brunton (2023) underlines the significance of supportive school leadership and professional development in harnessing AI for educational purposes, facilitating a transition towards more student-focused and culturally inclusive language learning strategies. This technological integration not only revitalizes language pedagogies but also offers a countermeasure to the dominance of languages like English, supporting the preservation of linguistic and cultural diversity. Leading into the next section, this discussion sets the stage for a detailed exploration of themes identified from a scoping review, further unraveling the intricacies of technology-enhanced language learning and its impact on cultural preservation and appreciation.

3.1.1 Theme A: Contextual personalization of AI Learning Tools

The landscape of educational technology, particularly within the realm of language learning, is undergoing a transformative shift towards contextual personalization, propelled by the integration of artificial intelligence (AI). This movement away from traditional, uniform teaching models towards a more individualized, learner-centric approach marks a significant evolution in pedagogical strategies. AI learning tools are now being designed to cater to the unique needs, preferences, and learning paces of students, dynamically adjusting content, difficulty levels, and learning pathways to enhance each learner's educational journey. This essay delves into the methodologies underscored by 27 scholarly works, exploring how AI's capabilities are harnessed to revolutionize language learning through contextual personalization.

Historically, language education has been characterized by its reliance on static methodologies, such as textbooks, which offered little to no personalization or adaptability. The advent of AI in pedagogical contexts signifies a groundbreaking departure from these methods, promising a more tailored and effective approach to language education.

Among the examined works, a notable consensus highlights the critical role of contextual personalization in AI language learning tools. Adaptive learning algorithms, as supported by approximately 59% (16 out of 27) of the authors, epitomize this shift. These algorithms adjust the learning experience in real-time, based on the learner's performance and interactions, ensuring an optimal challenge level. Research by Wan et al. (2023) and Xiaohong and Yanzheng (2021) exemplifies the impact of such algorithms in enhancing language proficiency, offering learners a

customized educational path that evolves with their needs. Oudeyer et al. (2019) delve into the potential of AI for creating personalized learning experiences, particularly through the generation of content that adapts to the learner's cultural background and language proficiency level. This could include AI systems that dynamically adjust the complexity and cultural content of language learning materials based on the learner's progress and interests. For example, an AI system might generate a series of interactive stories that incorporate cultural heritage elements specific to the learner's background, facilitating a deeper connection with the material and enhancing motivation and engagement.

In parallel, personalized feedback systems have been identified by 48% (13 out of 27) of the authors as a transformative element in AI-enhanced language learning. These systems provide immediate, customized feedback, allowing learners to swiftly address and rectify mistakes. The importance of this immediate correction is underscored in studies by Roe et al. (2023) and Shukla et al. (2019), which demonstrate how personalized feedback not only facilitates quicker error correction but also significantly elevates learner confidence and autonomy.

Additionally, the introduction of AI-driven content recommendation systems, highlighted by 37% (10 out of 27) of the authors, adds another layer of personalization. By analyzing previous interactions and performance, these systems recommend content that matches the learner's interests and objectives, thus maintaining engagement and motivation. Huang et al. (2022) and Cheng and Wang (2021) illustrate how learner-tailored content can significantly enhance engagement and enrich the learning experience. Huang et al. (2022) provide a compelling example of this approach in action. Their research delves into the development of an AI system capable of

sifting through extensive databases of language learning materials to identify and suggest resources that best match the learner's current proficiency level and thematic interests. By doing so, the system ensures that learners are continually presented with content that is both challenging and relevant, thereby maximizing the potential for engagement and retention. Similarly, Cheng and Wang (2021) explore the impact of content recommendation systems on learner motivation. Their study highlights how personalized content not only aids in sustaining learners' interest over time but also encourages deeper exploration of language and culture beyond the confines of a traditional curriculum. For instance, a learner showing a keen interest in culinary terms might receive recommendations for articles, videos, and interactive modules centered around the culinary arts of the target language's culture.

The efficacy of these methodologies is gauged through their proven impact on language learning outcomes, assessed via engagement metrics, proficiency evaluations, and learner feedback. Insights from authors like Divakaran (2021) and Divekar (2022) illuminate the tangible benefits of these AI-enhanced approaches, showcasing the substantial advantages of integrating personalized AI tools in language education. This comprehensive exploration, rooted in empirical research and theoretical analysis, affirms the vital role of contextual personalization in advancing the field of language learning, heralding a new era of educational technology that is as diverse and dynamic as the learners it aims to serve.

3.1.2 Theme B: Bridging Cultural and Generational Gaps with AI

In the examination of how Artificial Intelligence (AI) can be integrated into pedagogical language learning approaches with a focus on bridging cultural and generational gaps, the analysis of 16 articles has brought to light common methodologies employed across various studies. The methodologies underscore the potential of AI to make language learning more inclusive, engaging, and culturally sensitive.

The first methodology identified involves the use of digital storytelling and GenAI created content as visual aids, which is supported by nearly 44% (7 out of 16) articles analyzed. Authors like Byamugisha et al. (2014), Liaqat et al. (2022), Liaqat et al. (2023), and Zakraoui (2022) have explored how digital storytelling enhanced with AI can make language learning more relatable by integrating cultural narratives. Zakraoui (2022), for instance, discusses the effectiveness of generating Arabic story texts with visual aids through AI, demonstrating how such tools can support language comprehension and cultural exposure.

Byamugisha et al. (2014) and Liaqat et al. (2022) and Liaqat et al. (2023) also support the use of digital storytelling and visual aids in their research, underscoring the potential of these methodologies to enhance language learning by incorporating stories and content that reflect the learners' cultural backgrounds or introduce them to new cultural perspectives. These studies suggest that integrating AI in storytelling not only improves linguistic skills but also fosters cultural understanding and empathy among learners from diverse backgrounds.

This approach, as seen in the works of Plate and Hutson (2022), Belda-Medina (2022), and Oudeyer et al. (2019), focuses on employing AI to create educational content that is culturally and linguistically tailored. The utilization of AI in generating creative text outputs for educational purposes, as discussed by Plate and Hutson (2022), showcases the capacity of AI to enrich the learning experience with culturally rich narratives. They explore the potential of AI in the realm of creative writing, specifically how NLP tools can be utilized to generate text outputs that are both grammatically sophisticated and creatively stimulating. For instance, an AI model might be trained on a diverse corpus of texts from various cultures, enabling it to generate stories that incorporate elements from those cultures, thus exposing students to a wide range of cultural narratives and perspectives. This not only aids in language learning but also in cultural appreciation and understanding, making the content more engaging and relevant to learners from different backgrounds.

Belda-Medina (2022) focuses on the integration of AI in language teaching, particularly how generative models can be used to create educational materials that reflect the cultural diversity of the learner population. By using AI to tailor content to include cultural references and contexts familiar to the learners, or to introduce them to new cultural concepts in an accessible manner, educators can make language learning a more inclusive and comprehensive experience. This could involve generating scenarios, dialogues, or narratives that span a spectrum of cultural situations, thereby enhancing learners' ability to navigate and appreciate cultural nuances.

Furthermore, the development and use of AI-powered tools that support collaborative learning experiences in language education form another core methodology, highlighted in almost 19% (3

out of 16 articles). The research of Liaqat (2021), Lim (2016), and Hand and Cai (2023) emphasize the importance of collaborative AI tools in facilitating interactions among learners from diverse cultural and generational backgrounds. Lim (2016), for example, illustrates the potential of Persuasive Teachable Agents in fostering intergenerational learning, demonstrating how AI can effectively mediate diverse learning experiences. Liaqat (2021) and Hand and Cai (2023) further reinforce the importance of using AI tools to support collaborative learning experiences. These studies highlight how AI-powered platforms can adapt to the unique learning styles of different generations, promoting a more dynamic and interactive learning process. By facilitating collaboration, AI tools help bridge the generational divide, enabling learners to benefit from shared knowledge and experiences.

Each methodology has been evaluated through empirical studies within educational settings, assessing their impact on various aspects of learning, including engagement, comprehension, and cultural awareness. Lim (2016) implemented Persuasive Teachable Agents in an intergenerational learning program. The study evaluated engagement by observing interactions between participants of different ages, noting increased collaboration and communication when AI agents facilitated the learning activities. Comprehension was assessed through pre- and post-tests on the subject matter, showing improvements in both younger and older participants. Cultural awareness was gauged through participant surveys and reflection essays, which highlighted a greater appreciation for different generational perspectives and cultural insights shared during the learning activities.

These empirical studies utilize a range of qualitative and quantitative research methods to evaluate the impact of AI-enhanced learning methodologies. Observations, interviews, participant

feedback, and pre- and post-assessments are common tools used to measure engagement, comprehension, and cultural awareness. The findings from these studies underscore the potential of AI to create more engaging, inclusive, and effective educational experiences.

3.1.3 Theme C: Interactive, Immersive and Multimodal AI Learning Environments

In Interactive, Immersive, and Multimodal AI Learning Environments within language education, a comprehensive analysis of 18 pivotal articles unveils a concerted effort towards harnessing artificial intelligence (AI) and technology to redefine pedagogical approaches. This exploration identifies three principal methodologies, each backed by a distinct number of studies, reflecting a collective commitment to enhancing language learning through technological innovation.

The first methodology, the Integration of Immersive Technologies in Language Learning, garners support from 50% of the articles (9 out of 18). This approach underscores the significance of Virtual Reality (VR), Augmented Reality (AR), and sensory-enriched experiences in creating immersive language learning scenarios. Divekar (2018) and Katifori (2020) exemplify this method through the deployment of VR and AR to simulate engaging and contextually immersive environments conducive to language acquisition. Further contributions by Maksimova (2022) and Han and Cai (2023) emphasize the utility of visual and auditory aids in bolstering language skills, advocating for immersive technologies as a medium to simulate real-life linguistic interactions and enhance understanding.

The second methodology, AI-Driven Interactive and Collaborative Learning, is championed by approximately 65% (12 out of the 18 articles). This methodology illuminates the transformative

capacity of AI to facilitate interactive learning experiences and collaborative educational endeavors. Papers by Cai (2023) and Xiaohong and Yanzheng (2021) discuss the implementation of conversational AI to promote language practice and conversational skills. Meanwhile, Palala (2019) and Natasia and Angelianawati (2022) delve into the realm of collaborative learning games, where AI underpins shared storytelling and problem-solving activities. Quantitative analysis in co-creative writing, as explored by Plate and Hutson (2022) and Lively (2023), reveals how AI aids in assessing and enhancing creative writing, showcasing the diverse applications of AI in fostering interactive learning and creative output.

Lastly, the Development of AI-Enhanced Language Learning Materials receives acknowledgment from 22% of the articles (4 out of 18) aligning with the first methodology. This methodology encapsulates the utilization of AI in crafting or enhancing language learning content. Ali et al. (2021), Bensaid et al. (2021), Shukla (2018), and Zakraoui et al. (2022) contribute to this theme by illustrating how AI can generate materials that enrich language learning and cater to the varied requirements of learners. Notable examples include the automated generation of personalized stories and the customization of learning modules, highlighting AI's role as a dynamic facilitator in language education.

The methodologies are evaluated and implemented through a combination of practical application and educational efficacy assessment. For instance, Divekar et al. (2018) and Katifori et al. (2020) test their immersive learning solutions in classroom settings, measuring engagement and knowledge retention. Cai et al. (2023) and Xiaohong and Yancheng (2021) assess conversational AI tools via learner feedback and language proficiency outcomes, ensuring these interactive tools

contribute to tangible learning advancements. Similarly, the generation of AI-enhanced materials, as discussed by Ali (2021) and Zakraoui (2022), involves user-centric design and testing processes to affirm the educational value of the content produced.

3.1.4 Ethical, Culturally Responsive and Community Driven Implementation

The integration of AI within educational settings carries with it a responsibility to uphold ethical standards. We now explore the implementation of the above themes and methodologies in an ethically driven way, the methodologies for ethical AI integration into pedagogical language learning approaches, and the evaluation of these ethically driven methodologies, drawing on examples from recent scholarly work.

Frameworks & Methodologies:

In the evolving landscape of artificial intelligence (AI), a proposition emerges from the work of Maitra (2020), advocating for an innovative fusion of Indigenous languages and epistemologies with AI technologies. This approach, far from a mere linguistic addition, seeks to challenge and enrich the prevailing Western-centric paradigms of AI by weaving the rich tapestry of Indigenous cultures' values, knowledge systems, and worldviews into the very fabric of AI development. Maitra's vision transcends traditional boundaries, aiming to cultivate AI systems that not only communicate but also reason and make decisions rooted in Indigenous ethical frameworks, thus championing values of sustainability, community well-being, and harmony with nature. The journey towards realizing this vision, however, is fraught with both technical and ethical challenges, necessitating a paradigm shift in the dynamics of AI development to ensure Indigenous

communities are recognized not as mere data sources but as active collaborators in crafting AI systems that truly reflect and respect their unique cultural heritages and perspectives.

The significance of cultural considerations in AI is further illuminated by the pioneering work of Qadri et al. (2023). Through a community-centered study focusing on text-to-image models in South Asia, their research underscores the indispensable role of cultural expertise in the development of AI models. By engaging directly with communities to co-design and critically evaluate AI outputs, their methodology showcases the profound impact of cultural sensitivity and the imperative to mitigate biases within AI systems, thus reinforcing the value of inclusivity in technological advancements.

In a similar vein, the seminal study "User Perspectives on Ethical Challenges in Human-AI Co-Creativity" by Rezwana and Maher (2023) employs Design Fiction as a speculative research methodology to explore the ethical complexities of human-AI collaboration in creative processes. Engaging participants in speculative scenarios that span issues of ownership, accountability, the personification of AI, and the ethical implications of data practices, they delve into the nuanced perspectives of users. Their findings reveal a landscape marked by discomfort with AI's data practices, ambiguous expectations around ownership versus contribution, and significant privacy concerns, positioning AI more as an assistive tool rather than a co-creative partner. This investigation not only sheds light on the ethical dilemmas faced by users but also calls for the development of clear, human-centered guidelines addressing data privacy, informed consent, and ownership issues, urging policymakers and designers to heed these insights in the pursuit of ethical co-creative AI systems.

In their innovative work, Wan et al. (2023) articulate a strategic vision for the integration of AI that centers on community engagement, emphasizing the necessity for AI technologies to be developed and applied in a manner that is responsible, ethical, and inclusive, with the ultimate goal of empowering communities and elevating educational outcomes. This approach advocates for a participatory model of AI development, where communities are intricately involved in all stages—from design through deployment—to ensure that AI systems are attuned to their specific needs, cultural nuances, and aspirations, thus promoting empowerment over exclusion. The strategy underscores the critical role of ethical guidelines in safeguarding privacy, data rights, and cultural integrity, while envisioning AI as a transformative tool for bridging societal gaps and enhancing equity, especially in education. By tailoring AI to cater to diverse learning needs, facilitating accessible and engaging learning experiences, and overcoming barriers related to language, disability, and socioeconomic status, Wan et al. champion a future where AI not only democratizes education but also fosters a more equitable and inclusive society, leveraging broad perspectives and expertise to drive innovation that benefits all community members.

The work of Ali et al. (2023) emerges as a critical exploration into the ethical, social, and technical challenges that accompany AI-driven technologies in education. This narrative delves into the importance of transparency in the utilization of student data—a cornerstone of ethical AI deployment—demanding clear communication with students and stakeholders regarding data collection, usage, and protection. An exemplary AI-driven content recommendation system not only tailors learning experiences to individual students but also provides an explicit account of its data usage policies, setting a standard for how educational technologies should operate.

Securing explicit consent for data collection underscores the ethical fabric of AI practices. Ali et al. (2023) underscores the necessity for informed consent processes that respect student autonomy and privacy, advocating for AI systems that enhance educational experiences within a framework of trust and respect. This journey towards ethical AI deployment is further enriched by the introduction of digital storytelling and GenAI-created content as pedagogical tools, drawing attention to the indispensable role of inclusivity and cultural sensitivity in educational content creation.

Belda-Medina (2023) and Roe et al. (2023) bring to light the significance of maintaining academic integrity in an era where digital tools and GenAI have the potential to transform educational paradigms. These scholars emphasize the need for educational content that not only engages a diverse student body but also mirrors the rich tapestry of global cultures and intergenerational knowledge. This commitment to cultural sensitivity and inclusivity demands the programming of GenAI tools with algorithms that draw from a broad spectrum of cultural narratives, ensuring a learning environment where every student feels seen and valued.

Yet, the integration of AI and digital tools in education is not without its challenges. The specter of plagiarism and the unethical use of translation tools loom large, threatening to erode the authenticity of learners' work and the integrity of educational institutions. Belda-Medina (2023) and Roe et al. (2023) stress the imperative for clear guidelines and technological solutions that detect and deter academic dishonesty, advocating for the responsible use of translation tools that support, rather than circumvent, the learning process.

Through this narrative, the complexities of navigating the ethical deployment of AI in education unfold, highlighting the delicate balance between leveraging technological advancements and upholding the principles of privacy, consent, inclusivity, and academic integrity. This story not only reflects the ongoing dialogue among educators, policymakers, and technologists but also charts a course towards a more ethical, inclusive, and culturally sensitive digital learning landscape.

The advent of Virtual Reality (VR), Augmented Reality (AR), and AI-driven interactive learning games marks a transformative era in language learning, characterized by immersive and experiential methods. Crawford et al. (2023) emphasize the critical importance of developing these technologies with a deep commitment to accessibility, equity, and the mitigation of biases to ensure all learners, including those with disabilities, are fully included. By incorporating features such as text-to-speech functionalities, sign language avatars, and adjustable settings for visual and auditory adjustments, these applications not only aim to be universally accessible but also strive to present content that is free from cultural biases. This approach reflects a conscientious effort to create an educational ecosystem that is not only equitable and inclusive but also allows learners from diverse backgrounds to see themselves reflected in the learning material, highlighting the transformative potential of these technologies to prioritize accessibility and foster an environment where every student has the opportunity to thrive.

The ethical integration of AI into language learning transcends technological advancement, advocating for a harmonious collaboration among a broad spectrum of stakeholders—learners,

educators, ethicists, and technologists. Maitra (2020) champions inclusive policies and practices that reflect the multifaceted impacts of AI on diverse communities. This collaborative ethos envisages a participatory approach in the development of AI tools, where insights and feedback from all stakeholders are not merely supplementary but are integral to the design and implementation process. The call for the establishment of ethical review boards embodies a structured approach to maintaining ethical integrity, ensuring continuous oversight and adherence to ethical standards throughout the lifecycle of AI tools.

In assessing the ethical underpinnings of AI-driven language learning methodologies, the focus shifts to evaluating their impact on learners and the efficacy of bias mitigation strategies. Rezwana and Maher (2023) emphasize the importance of ethical guidelines in co-creative AI endeavors, proposing evaluation metrics that encompass accountability and respect for intellectual property. Concurrently, Wan et al. (2023) articulate the necessity for ethical, inclusive, and sustainable AI solutions in education. The evaluation of these solutions extends beyond measuring learning outcomes to encompass a broader consideration of social impact, including the sustainability of the technology and its capacity to inclusively cater to diverse learner demographics.

Future Explorations of AI Ethics

Through the insightful contributions of scholars like Maitra (2020), Qadri et al. (2023), Rezwana and Maher (2023), and Vall and Araya (2023), a nuanced exploration into the ethical gaps within current AI applications unfolds, offering a roadmap for future endeavors aimed at enhancing the ethical, cultural, and community responsiveness of AI technologies.

Maitra (2020) pioneers this discourse by advocating for the inclusion of Indigenous perspectives within AI development, spotlighting a glaring oversight in prevailing AI paradigms that largely neglect Indigenous languages, knowledge systems, and ethical frameworks. This advocacy for weaving Indigenous epistemologies into the fabric of AI development heralds a paradigm shift towards a more inclusive, culturally rich approach that honors a diversity of worldviews, thus laying the groundwork for AI technologies that are not only innovative but also ethically and culturally conscientious.

In a similar vein, Qadri et al. (2023) critique the inadequacies of Western-centric AI frameworks, arguing for a reevaluation that embraces globally inclusive and community-centric methodologies. Their research underscores the criticality of participatory practices that engage directly with communities affected by AI technologies, thereby ensuring that machine learning frameworks are both culturally sensitive and equitable. This call for a recontextualization of AI technologies to reflect diverse cultural experiences and structural inequalities marks a pivotal step towards rectifying cultural harms perpetuated by existing AI models.

Delving into the realm of human-AI co-creativity, Rezwana and Maher (2023) highlight the unique ethical challenges that emerge from such collaborations. Their work suggests that individuals from varied creative backgrounds could offer insightful perspectives on navigating these ethical quandaries, revealing a significant gap in our understanding of the intersection between diverse expertise and ethical AI practices. This revelation points towards an urgent need for research that bridges the gap between theoretical ethical frameworks and their practical application within diverse creative domains.

Further propelling this narrative, Vall and Araya (2023) envisage the future of AI in language learning, touching upon the potential integration of technologies like Virtual Reality (VR) and Augmented Reality (AR), alongside advancements in Natural Language Processing (NLP) and personalized learning algorithms. Their projections not only underscore the technological innovations on the horizon but also bring to light the ethical considerations imperative to ensuring data privacy, algorithmic transparency, and equitable access to these emerging educational tools. Collectively, the insights provided by these scholars paint a complex picture of the current state of AI ethics implementation, emphasizing the necessity for AI frameworks that are culturally responsive, honor Indigenous and global cultural diversities, and are attuned to the ethical intricacies of human-AI co-creation. The path forward necessitates a concerted effort to include diverse cultural and community voices in the AI development process, coupled with a steadfast commitment to transparent and responsible data management practices. By championing a more inclusive, equitable, and ethically sound approach to AI development, we pave the way for a future where AI technologies not only push the boundaries of human potential but do so with a profound respect for the vast spectrum of human diversity.

3.1.5 Overcoming Training Biases to Culturally Competent AI

In the rapidly evolving domain of artificial intelligence (AI), the specter of training data bias casts a long shadow over the promise of technological advancement, particularly within the realm of higher education and language learning. This bias, an inadvertent artifact of the data on which AI models are trained, can perpetuate and even exacerbate societal biases against underrepresented groups. A poignant example of this is the decision by the University of Texas to discontinue the

use of a machine learning program for evaluating PhD applicants. The program's reliance on a database informed by past admissions decisions resulted in unfair outcomes for students from diverse backgrounds historically underrepresented in PhD programs, starkly highlighting the issue of inherent biases within datasets (Crawford et al., 2023).

Overcoming training data biases necessitates a multifaceted approach, emphasizing culturally competent AI that is as diverse and inclusive as the societies it aims to serve. Diverse methodologies and frameworks have been proposed to mitigate these biases, with scholars advocating for a critical examination of datasets and assumptions embedded within AI decision-making processes. For instance, the integration of Indigenous perspectives in AI development, as discussed by Maitra (2020), underscores the significance of incorporating a multiplicity of worldviews, languages, and ethical frameworks. This inclusion fosters AI systems that respect and embody diverse cultural values, thereby reducing the risk of cultural biases.

Furthering this discourse, Qadri et al. (2023) emphasize the limitations of Western-centric AI frameworks and advocate for participatory practices that allow impacted communities to contribute to the development of machine learning frameworks. By recontextualizing data and model evaluation to explicitly incorporate diverse cultural experiences and structural inequalities, these scholars suggest pathways toward creating AI technologies that are globally inclusive and culturally competent. Similarly, Johnson and Verdicchio (2023) argue that AI ethics should be viewed within the broader context of sociotechnical systems, where overcoming training data biases involves not just technical solutions but also addressing the social, cultural, and organizational contexts in which AI operates.

In language education, Crawford et al. (2023) highlight the importance of including diverse linguistic data and cultural contexts in AI training data to ensure that language learning tools are equitable and accessible to all learners. This approach necessitates ensuring that AI's training data encompasses a wide range of languages and dialects, reflecting the rich tapestry of human speech and cultural expressions. Moreover, community-driven approaches, as discussed by Wan et al. (2023), underscore the value of engaging with communities, especially those underrepresented in technology development, to identify and mitigate biases in AI training data.

Chapter 4: Design Sessions

4.1 Design Sessions – Data Collection Methodology

To investigate the second research question on children's design preferences for AI-enhanced culturally relevant storytelling, I orchestrated participatory design sessions with 21 participants across two distinct settings.

The initial session took place at the KidsTeam research lab, which is a component of the Human-Computer Interaction Lab at the University of Maryland. This lab fosters collaborative efforts between children and adults as part of an intergenerational co-design team dedicated to creating technologies that enhance children's learning and play. The session engaged eight children aged between 7 to 12 years, who are English speakers from diverse non-Western backgrounds, including Chinese, Korean, and Nigerian descent. All participants were already familiar with AI technologies such as ChatGPT, DALL-E, and voice bots.

A subsequent series of sessions engaged 13 children in India. Participants for the study in India were recruited through a convenience sampling method, utilizing networks of families and family friends. The criteria for selection were that children be aged between 6 to 13 years, a target group chosen due to their enhanced cognitive capacity for learning new languages (Trafton, 2018) —a key aspect of this research—and that they spoke Telugu as their native language daily within their households. This focus was essential as the study aimed to explore ways to safeguard the Telugu language using GenAI and to understand children's design preferences in child-AI interactions. Their parents and residing elders, proficient in speaking, writing, and reading Telugu, have

witnessed the evolution of language usage over the years, including the increasing incorporation of English terms into their everyday conversations. Prior to the session, all necessary ethical procedures were adhered to, with parents completing parental consent forms and children signing child assent forms. As a gesture of gratitude for their participation, each child received a \$50 gift card.

This group presented a unique dynamic: three were adept in Telugu despite being raised in non-Telugu speaking states of India, while the others hailed from Telugu-speaking regions. Unlike the first group, these participants had limited exposure to GenAI tools. These sessions, conducted in a hybrid format of both in-person and online interactions, facilitated extensive engagement across varied geographical locales. To enrich the research data, all sessions were meticulously voice recorded, and photographs were taken of the participants' creative outputs, ensuring a comprehensive documentation of their storytelling journey and AI interaction experiences.

For the sessions in the USA, they took place in person at the KidsTeam research lab, involving a group of eight children and four adults in a co-design session. This setup facilitated a collaborative and interactive environment, allowing for a dynamic exchange of ideas and creative inputs among the participants.

Each in-person session in India took place within the child's home, providing a genuine setting for observing how cultural elements naturally integrate into daily living. This approach allowed for a direct view into the ways in which language shapes everyday activities. Observing the children's emotions and their interactions with parents and grandparents, especially when they sought

assistance in selecting cultural objects, was particularly illuminating. These interactions highlighted important family dynamics and bonding processes, revealing how cultural heritage and values are transmitted across generations. Such observations were crucial for understanding the deeper familial and cultural contexts that shape the participants' lives, offering a richer perspective on the social and emotional dimensions that underpin their learning and interaction with technology. Two online sessions were conducted for participants in India who were located in a different region within India.

The approach initiated with a co-design session where I worked alongside the children to design how AI could be utilized for language learning. This method was crucial because it allowed the children to actively contribute their ideas and preferences, shaping the AI tools in ways that resonated with their learning needs and cultural perspectives. Co-design was particularly important in this context as it empowered the children, giving them a voice in the development of technology that directly affects their educational experiences. During these sessions, I played a pivotal role in guiding the children on how AI works, discussing its possibilities, and providing examples and prompts that encouraged them to adopt a design thinking perspective. This guidance was crucial as it helped the children understand the potential of AI in enhancing their learning experiences and motivated them to think creatively about how technology could be tailored to their specific cultural and educational needs. This participatory setup not only facilitated creativity but also ensured that the resulting designs were both innovative and closely aligned with the users' real-world applications and cultural contexts.

Each session began with participants bringing a cultural artifact from their home, setting the stage with the question:

"Can you share a unique word from your heritage language that relates to your artifact and tell us what it means?"

The cultural artifact employed as a "cultural probe"—a participatory design technique—served as a tangible entry point into discussions about language and heritage. This method grounded our sessions in real-world cultural elements, linking tangible expressions of culture to broader concepts and enriching the storytelling process.

Responses were captured on a Whiteboard. I then steered the dialogue towards understanding participants' perspectives on culture, probing into what they considered the essence of culture and its core unifying element.

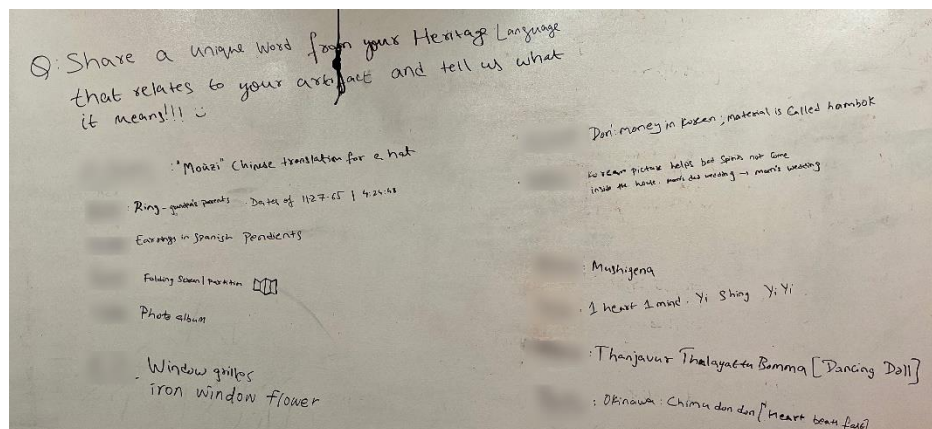


Figure 3: Capturing 'Question of the Day' responses

This transitioned into an exploratory discussion about the importance of language as a fundamental pillar of culture, highlighting the alarming issue of language dormancy and its potential to erode cultural identity itself. I encouraged the participants to contemplate the implications of losing their language and culture, inviting them to ponder their roles in combating such loss. Storytelling was

introduced as a pivotal means for language and cultural preservation, asking participants if they felt compelled to partake in saving their languages. This initial discourse effectively laid a solid foundation for the forthcoming design activity, emphasizing storytelling's significance in safeguarding linguistic and cultural heritage.

The design activity employed storyboarding, another participatory design technique, that encouraged children to creatively express their cultural artifact's story through various mediums—text, images, comics, or decorations. This flexible approach aimed to capture the full spectrum of their creativity. In India, children were given the choice to compose their stories in Telugu, fostering a deeper cultural connection. The session transitioned to presentations, where each child shared their narrative, reflecting on any challenges faced during the storytelling process.

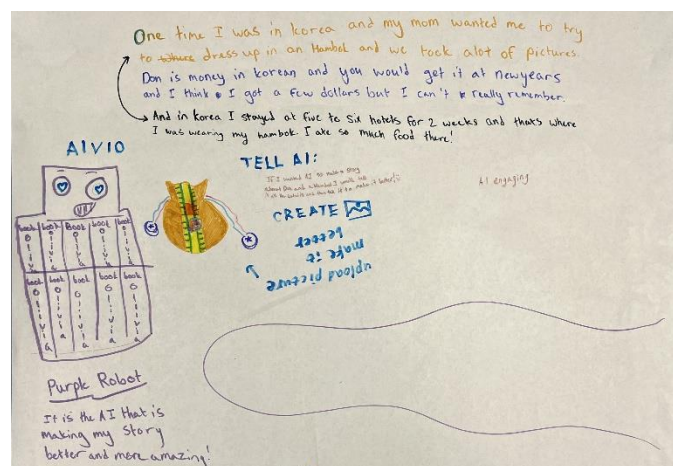


Figure 4: Storyboarding – write a story about your cultural artifact

Introduction to ChatGPT followed, demonstrating how AI could address storytelling challenges. Demonstrations included image generation through text prompts, inspiring children to consider AI's potential in enhancing their storytelling. Key discussion points centered on AI's role in

brainstorming, bringing descriptions to life, creating interactive experiences, sharing stories, preserving narratives, and considering AI's authority in creative processes:

- *How could AI help you brainstorm or organize these ideas more creatively?*
- *As you describe the settings or characters in your story, imagine an AI tool that could bring these descriptions to life. Could AI create images or animations based on your words?*
- *When AI creates pictures for your stories, how do you feel it connects with your culture?*
- *Imagine your story as an interactive experience. How could AI make your story more engaging?*
- *Once your story is complete, consider how AI could help you share it with others. Could AI turn it into a digital book, a spoken narrative, or even a mini movie?*
- *How do you imagine AI could help keep your story alive and accessible for many years? Think about ways AI could preserve, share, or even add to your story in the future.*
- *What are your thoughts on asking AI to write the entire story for you, including images, based on your idea?*

The sessions culminated with each child presenting their "big ideas," which were carefully recorded by an adult. Participants shared their stories, highlighting a key element or aspect of the story related to their cultural artifact. They then discussed two specific AI features they were most excited about, explaining why these features could enhance their storytelling. Additionally, they identified whom they would like to share their stories with—such as friends or grandparents—and how they envisioned AI assisting in this process. Each presentation concluded with a personal reflection on what preserving their cultural story means to them and the role they see AI playing in maintaining and enhancing these narratives. This imaginative exploration provided valuable

insights into how AI could be integrated into digital devices to authentically represent and preserve their cultural narratives.

Following the sessions, interviews were conducted with parents in India, to shed light on their views regarding their children's use of AI tools, especially in language learning. These conversations delved into parents' thoughts on the ethical considerations surrounding AI, highlighting their expectations for the respectful and correct use of the Telugu language within these platforms and the importance of maintaining cultural integrity in AI's representation of their heritage. Additionally, these conversations explored the role of intergenerational collaboration, particularly how the involvement of grandparents or senior community members could enrich the narratives' cultural depth and authenticity.

4.2 Design Sessions – Analysis Methodology

Building upon the foundation laid by the participatory design sessions and interviews with parents, the methodology for data analysis aimed to distill the rich insights these interactions provided, directly addressing the second research question regarding children's design preferences for AI-enhanced, culturally relevant storytelling for language learning. The approach adopted for this phase was narrative analysis, a method well-suited for exploring the complex interplay between children's creativity, cultural backgrounds, and their perceptions of AI's role in storytelling. This choice of methodology marked a seamless transition from gathering rich, diverse experiences to dissecting these experiences to answer our pivotal research question.

The analytical process began with a thorough examination of the recorded sessions and the visual artifacts produced by the participants. This step was crucial, serving not just to catalog factual information but to immerse deeply in the children's worldviews, capturing the essence of their engagement with cultural artifacts and AI technology. Integral to this exploration was examining how children perceive the cultural relevance of AI-generated imagery in their stories. Each child's contribution was seen as a chapter in a larger story, with their ideas, expressions, and creative outputs providing key plot points in understanding their relationship with technology and culture. Complementing these children-centered narratives, insights from the parent interviews were woven into the analysis to provide a multi-dimensional view of AI's role in cultural storytelling. Parents' reflections on technology's ethical use, their concerns, and aspirations offered a backdrop against which children's stories could be understood, adding depth and context to the emerging themes. Importantly, this analysis also delved into the role of intergenerational collaboration, exploring how connections between children and their grandparents or senior community members could enhance the cultural depth and authenticity of the narratives. This aspect of the analysis revealed the significant impact that elder family members have in enriching storytelling with cultural wisdom and authenticity, thus answering a crucial question about the generative power of collaborative storytelling in preserving language and culture through AI-enhanced educational tools.

The thematic synthesis that followed aimed to distill these individual and collective narratives into coherent themes that directly address the research question. This phase was not merely about identifying patterns but understanding how these patterns speak to broader questions of technology, education, and culture. It involved critically engaging with the data to draw out themes

that reflect both the diversity of children's design preferences in utilizing AI for language learning through storytelling and the shared aspirations of parents for the ethical and effective use of AI in educational contexts.

In the aftermath of thematic analysis, a critical step in my research involved integrating the key findings of identified themes from Scoping review into the insights garnered from the design sessions. Utilizing a comparative analysis technique, I aligned the three themes identified with the rich narratives and preferences expressed by children during the design sessions. This method allowed for an understanding of how these practices could be seamlessly woven into the fabric of child-friendly language learning approaches. By juxtaposing the theoretical best practices with the practical insights from children and their parents, I crafted a set of recommendations that embody the intersection of child-centric design, cultural sensitivity, and technological innovation. This integration process not only enriched the findings but also provided a blueprint for developing AI-enhanced educational tools that are both engaging for children and rooted in the pedagogical principles identified as most effective. Through this investigative journey, the fusion of thematic insights with session narratives illuminated the pathway for designing solutions that truly resonate with children's needs and preferences, paving the way for a more inclusive and effective approach to language learning in the digital age.

4.3 Design Sessions Findings

In an effort to discern the specific design preferences of children for AI-enhanced culturally relevant storytelling, a narrative review was undertaken. This review scrutinized the stories composed by 21 child participants, employing thematic analysis to extract discernible design preferences that emerged from the children's engagement with the narrative task.

4.3.1 Children's Design Preferences

The types of stories crafted by the participants were varied, including fantastical, informative, and comical narratives, all enriched with visual representations. Notably, 40% of the participants exhibited a preference for AI to facilitate their learning in crafting manga/comic-style stories, indicating a distinct inclination towards this genre.

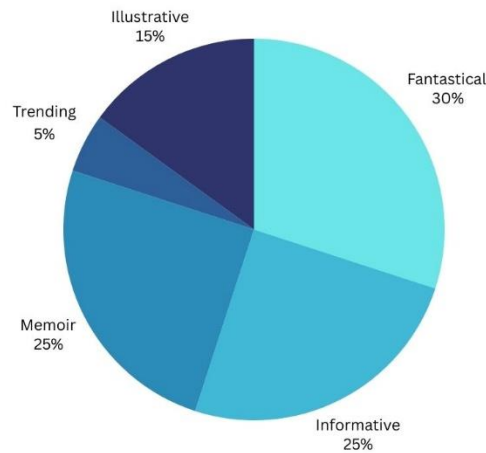


Figure 5: Pie Chart showing the distribution of children's story types

1. **Voice-Text Hybrid Interaction:** The preference among children for interacting with AI through voice commands, while preferring to receive responses in writing, illustrates a specific approach to technology use. Children from India specifically mentioned their comfort with reading responses from AI, rather than listening to them, due to not being used to AI's speaking

abilities and believing that seeing words helps them learn better. Similarly, the participants at KidsTeam expressed reservations about the auditory representation of AI, particularly in response to the prospect of AI emulating the voice of a family member. The idea was met with discomfort, with one participant describing the concept as "*creepy*." A significant majority, 95%, liked the idea of speaking to AI for tasks like asking for help with writing, seeking clarifications, or requesting image creations, but they wanted the AI to answer back in text. This method was seen as straightforward and less intimidating than dealing with voice responses. Moreover, children in India expressed a wish to communicate with AI in both Telugu and English, expecting AI to adapt its language in responses based on the situation, making the interaction more user-friendly and accessible for bilingual users and as quoted by one of the kids "*if we keep speaking and writing in Telugu then we can save the language*".

2. **Language and writing assistance:** Language played a crucial role in the children's preferences, with a definitive emphasis on AI as an assistive tool for language and writing.

"What is the spelling of Kuchipudi dance?",

"How do we say Functions/Events in Telugu?"

They envisaged an AI that seamlessly interjects with spelling corrections, word suggestions based on context or meaning, and even language lessons, particularly in writing in Telugu. The participants sought an AI that could engage with them throughout the writing process, attentively ensuring that their narratives were both linguistically accurate and true to their original ideas. This desire extended beyond mere spell-checking; the children wanted an AI

companion that could help refine their storytelling, shaping their prose without stripping away its authenticity. For the Telugu-speaking participants, the utility of AI was to serve as a tutor in mastering the written form of their native tongue. This feature set, including spelling assistance, contextual word suggestions, and writing instruction, was unanimously desired by all participants, highlighting the central role of language in crafting and enhancing their stories.

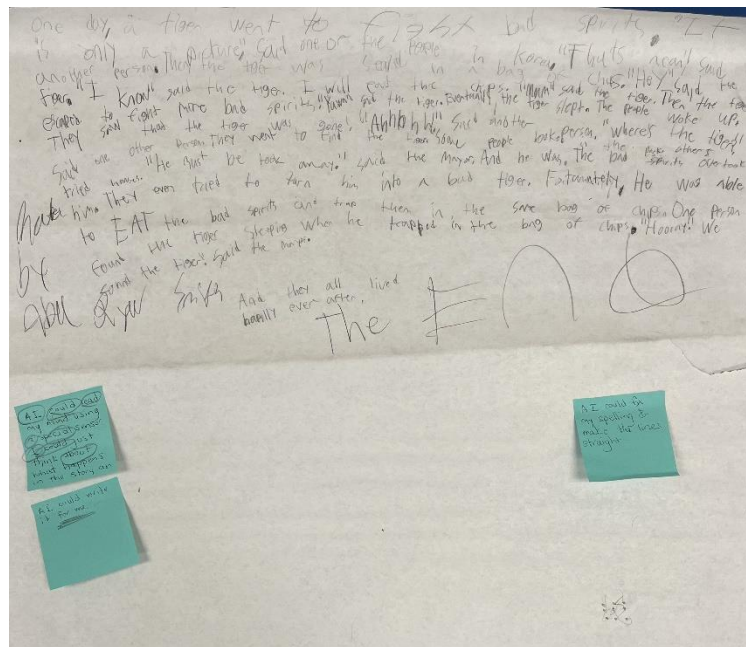


Figure 6: Participant hoped for AI to assist in enhancing handwriting skills and text alignment

3. **Enhancement and personalization of creative outputs:** Children showed a keen interest in using AI to enhance their artistic and narrative endeavors, demonstrating enthusiasm for an AI that could imbue their sketches with color, effectively creating a dynamic, digital coloring book. They envisaged this interaction to be intuitive, requiring no more than the simple presentation of their sketches to a camera, highlighting a desire for seamless and user-friendly

AI integration. Personalization was a salient theme, as evidenced by their desire for AI to integrate the familiar visages of friends into their stories, thus fostering a sense of relatability and immersion. The creation of cultural avatars, particularly those that reflect the children's own identities and heritages, revealed a deep-seated aspiration for self-expression and cultural connectivity. The participants' ambitions extended to the transformation of static written narratives into animated picture books or movies, leveraging AI to elevate the storytelling medium to a more interactive and engaging experience. Moreover, the ambition to transform static written narratives into animated forms such as picture books or movies was prominent, with a unanimous wish for AI to possess the capability to autonomously generate visual content like images, videos, or GIFs based on the stories written or through interpreting audio recordings and direct conversations.

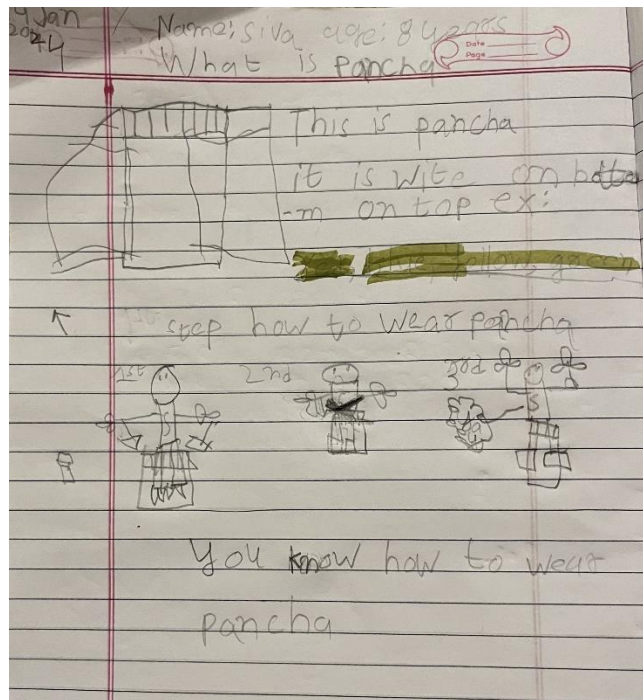


Figure 7: A participant desired for AI to animate and color their drawings in a lifelike manner

Additionally, there was a consensus on the need for an AI-driven sketch enhancement tool, tasked with refining and augmenting their drawings while maintaining the integrity of the original artwork, demonstrating the children's appreciation for the AI's potential to be a collaborative partner in their creative processes.

4. **Educational and Preservation Tools:** The children viewed AI as an important tool for learning and keeping traditions alive. They liked the idea of AI teaching them about history through stories, helping them understand and appreciate where they come from. The children were also keen on the idea of AI sharing their stories more broadly or storing them for the future, highlighting AI's potential in preserving their cultural heritage. They suggested innovative sharing platforms, such as showing their stories on public transport TVs, like those found on airplanes, to reach a wider audience. Additionally, they expressed a desire to share their creations with friends, hoping this would inspire their peers to craft their own stories. This peer sharing was seen to not only spread their language and culture but also encourage others to engage in storytelling, leveraging AI as a tool to foster cultural continuity and personal expression. Many children, about 80%, thought it was important for AI to check facts in their stories to make sure they were telling their cultural tales accurately. Besides history, they were excited about AI helping them learn to create comics and manga, making storytelling more fun. In India, there was also a specific interest in using AI to learn how to write in Telugu properly.

4.3.2. Comparative analysis of children's design thinking in India vs USA

In contrasting the design sessions between India and the USA, a key difference emerged related to cultural and linguistic connections. The design ideas from the Telugu-speaking children often incorporated elements of learning and sharing their language as evidenced by them saying *"I want to play these stories in the bus stations and flights so that everyone can learn and get entertained"*. In contrast, the American children's feedback leaned more towards using AI to augment their storytelling abilities as they mention *"I want AI to make my story sound more exciting"*.

This divergence was notably exposed when I asked the group, *"How would you feel if nobody could speak the Telugu language anymore?"* The question stirred profound contemplation among the Indian children. They had just learned about the possibility of languages disappearing, and the thought of losing their native tongue led to a poignant reflection on their cultural practices linked to language use. The prospect of no longer being able to engage in their culturally rich activities deeply affected them, sparking a motivation to preserve their language.

Conversely, when posed with a similar question about the loss of their lineage language, the children from KidsTeam in the USA, who predominantly speak English at home, did not exhibit a significant emotional impact. They expressed a disconnection from any personal or community culture tied to their language that they would miss. Their responses suggested a pragmatic view: if their primary language were lost, they said they could simply create a new one. This difference underscores a lesser degree of cultural attachment in their daily interactions, which in turn influenced their creative output.

This is evident in the narratives of the children in the USA which were typically based on distinct personal experiences or cherished memories, such as a humorous incident with an uncle during a family gathering, or a treasured ring passed down from their great-grandmother or a cool cap they once bought when in China. However, these stories, tied to specific events rather than daily practices, potentially contribute to a limited connection with their cultural and linguistic heritage.

The stories from Telugu-speaking children often originate from recurring daily activities. These include wearing traditional clothes without slipping, discussing their favorite meals that they help prepare with their parents, or recounting visits to the shop with their grandparents during each festival to buy new clothes and toys. The thought of losing their language brings a palpable fear of missing out on the rich conversations and enjoyable interactions that accompany these activities, which are integral and unique to their community.

To illustrate, we have a tradition in Telugu culture where new clothes are purchased and worn for each festival. These festivals are numerous, and each one is celebrated with its own unique stories and customs. These narratives, enriched by both mythological and real-life events, are reiterated by elders annually. This repetition helps children gradually comprehend and appreciate their cultural practices, which they are expected to pass on to future generations. The fear of losing this connection not only made them feel isolated but also brought them closer to understanding the profound impact of losing their cultural identity.

Another trend observed among some Telugu children is their preference for using "we" instead of "I" in their narratives. Their stories often included phrases like "*we all ate the dish*," involving

families and friends, even in contexts where individual actions could have been emphasized. This inclusive language reflects a communal perspective deeply ingrained in their storytelling.

The similarities in ideas from both sessions were primarily academic, with children from India and the USA expressing a desire for AI to aid in improving their literacy skills, including spelling, word suggestions, and handwriting enhancement. Additionally, there was a notable interest in using AI to boost their creative expressions by creating images, videos, and comics based on their stories and ideas.

In the session held online, the only distinction observed between them and in-person participants in India was that children in the online sessions, located in a non-Telugu speaking state, exhibited a heightened awareness of their cultural customs and traditions compared to their counterparts in Telugu-speaking regions. This increased cultural awareness can be attributed to the parents' concerns that their children might lose touch with their cultural roots due to their environment's differing cultural influences.

As a result, parents in non-Telugu speaking states take deliberate steps to reinforce cultural identity through various means. They engage their children in watching culturally relevant movies, learning traditional dances and music, and teaching them cultural stories. Parents also ensure that traditional customs, particularly the comprehensive celebration of festivals, are meticulously followed, a practice that might be more relaxed in Telugu-speaking states where community involvement naturally supports cultural practices. This focused effort by parents ensures that their

children maintain a strong sense of cultural identity, which likely contributes to their apparent enhanced cultural awareness.

Therefore, in terms of storytelling and child-AI interaction, the design ideas showed a significant overlap. However, from a cultural perspective, the Telugu-speaking children demonstrated a deeper engagement with AI's potential. They showed more thoughtful consideration in utilizing AI to enhance their language learning capabilities in reading, writing, and speaking reflecting broader opportunities for cultural engagement through technology.

4.3.3. Cultural Relevance and Engagement with Parents

In exploring the intricate relationship between children, their cultural heritage, and the evolving role of AI in language learning through storytelling, it becomes crucial to consider the perspectives of both the young learners and their guardians. The dialogue around AI's integration into the fabric of cultural and educational spheres reveals a complex tapestry of expectations, concerns, and aspirations.

Children's interactions with AI, particularly in generating media that represent cultural elements, underscore the importance of cultural relevance and accuracy. For instance, when children encountered images generated by AI, such as those depicting a Telugu traditional priest having lunch, discrepancies between their cultural expectations and the AI's representation highlighted a gap. Such experiences point either to disagreement and distrust in AI or to a desire for personalization in AI-generated content, allowing children to align the technology more closely with their cultural realities by incorporating familiar faces or more accurate depictions.

Another example, when presented with AI renditions of traditional Telugu cuisine, the children were quick to note any inaccuracies or generic portrayals that didn't match their lived experiences or the rich culinary traditions passed down through generations. This keen observation underscores their expectation for AI to not only recognize but also accurately represent the nuanced aspects of their culture. Such instances reinforce the children's wish for AI to offer not just a broad stroke of cultural elements but a detailed and faithful representation that resonates with their personal understanding and familial teachings. Their feedback highlights a collective yearning for technology that respects the intricacies of their cultural identity, suggesting a need for AI systems that are developed with a deep understanding of and sensitivity to the cultural contexts they aim to depict.

The engagement with parents further illuminates concerns and desires regarding AI's role in their children's lives. Parents appreciated AI's potential as a supportive educational tool, highlighting the design session where storytelling and introduction to AI played a pivotal role in deepening their child's understanding of their chosen cultural topic—Rice. The AI's ability to elucidate the various types of rice, its harvesting methods, and the refining process sparked curiosity in the child. The discussion evolved to explore why brown rice is different, leading to further inquiries about the global consumption of rice and the shared culture of eating rice in different regions. This expansion of knowledge not only provided a global perspective, which is often not so evidently presented in schools, especially in matters of culture, but also ignited a newfound curiosity in the child about the diversity of world cultures. The parents observed a marked increase in their child's interest in learning about different cultures and languages since the session. The engagement

facilitated by AI in this context not only enriched the child's educational experience but also broadened their understanding of cultural diversity and the importance of language in preserving cultural identity.

On the other hand, a concerning scenario involved children relying solely on AI for homework answers without engaging in the learning process, leading to a superficial understanding of topics and stifling critical thinking and problem-solving skills. Parents envision AI as a supportive tool that aids in learning rather than merely serving as a repository of answers. This distinction underscores a broader educational philosophy where AI should stimulate cognitive development, critical thinking, and creative exploration rather than encourage rote learning. Ethically, parents underscore the necessity for AI to produce culturally sensitive and accurate content, particularly in representing cultural practices or historical narratives. The sensitivity around content accuracy extends to the depiction of cultural practices, with a call for AI to avoid misrepresentations that could mislead or offend.

During the interviews with parents, a notable tension emerged between the children's needs and the parents' perspectives, particularly regarding the use of AI to correct spellings. Parents expressed that making spelling errors is a natural part of the learning process, and they do not expect their children to write flawlessly at a young age. They emphasized that when children make mistakes, the process of realization and correction helps them remember the correct usage, preventing future errors. Parents were concerned that if AI automatically corrects their children's spelling, it will bypass this essential learning journey. They argued that this might lead to a superficial understanding of vocabulary, as children might rely too heavily on AI, diminishing

their ability to engage with and appreciate more complex literature in the future. Ultimately, parents felt that mastering spelling and vocabulary through traditional means is crucial for children to fully comprehend and creatively engage with the language.

Parents also voiced concerns about AI improving children's handwriting, emphasizing that handwriting is a form of self-reflection and learning. One parent explained *“although future generations might primarily type, handwriting in languages like Telugu is crucial for learning. Writing by hand creates a visual and auditory imprint in the brain, enhancing word retention and reading skills.”* They argued that while neat handwriting is important, the process of improving it naturally is essential for development. Parents felt that if AI were to enhance handwriting automatically, it would bypass this critical learning curve, depriving young children of a fundamental developmental experience.

Parents expressed skepticism regarding the use of AI for creative tasks such as coloring or enhancing children's sketches. They emphasized that the primary goal of such activities is to develop fine motor skills by encouraging children to color within the lines of sketches, thus stabilizing their hand movements. Parents were open to AI tools being used in a limited capacity to guide children on a digital interface, such as providing feedback when they color outside the lines. However, they were firm in their belief that children should complete these tasks independently, without AI completing any part of the task for them. One parent reflected, *“I'm not sure, I still feel traditional learning methods are strong because I went through them and now understand their purpose. Integrating too much technology may be the future, but accepting this*

change is hard." This sentiment highlights a cautious approach to integrating technology into educational practices that involve developing basic skills.

When discussing a case where a child, intrigued by a story they wrote about rice, interacted with ChatGPT to learn more about its global presence and different types, parents acknowledged the value of AI as an informational tool, akin to an encyclopedia. They appreciated this use of AI, noting that it broadens children's horizons without giving them direct answers that might bypass important learning processes. Parents expressed that while AI can be beneficial, its use should be limited to avoid creating an overreliance on technology at a young age. They see potential for AI in performing complex tasks such as image and video generation or transforming children's work into animations and comics—tasks that are typically daunting for both children and adults. This would encourage children to engage in initial creative activities like writing, drawing, and storytelling, after which AI could "*show its magic*," bringing their ideas to life in ways that captivate and inspire further creativity.

Parents expressed a nuanced perspective on AI's potential to contribute to their children's learning and creativity, appreciating its vast knowledge base and capacity for creative stimulation. However, they remain vigilant about the technology's ability to inadvertently replace traditional learning methods or misrepresent cultural heritage. This vigilance is particularly evident in discussions about ethical and cultural integrity, emphasizing the importance of AI's correct and respectful use of language, such as Telugu.

Parents highlighted a specific concern regarding AI, like ChatGPT, and its approach to language translation. They pointed out that simply translating English words into Telugu without considering the fundamental grammar, context, and cultural nuances leads to inaccuracies. For example, direct translations by AI can result in text that, while technically Telugu, lacks grammatical coherence and fails to convey the intended meaning properly. This not only distorts the language but also diminishes its beauty and cultural significance. Such translations, they argue, could mislead children, especially when used for language learning, by presenting them with a jumbled mess of words devoid of the rich context and understanding native to a Telugu speaker. Parents advocate for AI systems that grasp the essence of Telugu, employing grammatically correct, culturally informed, and contextually appropriate language, thus ensuring that AI tools enhance rather than undermine the cultural identity embodied in language.

In the context of language learning, parents see potential for AI to enhance the process through innovative methods that encourage active engagement rather than simply providing answers. They suggest using games or interactive activities that promote learning through iteration, particularly to improve pronunciation, reading, and writing skills. These aspects are crucial as they are areas where even many adults lack proficiency. By incorporating these methods, AI could not only aid children in their language development but also offer opportunities for adults to improve their skills alongside their children.

On the intergenerational front, there's an acknowledgment of the potential for AI to bridge generational gaps. An example cited was an AI platform that enabled children to record and transcribe stories told by their grandparents, thus preserving these narratives in the family's digital

archive. This facilitated a meaningful exchange of cultural wisdom and strengthened family bonds. By incorporating elements that facilitate or enhance intergenerational learning, AI can become a conduit for sharing cultural knowledge, where stories and traditions are passed down more dynamically. This approach could enrich the children's cultural understanding and personal identity, fostering a deeper connection with their heritage.

A notable gap in existing literature is the limited focus on utilizing AI to support learning and writing in native languages, a need emphatically expressed by children during the design sessions. This oversight becomes particularly evident in the context of Telugu-speaking children, where, out of 15 participants, only 2 were able to write stories in the Telugu script, despite it being their native language. The majority found comfort and ease in using English for writing, indicating a proficiency gap not just in writing but also in reading their mother tongue, with many only able to identify individual alphabets. This scenario sheds light on the critical need for AI tools that can provide support in native language literacy, going beyond mere transliteration to include spell-checking, word suggestions, and perhaps more importantly, contextual understanding and grammar assistance in languages other than English.

4.4 Analysis of Research Findings

The interaction among artificial intelligence (AI) in education, ethical considerations, and design preferences outlined by children and their parents presents a comprehensive framework for exploring the advancement of language learning. These components are meticulously examined and integrated, assessing how they can collectively contribute to refining language learning experiences while upholding ethical standards and cultural significance. The insights derived from

this thorough analysis highlight the trajectory towards creating AI-enhanced language learning tools that are not just efficient but also align with ethical principles and cultural sensitivities.

The ethical guidelines and approaches detailed in the "Ethics" segment, put forth by researchers like Maitra (2020) and Qadri et al. (2023), underscore the necessity of embedding a wide array of cultural insights and promoting inclusive development processes in AI technology. These strategies are pivotal for mitigating biases and crafting AI systems that genuinely embody the vast array of human cultures and languages. Echoing this sentiment, children voiced similar concerns, as evidenced by reactions like *"this image of the food looks different from what I eat, can I change it myself?"* This illustrates their desire for AI systems that accurately reflect their lived experiences and cultural practices. Furthermore, parents highlighted the significance of precise cultural representations when AI is utilized in learning contexts. They stressed that ensuring such accuracy necessitates vigilant involvement from community members and scholars, pointing to a collective responsibility to guide AI development in a way that faithfully represents and respects diverse cultural identities and traditions.

The principle of personalization and cultural relevance in AI-enhanced learning tools crystallizes a shared aspiration across the board—from academic researchers to the youngest end-users. Research by Wan et al. (2023) and Xiaohong and Wang (2021) underscores the potential of AI to tailor learning experiences to individual and cultural needs, demonstrating the value of dynamically adjusting educational content. These systems dynamically modify content, difficulty levels, and learning pathways based on real-time analysis of learner interactions and performance. Such adaptability ensures educational content is engaging and appropriate for the learner's

proficiency level. Echoing these scholarly insights, children's preferences for AI applications in storytelling and creative tasks vividly illustrate the demand for personalization.

The diversity in the types of stories chosen by the children—ranging from imaginative and fantastical to comical or rooted in real-life experiences—underscores the variety in learning and creative preferences among young learners. For instance, some children expressed a wish for AI to color their picture, indicating a preference for engaging visually with learning materials. In contrast, others desired AI to enhance their already colored picture, showing a need for AI tools that can refine and build upon their initial creative efforts. Another group sought AI's assistance in giving them ideas on how to proceed and turn it into a storybook, highlighting a desire for AI that acts as a creative partner in storytelling, guiding them through the process while allowing for substantial personal input and creativity. These varied preferences not only reflect the different ways children wish to learn and interact with AI but also underscore the importance of AI tools being versatile enough to cater to individual learning styles and creative processes.

Bridging generational gaps with AI unveils innovative methods for enhancing language learning and cultural exchange. Authors like Lim (2016) delve into the use of Persuasive Teachable Agents, demonstrating how AI can mediate learning experiences that bring together different generations, fostering a shared learning environment. This concept of AI as a facilitator of intergenerational collaborative learning is intriguing, yet it invites scrutiny from a practical standpoint, especially from parents concerned about the integration of such advanced technologies in family settings.

Parents acknowledged the value of intergenerational learning but expressed reservations about the elderly's ability to engage with sophisticated AI tools. They pointed out that the effectiveness of AI in bridging generational gaps heavily depends on the technological proficiency of older family members. There's an underlying concern that introducing technology into interactions between grandparents and children could inadvertently shift the focus away from meaningful content and interpersonal bonding to the mechanics of the technology itself. As one parent articulated, *"We really hate it when any technology wastes time in setting up and finding the right settings to function properly and gives incorrect answers. As two working parents when we get to spend time with kids, we don't want to spend time configuring the technology."*

Moreover, parents highlighted a potential conflict that could arise from discrepancies between AI-generated content and grandparents' knowledge or beliefs. The skepticism of older generations towards technology, fueled by a belief in the sufficiency of traditional upbringing methods, could lead to resistance against AI-assisted storytelling. *"Maybe in the context of AI allowing them to record the stories they want to say to store it for their future generations, can make them excited rather than AI providing the content itself,"* suggested a parent, indicating a preference for AI tools that facilitate personal storytelling over those that generate content.

Some parents further resonated on this idea that parents strive to impart cultural values and moral principles to their children through the wisdom of cultural scholars. Such efforts, however, frequently encounter resistance, as children tend to find these insightful yet traditional talks uninteresting, dismissing them as *"adult talks."* However, if AI could transform these important cultural and moral discussions into formats that captivate children's interest, it would not only aid

parents in imparting essential values but also help in preserving cultural roots. This approach underscores a collective desire for AI to act as a bridge, not only between generations but also between tradition and modernity, making cultural education both accessible and engaging for the younger generation.

Children, on the other hand, showed reluctance to engage with AI that impersonates familiar voices, describing such interactions as *"weird and creepy."* This reflects a distinct preference for AI that supports rather than supersedes human elements in storytelling and learning processes. This nuanced perspective from both parents and children underscores the complexities involved in utilizing AI to foster intergenerational connections through storytelling. While the potential for AI to serve as a bridge between generations is recognized, its implementation must be thoughtfully considered, prioritizing ease of use, cultural sensitivity, and the enhancement of human connections.

Focusing on interactive, immersive, and multimodal AI learning environments, researchers like Divekar (2018) and Katifori (2020) present compelling examples of how Virtual Reality (VR) and Augmented Reality (AR) can significantly enhance language learning through real-world simulations and interactive cultural artifacts. However, juxtaposed with these technological advancements, parents voice concerns about the potential for an over-reliance on such tools detracting from traditional learning methods. One parent candidly expressed, *"My kids only get 1-2 hours of technology time... they are so invested in them that they won't even know what is happening around them. So, I am afraid if I give them for a long time, they will be addicted to it."*

This fear is reflective of a broader dilemma faced by many families, caught between the allure of engaging AI-enhanced education and the grounding of conventional learning approaches. The sentiment, *"We don't know what the right way is to do it... some parents give full access to mobiles, while some don't even introduce technology to their kids in the house,"* underscores the uncertainty and varied approaches parents consider in integrating technology with education, striving to balance the immersive benefits of AI with the rich, tangible experiences offered by traditional learning methods.

Conversely, during design sessions utilizing ChatGPT, children showed a profound interest in technology, demonstrating curiosity and enthusiasm in their interactions. They were highly engaged in generating images and content related to their stories, showcasing a desire to explore and learn from these AI-facilitated experiences. For instance, a child's discovery, *"oh so veena (a musical instrument) is made of jackfruit tree wood,"* after inquiring about the composition of a veena, illustrates the potential of AI to spark curiosity and facilitate learning among young participants.

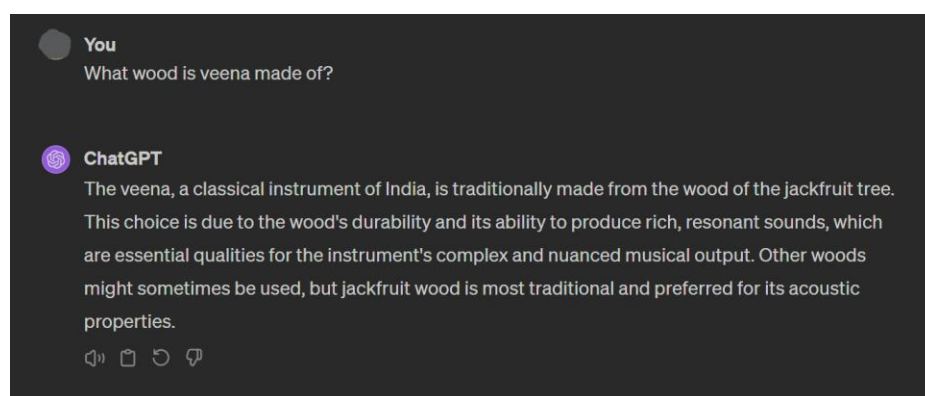


Figure 8: A participant explores with AI how cultural items are made to tell their story

This eagerness to engage with AI and discuss findings with peers suggests that, while parental concerns about technology's role in education are valid, children's perspectives reveal a genuine interest in leveraging AI tools for learning, pointing towards the necessity of finding a harmonious balance that accommodates the immersive benefits of technology without neglecting the importance of conventional educational practices.

By closely examining these insights, several practices emerge as essential for incorporating AI-enhanced language learning practices with the design preferences offered by children and their parents.

1. **Develop Adaptive Learning Tools with Cultural Sensitivity:** Adaptive algorithms should adjust learning content based on the learner's performance and cultural background, ensuring a personalized and culturally relevant learning experience (Wan et al., 2023).
2. **Engage Users in Co-Design:** Involvement of children and their parents in the design process ensures that AI learning tools meet their needs and respect their cultural perspectives (Maitra, 2020).
3. **Implement Ethical AI Frameworks:** Adoption of ethical AI frameworks that prioritize transparency, data privacy, informed consent, and bias mitigation is crucial for the responsible use of AI in education (Qadri et al., 2023).
4. **Incorporate Multilingual and Culturally Diverse Content:** AI tools should support multilingual learning and include culturally diverse content, reflecting the linguistic and cultural diversity of learners (Belda-Medina, 2023; Roe et al., 2023).

5. **Foster Intergenerational Learning Opportunities:** Utilize AI to create opportunities for intergenerational learning, such as storytelling tools that allow children to learn from and with their families, preserving cultural heritage and language (Rezwana and Maher, 2023).
6. **Develop Interactive Experiences:** Design AI-enabled interactive and multimodal learning experiences that ignite children's curiosity and facilitate quick, engaging learning moments. These experiences should be carefully calibrated to captivate without fostering over-reliance or addiction to technology (Crawford et al., 2023).

This approach aligns with the articulated design preferences of learners and their guardians, ensuring that AI tools in education serve to enrich, rather than diminish, the diverse tapestry of human learning experiences. By grounding AI development in ethical considerations and user-centric design principles, educators and technologists can forge a path towards a more inclusive and equitable educational future.

4.5 Why these findings matter in the context of Literature

The findings focus on contextual personalization in AI-enhanced language learning tools reflects a growing trend identified within the literature (Wan et al., 2023; Xiaohong and Wang, 2021). However, this research extends the conversation by specifically addressing the nuanced needs of children learning in native languages, an area less explored in previous studies. The emphasis on cultural sensitivity and ethical considerations echoes the work of Maitra (2020) and Qadri et al. (2023), yet uniquely contributes by highlighting the practical application of these principles in designing AI tools for language learning.

Children's requests for AI interactions that balance auditory commands with written responses highlight a nuanced understanding of learning preferences, emphasizing the importance of accommodating diverse learning styles. This is particularly relevant for bilingual learners who navigate multiple languages, showcasing a clear gap in the literature where the specific interactions of children with AI, especially in multilingual contexts, are not thoroughly explored. The practical implications of this desire touch upon the need for AI learning tools that are adaptable, flexible, and sensitive to the linguistic and cultural contexts of users, a consideration that is currently underrepresented in the development of such technologies.

Moreover, parents' concerns about the ethical use of AI, particularly regarding content accuracy and cultural representation, echo the literature's emphasis on ethical considerations but extend it by underscoring the critical role of community involvement and expert guidance in AI content creation. This insight reveals a practical gap in how existing AI learning tools address the complex interplay between cultural accuracy, ethical standards, and educational value, suggesting a need for more inclusive and collaborative approaches in AI development that directly involve the target user communities and cultural scholars.

This research uncovers a crucial gap in the literature regarding the support of native language learning through AI. While significant strides have been made in using AI to enhance language education, less attention has been paid to the unique challenges and opportunities presented by native and lesser-spoken languages. Additionally, the study identifies a need for further exploration into the ethical implications of deploying AI in educational settings, particularly in relation to preserving cultural integrity and ensuring equitable access to technology.

The discovery that only a fraction of Telugu-speaking children were capable of writing stories in their native script reveals a significant oversight in current educational technologies' linguistic inclusivity. Most existing research and AI tool development have predominantly centered around global or widely spoken languages, inadvertently sidelining the nuanced challenges and opportunities present in supporting underrepresented languages (Byamugisha et al., 2014).

In essence, while the findings align with existing research advocating for user-centric and ethically informed AI development, it crucially expands the conversation to highlight the practical gaps and opportunities in designing AI-enhanced language learning tools that cater to the specific needs and concerns of children and their parents. This extension into practical application underscores the importance of bridging these identified gaps, aiming to develop AI learning tools that are not only technologically advanced and ethically sound but also deeply resonant with and responsive to the diverse cultural and linguistic landscapes of learners.

Chapter 5: Discussion

As we navigate through the aftermath of our research into AI-enhanced language learning, this discussion section stands as a crucial crossroads where findings merge with broader implications and pathways for future exploration. Here, we articulate "Design Recommendations" as the cornerstone of our research's practical outputs, offering a scaffold for ethically informed, culturally attuned, and learner-centered AI development. We then delve into the successes and ongoing endeavors in "AI-driven revitalization efforts". This reflective juncture also casts a light on "Future Work", charting unexplored territories and unanswered questions that beckon with the promise of deepening our understanding. Simultaneously, by Acknowledging the "Limitations" of our inquiry grounds our discourse of the inherent challenges and constraints that shape the scope of our findings. Furthermore, engaging in a reflective dialogue with the literature, we assess the resonance and divergence of our findings within the academic milieu, thus contextualizing our contributions within the evolving narrative of educational technology.

5.1 Design Recommendations

Drawing from the rich insights gleaned from the themes, ethics, and design preferences, this section endeavors to lay down a series of design recommendations that aspire to elevate the role of AI in language learning.

Interactive AI Storybook: A digital interactive storybook designed for tablet devices, featuring a vibrant library of animated stories in Telugu. This emerged in response to concerns from parents about AI potentially hindering the visual and auditory natural learning curve of children. However, children expressed a strong interest in utilizing AI to assist with reading and writing in Telugu.

Each page of this storybook is enriched with interactive elements—children can tap on words to hear their pronunciations, view their meanings, and engage with small animations that elucidate the context or elements of the story. Functionality is threefold: Firstly, the reading assistance feature, where words highlight as they are narrated, helps children make the connection between spoken and written Telugu. Secondly, the speaking practice segment offers interactive exercises at the end of each page, where the AI prompts the child to recite phrases from the story, providing corrective feedback and praise to enhance pronunciation and language use. Finally, the writing drills are seamlessly integrated into the story narrative, encouraging children to write key phrases directly on the touchscreen, with the AI offering guidance on handwriting and spelling accuracy. This comprehensive tool can bolster reading, speaking, and writing skills in a fun and interactive environment, making the learning process both engaging and effective.

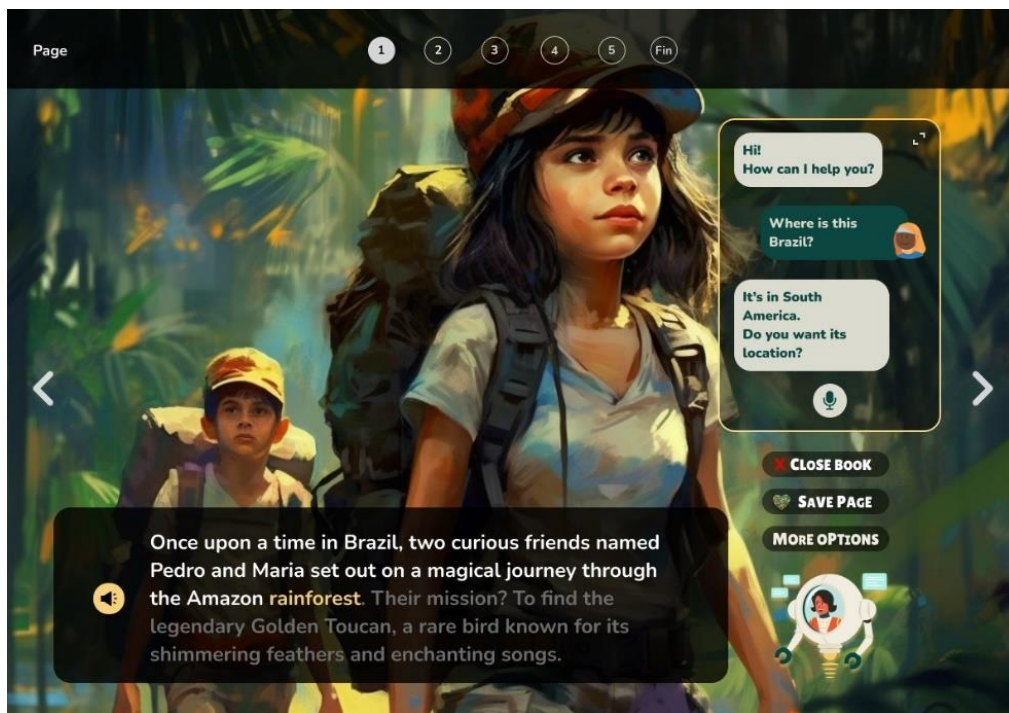


Figure 9: Concept design for a storybook app featuring Voice-Text Hybrid AI interaction

Incorporating Voice-Text hybrid interaction, as shown in the conceptual design, this storybook allows children to speak to the AI, which then responds in text with the answer and a leading question designed to trigger further exploration and learning. This feature caters to the evolving needs of young learners by combining the auditory benefits of voice interaction with the cognitive reinforcement of text responses, thereby expanding their knowledge in an intuitive manner.

Cultural Creativity Kit: A tangible AI-powered craft box designed to engage children in creative activities while learning the Telugu language, striking a balance between children's curiosity about cultural artifacts and parental approval of AI's educational applications. This kit includes art supplies, a digital pen, and a fold-out digital screen integrated into the lid, creating a versatile crafting station. Functionally, the kit supports handwriting recognition, where children can write or draw on traditional paper using the digital pen. The AI then recognizes and digitizes the content, providing feedback on Telugu script handwriting and spelling to enhance learning accuracy. Additionally, the kit offers interactive crafting opportunities, allowing children to create items based on Telugu cultural themes such as festivals and folklore. The AI enriches this experience by providing interactive guides, stories, and language lessons related to each craft, thereby deepening cultural and language understanding. Once a craft is completed, it can be scanned by the device, transforming it into animated stories or interactive games that further reinforce language skills. This design aligns with parental perspectives that AI should be used to perform complex tasks like generating videos and animations—tasks that are typically daunting for both adults and children.

This multifunctional kit is designed to be both educational and entertaining, fostering creativity and language learning through hands-on activities and digital technology.

Learning Wall Projector: The AI-Enhanced Telugu Learning Wall Projector is designed as a versatile educational tool that can be mounted in a child's room or a classroom, transforming any wall into an interactive learning display. Controlled via a tablet or smartphone, this projector offers a broad array of interactive, language-focused content. It features wall-sized language games, including puzzles and quizzes, which are projected onto the wall, making learning a physically active and engaging experience. Additionally, it can visualize stories as the child reads or listens, incorporating interactive elements that bolster comprehension and vocabulary development.

The projector also includes a Cultural Exploration Mode, allowing children to delve into various aspects of Telugu culture through interactive maps, historical events, and cultural practices. This mode provides a rich, immersive learning environment that encourages a deeper understanding and appreciation of Telugu heritage. Aligning with the theme of immersive learning environments identified in the scoping review, this projector addresses parental concerns about technology being a distraction by offering a collaborative tool that fosters interaction between children and elders. It provides a perfect opportunity for both groups to explore the culture in an innovative, fun, and educational way, enhancing the learning experience and promoting collaboration in discovering cultural heritage.

Telugu Ancestral Story Garden: An innovative Augmented Reality (AR) app designed to bring old authentic Telugu stories and poems vividly into the real world by overlaying digital content

onto the physical environment. This transformative app allows children and elders to walk through their garden or a park, with the app projecting scenes and characters from Telugu stories around them, effectively integrating the narratives into their actual surroundings. It also offers a feature for interactive story creation, where users can craft their own stories or adapt existing ones by positioning virtual objects and characters, and narrating their tales live. Additionally, the app includes engaging cultural treasure hunts, encouraging users to explore their environment to find hidden cultural artifacts or story elements, making the learning of Telugu literature and history an interactive and enjoyable experience. This AR environment not only enriches storytelling but also fosters intergenerational collaboration deeper connection with cultural heritage through playful and educational exploration.

Telugu Audio/Visual Interactive Museum: This is an innovative space equipped with user-friendly recording and playback equipment, touchscreens, and an interface accessible for visitors of all ages. This museum serves as a central hub where a skilled narrator recounts classic Telugu stories and poems to groups of children. These narrations are then visually interpreted by the children using the museum's digital tools, with an AI system providing constructive feedback to enhance the children's illustrations according to the themes and messages of the stories. All narrated stories and children's artwork are preserved in a digital archive accessible within the museum, allowing future visitors to explore the rich tapestry of Telugu culture. For example, a narrator at the museum tells the tale of "Palnati Yudham," a historic war tale, inspiring a group of children to create digital illustrations of its epic scenes. The AI critiques and suggests improvements, enriching the children's understanding of traditional attire and historical landscapes. These creations, coupled with the professional narration, become a part of the

museum's digital collection, offering a dynamic and interactive way to connect younger generations with their cultural heritage.

Language script writing: AI has the potential to revolutionize learning native language scripts by making the process engaging and personalized for children. Through interactive writing interfaces, AI can guide children through the correct strokes for each letter, providing real-time feedback. Voice-assisted technologies enhance this learning, allowing children to pronounce words while AI visually breaks them down into letters and offers writing and pronunciation tips, making the experience intuitive and interactive.

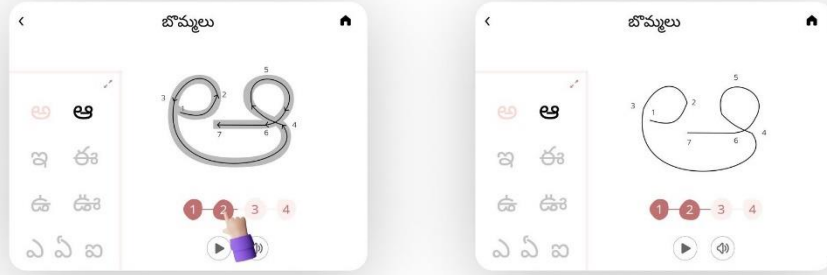


Figure 10: Conceptual design for AI-powered writing assistance

Gamification and personalized learning paths keep the practice of writing in native scripts fun and tailored, helping children progress at their own pace. Integrating cultural contexts into learning materials deepens their connection to heritage. For instance, Augmented Reality (AR) can merge digital learning with the real world, such as overlaying the Navajo word for "harmony" on a traditional sand painting, complete with visual text, pronunciation, and cultural context. This

approach not only supports the learning of native scripts but also helps preserve and celebrate linguistic diversity.

Transforming Cultural Speeches to Tangible Interactive Storybooks: This pivotal recommendation, stemming from parental insights, underscores the significance of leveraging AI to revitalize cultural education for children. As many parents collectively mentioned *"In this modern day, the cultural speeches are the only thing we can say is resonating and preserving our culture, which we want our children to learn from an early age to be aware of their culture, which children otherwise find it boring. So, if AI can help transform these speeches into tangible storybooks which are engaging, then it would be a great help!"*

Consider a scenario where a cultural scholar's speech on moral values, potentially dry and unengaging for children in its original form, is transformed by generative AI into an interactive, tangible storybook. This book could narrate cultural tales, making it an engaging tool for instilling cultural values from an early age, while simultaneously promoting language learning and vocabulary expansion. Leveraging paper-based electronics and conductive ink, the pages of this book could become interactive, initiating AI-generated narrations, sounds, or even simple animations upon touch. Such a book, inspired by a scholar's insights into ancient myths, enables children to engage with their heritage in a hands-on manner. Every page turn would reveal new insights, bringing age-old myths to life through a multi-sensory experience that combines the traditional with the technological, thus providing an immersive educational tool that bridges the gap between past and present.

Intergenerational knowledge transmission: Imagine a community project where elders and young people come together to preserve their native language, using an AI-driven platform. During these interactions, the elders speak in their native language, discussing everyday topics, traditional sayings, or cultural norms, while the AI records and analyzes these conversations. The system identifies linguistic patterns, detects rare expressions, and assesses the proficiency levels of the younger participants. From this analysis, the AI generates tailored exercises, such as language drills or pronunciation practices, specifically designed to address the detected gaps in understanding or usage among the youth. This approach not only strengthens linguistic skills across generations but also aids in the structured preservation and enrichment of the community's linguistic heritage.

5.2 AI-Driven Language Revitalization Efforts

India - Mundari, Gondi, Maithili, Rajasthani: AI models are being developed for several Indian languages—Mundari, Gondi, Maithili, and Rajasthani—to enhance digital accessibility and promote linguistic integration. In central India, AI models for Mundari and Gondi, developed through a collaboration between Microsoft and the Indian Institute of Technology Kharagpur, focus on translating Hindi to build comprehensive language corpora. These models aim to bridge linguistic gaps for speakers and enhance digital accessibility. In contrast, Maithili initiatives focus on translating children's books and creating digital scripts to support educational programs, while the Rajasthani model provides digital services like text prediction and grammar correction, necessitating the standardization of diverse dialects for effective digital integration.

These development efforts face substantial challenges, including resource limitations due to scarce comprehensive language datasets and digital resources essential for effective machine learning. Additional challenges include technological inequity, which complicates collaborations between large tech companies and local institutions, and structural constraints that affect the teaching and learning processes for these languages. Users, particularly from the Mundari community, experience limited participation in project development, potentially leading to inadequate solutions that fail to address their needs or integrate their cultural contexts. Moreover, users often struggle with accessing and adapting to new technologies, reflecting a significant digital divide and the need for culturally sensitive technology integration.

To overcome these obstacles, projects emphasize collaboration and community engagement. For Mundari and Gondi, efforts involve working with community members and anthropologists to create culturally appropriate tools and develop digital resources like scripts and databases. The Maithili initiatives leverage partnerships with organizations such as Pratham to digitize children's literature and innovate new typing tools to accommodate unique phonetic characteristics. Rajasthani projects focus on community involvement to ensure digital standards are acceptable and use multi-dialect approaches to develop tools for text prediction and grammar correction, enhancing functionality and inclusivity for all speakers. These comprehensive efforts aim to ensure the successful integration of these languages into the digital era. (Pradhan and Dey, 2023)

New Zealand - Māori: Te Hiku Media in New Zealand employs AI to revitalize Te Reo Māori and other indigenous languages like Hawai'ian and Cook Islands Māori. They use AI for speech-to-text systems and pronunciation practice through apps like Korero Maori and Rongo. Challenges

include data collection and creating accurate speech-to-text systems that respect cultural nuances. To overcome these, Te Hiku Media engages communities and collaborates with data scientists, emphasizing data sovereignty with the Kaitiakitanga license. They utilize open-source platforms and digital archives for AI training, and develop innovative applications like Rongo (ITU News, 2022).

Canada - Kwak'wala: In Canada, Sara Child, a member of the Kwaguł band and a professor, is leading a fascinating project to revive the Kwak'wala language. They're using AI to dig through vast archives of Kwak'wala recordings, turning them into practical resources. But it's not easy. Kwak'wala is structured differently from English, so they're custom-building speech recognition systems. Plus, there's the challenge of transcribing loads of recordings, which AI helps with. The younger generation isn't finding it a breeze to use these new technologies, though. And ensuring that the digitized language stays culturally accurate is another hurdle. To tackle these obstacles, the project is all about teamwork. They're working closely with elders and community members to create tech that's sensitive to Kwak'wala's nuances. And they're getting creative, too. Caroline Running Wolf is using virtual and augmented reality to make learning the language an immersive experience. What's really cool about this project is that it's led by indigenous folks, a big change from the usual academic approach. They're blending age-old wisdom with cutting-edge tech to keep indigenous languages and cultures alive and thriving (CBC News, 2022)

Woolaroo by Google: Communities speaking endangered languages like Calabrian Greek, Louisiana Creole, Maori, and Yiddish are turning to Google's Woolaroo app for help. This AI model identifies objects in real-time photos and translates them into native languages, complete

with pronunciations, making language learning interactive and relevant. Challenges include gathering enough accurate data for lesser-known languages and ensuring translations are culturally appropriate. To address this, Woolaroo involves Google employees who speak these languages and collaborates with partner institutions for thorough review. Making Woolaroo open source allows communities to customize it to their needs. New methods include using Vision AI and collaborative model development to enhance accuracy. Woolaroo showcases how modern tech can preserve endangered languages and enrich cultural heritage (Google Cloud, 2021).

Japan - Ainu: The Ainu people, indigenous inhabitants of Hokkaido and surrounding islands in northeastern Japan, are employing AI models, specifically AI Pirika, to revitalize their language. AI Pirika, designed as a virtual chatbot and speech recognition engine, aims to preserve and teach the Ainu language by facilitating conversations and providing educational resources through natural language processing (NLP). However, the initiative faces significant challenges such as data scarcity due to the limited written or recorded data of the critically endangered Ainu language, the complexity of designing NLP systems for a language with unique structural features, and ethical concerns about cultural exploitation. Users may struggle with accessing and utilizing the technology, and there are concerns about the AI's ability to accurately capture and convey the cultural nuances and spiritual elements of the Ainu language. To address these issues, the development of AI Pirika includes innovative algorithm designs like the SeGA-ILSD, a novel Spoken Dialogue Method using an Inductive Learning Method based on a Genetic Algorithm with Sexual Selection, which allows the system to generate new dialogue data, enhancing the language resource base. Community involvement and user feedback play critical roles in ensuring the tool is culturally sensitive and meets the community's needs. AI Pirika has been made openly accessible

online to lower barriers to access and encourage widespread use and customization, integrating Ainu spirituality and cultural nuances directly into the system to make it a more effective tool for cultural preservation. This public and open-source approach facilitates broader participation and adaptation by other indigenous communities facing similar challenges, making AI Pirika a significant technological and cultural initiative aimed at preserving and revitalizing the Ainu language and cultural heritage (Stanford Re:Wired, 2021).

Australia – Social Robot Opie: Indigenous Australian communities, in collaboration with the ARC Centre of Excellence for the Dynamics of Language (CoEDL) and Google, are using AI models to preserve and revive their languages. With over 300 originally spoken languages, only 140 are still in use today. These AI models help transcribe and process 40,000 hours of language recordings collected by CoEDL, making linguistic data more accessible. Challenges include managing vast amounts of audio data and customizing AI for accurate speech-to-text in structurally different languages. Users, especially community members, may struggle with technical skills and cultural acceptance. To tackle this, the project integrates AI into linguists' workflows and involves community feedback. They also employ Opie, a social robot designed to teach endangered languages to children in a culturally sensitive manner. Opie's customizable software allows for the addition of new stories or languages as community needs change. This innovative approach not only preserves endangered languages but also enhances educational outcomes and cultural engagement among indigenous communities (Sydney Morning Herald, 2018)

Brazil - Guarani: In a community near São Paulo, Guarani Indigenous teenagers, including TikTok influencers and gamers fluent in both Portuguese and Guarani Mbya, are using AI to

improve their Guarani Mbya writing skills. The "Linguistic Assistant" app functions like autocorrect and text suggestion tools, helping them write in their native language. Challenges include gathering enough linguistic data for Guarani Mbya and developing accurate AI tools due to its limited digital presence. The teens face difficulties in adapting to new technology for writing in their native language and ensuring cultural relevance. To overcome these, the project emphasizes community engagement, with IBM collaborating with local educational institutions to tailor the AI tools to the Guarani community's needs. The app is evolving into a mobile version, enhancing accessibility for the teens. This AI initiative not only preserves language but also bridges modern technology with traditional language use, fostering cultural continuity and digital literacy among Indigenous teens (Reasons to be Cheerful, 2023).

From these diverse global examples, it is evident that while employing AI models for language revitalization presents distinct challenges, innovative measures tailored to specific community needs can effectively address these hurdles. These initiatives demonstrate a crucial blend of advanced technology and deep cultural engagement, emphasizing the importance of community involvement and tailored solutions in overcoming obstacles ranging from data scarcity to technological adoption. Through such concerted efforts, AI not only aids in preserving linguistic heritage but also ensures the integration of indigenous languages into the digital age, enriching cultural identities and broadening access to technology worldwide.

5.3 Limitations

This research, while contributing valuable insights into the integration of Artificial Intelligence (AI) in language learning and its potential to bridge cultural and generational gaps, acknowledges several limitations. First, the scope of this study is predominantly qualitative, focusing on the design preferences of children and parents, and the ethical considerations surrounding AI's use in education. While this approach provides deep, nuanced understandings of user experiences and expectations, it lacks the quantitative data necessary for generalizing findings across broader populations.

The scope of this study was limited by its reliance on a specific set of databases: ACM, arXiv, ERIC, and Living Languages. Consequently, relevant research outside these databases may not have been accessed, potentially omitting studies that could contribute additional perspectives or evidence to the themes identified. Expanding the range of databases in future research could uncover a more comprehensive array of literature, enhancing the robustness and breadth of the systematic review.

Another limitation lies in the specificity of our focus group—children and parents from Telugu-speaking communities. While this focus allows for a detailed exploration of design preferences and ethical considerations in a specific cultural context, it may not fully capture the diversity of needs, preferences, and challenges present in other linguistic or cultural groups. This specificity, although strength in understanding cultural nuances, restricts the broader applicability of the findings.

Furthermore, the research acknowledges the rapid evolution of AI technologies, which can outpace the research timeline. As such, some of the AI capabilities and ethical frameworks discussed may evolve, requiring continuous updates to stay relevant. This dynamic nature of technology presents a challenge in creating enduring recommendations and highlights the need for ongoing research.

Lastly, the study also recognizes the potential discrepancy between the envisaged design recommendations and the practical feasibility of implementing such AI systems in real-world educational settings. Constraints related to technological infrastructure, resources, and the digital literacy of users (particularly older generations) may hinder the practical application of these recommendations. This can be mitigated by utilizing a multifaceted approach. Initial surveys could gather detailed feedback from educators, students, and administrators to identify specific barriers and needs related to technology infrastructure and digital literacy. This data can then inform targeted pilot programs that test the AI systems in diverse educational environments, allowing for adjustments based on real-world usage and challenges. Finally, ongoing training and support would ensure that all users, particularly from older generations, can effectively engage with the technology, enhancing the overall feasibility and impact of AI in education.

While this research sheds light on significant aspects of AI in language learning, these limitations underline the importance of further empirical studies. Future work should aim to expand the diversity of participant demographics, incorporate quantitative methods to complement qualitative insights, and continuously adapt to the evolving landscape of AI technology. Overcoming these limitations will enrich the field's understanding and contribute to the development of more effective, ethical, and culturally sensitive AI-enhanced learning tools.

5.4 Future Studies

The synthesis of themes, ethics and design preferences from the research into AI's role in language learning, particularly for children and the revival of native languages, offers rich insights. These findings not only spotlight the current state of AI in educational settings but also illuminate paths for future research aimed at practical implementation and advancement. This section delineates potential areas for future work, focusing on how research can evolve to meet the nuanced demands of utilizing AI as a tool for native language learning and its revival.

A pivotal insight from the study highlights AI's capacity to bridge intergenerational gaps in language learning, revealing both the potential and the challenges inherent in engaging older generations with technology. The interviews with parents underscored a spectrum of responses from discomfort to skepticism among the elderly towards AI, coupled with concerns over the ideological conflicts that may arise from inaccuracies in AI-delivered content. Addressing these issues calls for future research to delve deeper into creating AI systems that are not only culturally sensitive and easy to use for all ages but also trusted and intuitive, minimizing the gap between technological potential and user comfort. This endeavor necessitates a multidisciplinary approach, where Human-Computer Interaction (HCI) plays a crucial role, bridging linguistics, anthropology, AI ethics, and the practicalities of technology use among diverse age groups. By employing participatory design methods that actively involve learners, educators, community elders, and researchers can ensure that AI tools are developed with a deep understanding of users' cultural contexts and learning needs. Such collaborative efforts should aim to foster HCI research that

integrates insights from each of these fields, crafting AI tools that are not only technically adept but also resonate deeply with the cultural and educational aspirations of communities, thereby making AI a trustworthy and enriching presence in intergenerational language learning.

Ethical considerations, particularly in the realms of data privacy, bias mitigation, and the preservation of cultural integrity, have been highlighted as paramount in the integration of AI into language learning. The evolution of AI technologies beckons the necessity for robust ethical frameworks tailored to the unique challenges and opportunities presented by AI in educational contexts. Future research avenues should pivot towards the formulation and implementation of ethical guidelines that are meticulously designed to address these challenges, with a significant emphasis on fostering community-driven data governance models and culturally compliant research methods that are non-westernized. Such models would not only democratize the development and use of AI tools but also ensure they are aligned with the values and expectations of the communities they aim to serve. Researching the interplay between ethical considerations and the design and deployment of AI in language learning could unveil insights into how these tools impact individual privacy, informed consent processes, and the accurate and respectful representation of diverse cultures. Collaborative efforts among AI developers, ethicists, and community representatives are essential in this regard, as they collectively can pioneer the creation of AI language learning resources that meet the highest ethical standards. By delving deeper into these collaborative frameworks, future work has the potential to significantly advance the ethical deployment of AI tools in education, ensuring they enhance learning experiences without compromising on the ethical principles that underpin our increasingly digital society.

The burgeoning interest in personalized AI learning experiences signals an essential direction for future research: the development of adaptive AI systems finely tuned to individual learning styles, proficiency levels, and cultural backgrounds, especially for children. This endeavor calls for the utilization of advanced machine learning algorithms capable of forging dynamic, real-time learning paths responsive to each learner's interactions. A promising avenue involves crafting smaller, community-specific AI systems, a strategy that demands a nuanced understanding of localized educational needs and cultural nuances. These systems could offer tailored language learning experiences, providing dialect-specific instruction, and adaptive word and spelling suggestions that align with the learner's native tongue. For children, the personalization extends into creative domains, where AI tools could assist in refining sketches, generating initial artwork for further modification, or even offering concise, digestible information snippets that ignite creativity and bolster confidence in their work. Rigorous testing across various educational contexts is crucial to ascertain the effectiveness and adaptability of these personalized AI solutions. Such comprehensive research efforts aim not just to validate the technological capabilities of these systems but also to ensure they embody a child-centric approach, empowering young learners to explore their creative and linguistic skills in a supportive, culturally aware digital environment.

To advance AI in the context of these findings, methodological innovations in research are paramount. Future studies should adopt a cross-disciplinary approach, integrating methodologies from education, linguistics, computer science, and Human Computer Interaction. Longitudinal studies could provide insights into the long-term effects of AI-assisted language learning, while comparative studies might offer evidence on the efficacy of different AI models and approaches.

Additionally, employing ethnographic methods can offer deeper insights into the socio-cultural dynamics of using AI for language learning in diverse communities.

In light of the limitations identified, future work should prioritize broadening the diversity of participant demographics to encompass a wider range of linguistic, cultural, and socio-economic backgrounds. This expansion would not only enrich the dataset but also enhance the generalizability of findings across different communities. Specifically, engaging with a variety of communities in both community-specific and more generalized research settings with children will offer deeper insights into the nuanced preferences and challenges faced by diverse groups in language learning through AI. Furthermore, integrating quantitative methods alongside qualitative research will provide a more holistic view of the impact of AI on language learning. This dual-method approach would allow for the correlation of qualitative insights with quantitative data on learning outcomes, user engagement, and the effectiveness of AI tools in real-world educational settings.

The future work emanating from this research presents an exciting opportunity to redefine the role of AI in language education, particularly for native language learning and revival. By focusing on culturally sensitive, ethical, and personalized AI tools that bridge generational gaps and enhance language script learning, researchers can contribute to the development of AI applications that not only support language proficiency but also foster a deeper connection to cultural heritage. Through methodological innovations and cross-disciplinary collaborations, the future of AI in language learning holds the promise of more inclusive, effective, and engaging educational experiences for children worldwide.

5.5 Reflecting back and across on literature and what it means

Reflecting on the literature and its implications reveals a nuanced landscape where language, culture, and technology intersect, offering insights into the current state of research and paving the way for future work. This reflection uncovers the critical gaps in literature, particularly in the integration of artificial intelligence (AI) in educational contexts, and provides a critical analysis of these gaps, suggesting directions for future research.

The significance of storytelling as a tool for language learning and cultural preservation emerges as a pivotal theme. Storytelling, especially when enhanced by AI, has the potential to support language acquisition in novel and engaging ways, catering to the linguistic and cultural needs of learners (Wang et al., 2023; Sharples, 2023). However, the literature indicates a gap in exploring the full potential of AI in storytelling for language learning, particularly in the context of cultural nuances and intergenerational transmission of knowledge (Axelrod and Kahn, 2019; Zastudil et al., 2023).

Another challenge is ensuring the development of AI tools that not only resonate with educational goals but also harmonize with the cultural and linguistic diversity of learners. The research illustrates that while there is an increasing recognition of the importance of cultural sensitivity in AI design, the practical application of these principles is often lacking, leading to tools that may not fully engage the target audiences (Wan et al., 2023; Xiaohong and Wang, 2021).

Moreover, the research underscores the importance of cultural sensitivity and ethical considerations in developing AI tools for education (Wan et al., 2023; Xiaohong and Wang, 2021;

Maitra, 2020; Qadri et al., 2023). It highlights the need for community-driven AI design that acknowledges and respects cultural diversity. Yet, there is a critical gap in how these considerations are systematically integrated into the design and implementation of AI solutions in educational settings.

Focusing on research with children highlights the significance of adopting innovative methodologies to meet their unique learning needs and preferences. Children's engagement with language learning and cultural education can be significantly enhanced through AI-powered storytelling and interactive tools that cater to their interests and learning styles. However, the literature reveals a gap in involving children in the design process of these tools, which could lead to more personalized and effective learning experiences (Lucarevski, 2016; Axelrod and Kahn, 2019).

Reflecting on my work within this context, it is evident that while the study has contributed to understanding the intersection of AI, language learning, and cultural preservation, there remains a vast terrain unexplored. Future work should focus on addressing the identified gaps by exploring the integration of cultural sensitivity and ethical considerations into AI design processes. Research should also aim to uncover the potential of AI in facilitating intergenerational storytelling, engaging communities in the preservation of their linguistic and cultural heritage.

Chapter 6: Conclusion

In this thesis, we have embarked on an exploratory journey to uncover the intricacies of integrating Artificial Intelligence (AI) into language learning, with a particular focus on preserving and revitalizing languages and nurturing cultural connections. Through a meticulous analysis that weaves together a scoping review, design sessions, and a deep dive into ethical considerations, this research has illuminated the vast potential and the complex challenges of harnessing AI to support language education. The endeavor was rooted in a dual-methodology approach, combining a broad thematic analysis with focused insights gained from participatory design sessions involving children and their parents. These sessions provided a unique lens through which the design preferences, ethical concerns, and cultural sensitivities of learners were intricately examined.

Central to this investigation was a personal quest to understand how AI might serve as a catalyst for preserving linguistic diversity, particularly for non-western languages like Telugu. The research unfolded against a backdrop of alarming statistics regarding language endangerment, highlighting the urgency of developing effective, innovative, and culturally sensitive educational tools. By drawing upon AI's capabilities—from personalized learning experiences to digital storytelling and beyond—this study sought to chart a course for future educational technologies that honor cultural heritage while embracing the transformative potential of AI.

This thesis thus serves as a critical examination of the current landscape of AI in education, scrutinized through the prism of language learning and cultural preservation. It bridges theoretical frameworks with practical applications, offering a comprehensive analysis that contributes to the broader discourse on the role of technology in education. The journey through this research has

not only shed light on the potential of AI to enhance language learning experiences but has also underscored the importance of ethical frameworks, community involvement, cultural sensitivity and practical implementation needs of children in the development of AI tools. As we navigate the conclusion of this thesis, we reflect on the key findings and the significant contributions this research makes to the field.

6.1 Summary of key findings

This research has unveiled several key findings that highlight the complexities and potential of integrating Artificial Intelligence (AI) into language learning environments. These findings underscore the transformative role AI can play in language education, especially in the potential context of preserving endangered languages and fostering cultural connections.

1. Contextual Personalization and Cultural Sensitivity in AI Tools

A significant finding of this study is the paramount importance of contextual personalization in AI-enhanced language learning tools. The research revealed a clear preference among participants for AI systems that adapt learning experiences to individual needs and cultural backgrounds. This adaptation not only enhances engagement and motivation but also fosters a deeper connection to the language being learned. Furthermore, the study illuminated the necessity for AI tools to be culturally sensitive, accurately representing and respecting the diverse cultural heritages of learners. Such sensitivity is critical in ensuring that AI not only aids in language acquisition but also in the preservation and appreciation of cultural identities.

2. Bridging Generational Gaps Through AI

Another pivotal finding is AI's potential to bridge generational gaps in language learning. By facilitating interactive and collaborative experiences, AI can serve as a conduit for cultural and linguistic knowledge between generations. This aspect was particularly highlighted in design sessions, where the literature expressed a desire for AI tools that could help children learn from and connect with older family members. However, this potential is contingent upon the development of AI systems that are accessible and intuitive for all ages, proving to aid and not hinder collaborative efforts, underscoring the need for user-friendly designs that cater to both young learners and their elders.

3. Ethical Considerations in AI Development

The research also delved into the ethical considerations surrounding the use of AI in educational settings. It identified a strong consensus on the need for ethical AI frameworks that prioritize transparency, data privacy, informed consent, and the mitigation of biases. Ensuring that AI tools in language learning are developed and implemented ethically is crucial in maintaining the trust and confidence of users. This entails a commitment to addressing potential biases in AI algorithms and content, thus preventing the perpetuation of stereotypes, and ensuring equitable access to educational opportunities.

4. Design Preferences for Child-AI Interaction

Insights from participatory design sessions with children highlighted specific design preferences for AI-enhanced learning tools. Children favored voice-text hybrid interactions with AI, indicating a preference for speaking to AI for assistance but receiving responses in text form, which was

perceived as more conducive to learning. Additionally, there was a strong interest in AI tools that support creative storytelling and artistic expression, suggesting a desire for AI that not only aids in language learning but also stimulates creativity and personal expression.

5. The Role of AI in Cultural Storytelling and Preservation

Finally, the study underscored the role of AI in facilitating cultural storytelling and preservation. Participants expressed a keen interest in using AI to create and share stories that reflect their cultural heritage, pointing to the potential of AI to serve as a digital custodian of cultural narratives. This highlights an important avenue for AI in education: leveraging technology not just for language learning but also for ensuring the longevity and accessibility of cultural stories and knowledge.

These key findings offer a nuanced understanding of the complex interplay between AI, language learning, cultural preservation, and ethical considerations. They reflect a landscape ripe with opportunities and challenges, signaling a pivotal moment in the evolution of educational technologies. As we look toward the future, these insights lay the groundwork for developing AI-enhanced language learning tools that are not only effective and engaging but also culturally sensitive and ethically sound, ensuring a rich, inclusive, and equitable learning experience for all.

6.2 Research contributions

This thesis represents a significant contribution to the interdisciplinary landscape, spanning the fields of Human-Computer Interaction (HCI), educational technology, linguistics, and ethics, with a central focus on the design of integrating Artificial Intelligence (AI) into language learning for children. Emphasizing cultural preservation and ethical considerations, this research offers a nuanced examination of AI's role in enhancing educational experiences while fostering a deeper connection to linguistic and cultural heritage. The findings and discussions presented herein not only advance the academic discourse in each of these fields but also provide practical insights and frameworks that can inform future technological developments and policy formulations.

In the realm of Human-Computer Interaction (HCI), this thesis presents a major contribution through its use of participatory design techniques to explore child-centric AI design. By bringing together children and their parents, it captures the nuanced tensions between children's needs and parents' perspectives, as well as the insights of elders on pedagogical practices. This approach not only emphasizes community involvement but also generates rich data that inform designs which balance the needs of children with the concerns of parents. While focusing on the Telugu-speaking demographic, the findings of this thesis hold potential applicability to other languages at risk, providing a broad framework for designing solutions that are culturally sensitive and educationally effective.

The use of ChatGPT in this thesis introduces an innovative methodology for scoping reviews, portraying a novel approach to filtering papers and conducting thematic analysis. By employing ChatGPT as a virtual peer reviewer, this study enhances the traditional review process.

Specifically, it utilizes carefully crafted prompts to validate the content of articles rigorously, avoiding reliance on potentially inaccurate AI-generated summaries. This approach not only streamlines the often tedious and time-consuming manual aspects of literature reviews but also accelerates the process, making it particularly valuable for projects under tight deadlines. Additionally, the thesis corroborates the findings obtained from ChatGPT with manual reviews, establishing confidence in the reliability of generative AI models like ChatGPT when used with precise prompts for accurate Literature reviews.

From the perspective of educational technology, this thesis highlights the critical need for personalized and culturally sensitive AI tools in language education. It showcases the vast potential of AI to offer learning experiences that are not only tailored to the individual learner's needs but also deeply respectful of their cultural backgrounds. Additionally, by delving into the ethical dimensions of AI use in education, this research offers comprehensive frameworks for ethical AI development, addressing key issues such as data privacy, bias mitigation, and the preservation of cultural integrity. These contributions are crucial for educators, technologists, and policymakers as they navigate the ethical complexities of integrating AI into learning environments.

Overall, this thesis stands at the confluence of multiple disciplines. Its interdisciplinary contributions not only advance academic understanding in these fields but also provide a solid foundation for future research and development efforts. By advocating for user-centered, ethically informed, and culturally sensitive approaches to AI in education, this research paves the way for a future where technology enhances learning experiences in a manner that is equitable, inclusive, and respectful of cultural heritage.

In conclusion, this thesis has traversed the multifaceted landscape of integrating Artificial Intelligence (AI) into language learning, uncovering the profound potential and inherent challenges of utilizing technology to preserve linguistic diversity and foster cultural connections. Through a methodical exploration that melds a scoping review with participatory design sessions and a critical examination of ethical frameworks, we have illuminated the pathways for creating AI-enhanced educational tools that are not only effective and engaging but also ethically sound and culturally sensitive.

The journey through this research has highlighted the importance of community-driven design, the need for voice-text hybrid interaction models, the significance of language script support in native languages, and the crucial role of AI in intergenerational learning and cultural storytelling. By delving into these aspects, this thesis contributes to the fields of Human-Computer Interaction and educational technology offering insights and frameworks that can guide future technological developments and educational practices with the hope of applying these concepts to potentially save other languages and especially those that are on the edge of dormancy. As we stand on the brink of a new era in education, where AI holds the promise to revolutionize language learning and cultural preservation, this research serves as a Call to action for future research and development.

This study guides the way towards a future where technology and humanity converge in harmony, ensuring that the rich tapestry of human language and culture is not only preserved but also cherished and celebrated for generations to come.

Appendices

Appendix A: KidsTeam Participatory Design Session Plan – USA

AI Cultural Storytelling Design Session – English Speaking Children

Date: 16 Nov 2023

Place: KidsTeam Research Lab, HCIL, University of Maryland

Format: In-Person

No. of participants: 8

Background: Children are accustomed to participatory and co-design sessions and have previous exposure to using AI tools.

Materials: Paper, markers

Goal for the session: The goal is to explore children's preferences in utilizing AI for culturally relevant storytelling, focusing on how they envision AI enhancing their narrative creation and expression of cultural heritage.

4:00 – 4:10: “Snack” - getting ready

Snack // Hanging out // “reducing power dynamic; building relationships/trust.

4:10 – 4:30: Circle Time

Question Of the Day

The question of the day helps us all think about the content area of the day’s session before the design activities.

Q: Can you share a unique word from your heritage language that relates to your artifact and tell us what it means?

4:30 – 5:15: Design Activity

Objective: To encourage children to write the story of their cultural artifacts and imagine how AI could enhance this storytelling process.

Design Prompt: Write the story of your cultural artifact and imagine how AI can assist. Consider any AI elements that might enrich your narrative, aid in creativity, or help in sharing your story more effectively.

Introduction to AI in Storytelling (5mins):

- Engage in a discussion about culture, the critical role of language, and introduce the concept of language endangerment.
- Discussion Prompt: “How would you feel if nobody is speaking English anymore? What do you think you won’t be able to do when you stop speaking English?”
- Brief overview of how AI can assist in storytelling.

Story Crafting (15 minutes): (Storyboarding)

- Each participant receives Big paper to write the story of their artifact, inspired by their cultural heritage and the earlier discussion.
- Encourage them to include details like characters, settings, images, drawings, descriptions, cultural practices, and any language terms.

Imagining AI Assistance (10 minutes):

- After writing their stories, participants are prompted to think about how AI could help in telling their story more effectively.
- Children draw or write how they imagine an AI tool could enhance their written stories. This could include voice narration in different languages, interactive elements, or digital illustrations.
- Encourage creative thinking about AI features that respect and amplify cultural elements in their stories.
- Children will explore various methods they wish to use for preserving this story and others they may write in the future, considering how AI could support them in this endeavor.
- Adults help note down the ideas on sticky notes or illustrate the ideas.

* ‘Story Crafting’ & ‘Imagining AI assistance’ can happen simultaneously

Prompts for adults to ask children:

- How could AI help you brainstorm or organize these ideas more creatively?
- As you describe the settings or characters in your story, imagine an AI tool that could bring these descriptions to life. Could AI create images or animations based on your words?
- Imagine your story as an interactive experience. How could AI make your story more engaging?
- Once your story is complete, consider how AI could help you share it with others. Could AI turn it into a digital book, a spoken narrative, or even a mini movie?
- How do you imagine AI could help keep your story alive and accessible for many years? Think about ways AI could preserve, share, or even add to your story in the future.

Children will work individually for this project. The below pairing is only for grouping the kids with adults.

	Group 1	Group 2	Group 3
Kid Partners:			
Adult Partner(s):			
Floaters			

Assign kids and adults into groups.

5:15/5:20 – 5:28: Presentations and Themes

Each group presents ‘big ideas;’ adult captures on whiteboard. Participants share their stories and their ideas for AI enhancements with the group.

- Mention one key element or aspect of the story related to the artifact.
- Pick two specific AI features they are most excited about and explain why.
- Mention whom they would like to share this story with (e.g., friends, grandparents) and how they envision AI can assist.
- End with a quick statement on what preserving their cultural story means to them and how AI could play a role in it.
- Each idea from the kids is noted on a whiteboard by an adult.

5:30 - 5:45: Debrief

Adults will debrief on their impressions and observations from the session.

Appendix B: KidsTeam Participatory Design Session Plan – India

AI Cultural Storytelling Design Session – Telugu Speaking Children

Dates: 29 Dec 2023 to 14 Feb 2024

Place: Children's home

Format: Hybrid (In-Person and Online)

Background: Children have not previously participated in co-design or participatory design sessions and have no exposure to using AI tools

Materials: Paper, Pad, pens, pencils

Goal for the session: The goal is to explore children's preferences in utilizing AI for culturally relevant storytelling, focusing on how they envision AI enhancing their narrative creation and expression of cultural heritage.

10mins: Introduction

- Engage in a discussion about culture, the critical role of language, and introduce the concept of language endangerment.
- Discussion Prompt: "How would you feel if nobody is speaking Telugu anymore? What do you think you won't be able to do when you stop speaking Telugu?"
- Purpose: To set a reflective tone on cultural and linguistic identity, fostering a deeper connection with their heritage.

5mins: Artifact Retrieval

Ask participants to bring a cultural artifact from their home.

10mins: Question of the Day

The question of the day helps us all think about the content area of the day's session before the design activities.

Q: Can you share the word in Telugu that relates to your artifact and tell us what it means?

25mins: Design Activity - Storyboarding

Objective: To encourage children to write the story of their cultural artifacts and imagine how AI could enhance this storytelling process.

Design Prompt: Write the story of your cultural artifact and imagine how AI can assist. Consider any AI elements that might enrich your narrative, aid in creativity, or help in sharing your story more effectively.

- Each participant receives a paper to write the story of their artifact, inspired by their cultural heritage and the earlier discussion.
- Encourage them to include details like characters, settings, images, drawings, descriptions, cultural practices, and any language terms.

5mins: Introduction to AI and ChatGPT4

- Objective: To introduce children to the potential of AI in enhancing cultural storytelling.
- Explain how AI, like ChatGPT4, can assist in storytelling by providing Image generations, language assistance, and more.

20mins: Feedback and Design Ideas

- Participants are prompted to think about how AI could help in telling their story more effectively.
- Children draw or write how they imagine an AI tool could enhance their written stories. This could include voice narration in different languages, interactive elements, or digital illustrations.
- Encourage creative thinking about AI features that respect and amplify cultural elements in their stories.
- Children will explore various methods they wish to use for preserving this story and others they may write in the future, considering how AI could support them in this endeavor.
- Adults help note down the ideas on sticky notes or illustrate the ideas.

Prompts to ask children:

- How could AI help you brainstorm or organize these ideas more creatively?
- As you describe the settings or characters in your story, imagine an AI tool that could bring these descriptions to life. Could AI create images or animations based on your words?
- Imagine your story as an interactive experience. How could AI make your story more engaging?
- Once your story is complete, consider how AI could help you share it with others. Could AI turn it into a digital book, a spoken narrative, or even a mini movie?

- How do you imagine AI could help keep your story alive and accessible for many years? Think about ways AI could preserve, share, or even add to your story in the future.

15mins: Presentations and Themes

Participants share their stories and their ideas for AI enhancements with the group.

- Mention one key element or aspect of the story related to the artifact.
- Pick two specific AI features they are most excited about and explain why.
- Mention whom they would like to share this story with (e.g., friends, grandparents) and how they envision AI can assist.
- End with a quick statement on what preserving their cultural story means to them and how AI could play a role in it.

Appendix C: Interviews with parents and elders – India

This appendix outlines interview questions with parents and elders in India, focusing on their views about children's use of AI in educational and creative contexts.

General Questions

- What are your initial thoughts on AI technology being used by children, especially in educational or creative contexts?
- How do you think AI can contribute to your child's learning and creativity?

Ethical and Cultural Integrity

- What are your primary concerns regarding your child's interaction with AI, particularly in terms of ethical considerations?
- How important is it for AI platforms to respect and correctly use the Telugu language in your opinion? Can you provide examples of what this respect looks like to you?
- In what ways do you believe AI should incorporate cultural elements to ensure the integrity and authenticity of your heritage?
- Have you encountered any AI tools that you felt misrepresented or failed to accurately reflect your culture? How did that impact your or your child's perception of AI?

Intergenerational Collaboration

- How do you view the role of grandparents or senior community members in guiding or participating in children's use of AI?
- Can you suggest ways in which AI platforms could facilitate or enhance intergenerational learning and sharing of cultural knowledge?

Children's Design Preferences

- How do you feel about AI that can speak to your child, enhance their drawings, suggest spellings, and help with fact-checking? Do you see these features as beneficial or potentially problematic?
- Are there any specific safeguards or features you would like to see in AI tools to ensure they are suitable for children, especially in terms of content and language use?
- How important is it for AI to be able to explain topics in brief or suggest words to your child? Do you think this could significantly impact their learning experience?
- How do you balance the benefits of AI in education with the risk of over-reliance on technology for learning and creativity?

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