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Designing AI-Powered Language Learning Tools for Refugee Children: Balancing Intrinsic Motivation with Cultural and Linguistic Diversity

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Abstract. Refugee children constitute one of the most educationally marginalized populations worldwide. Language acquisition is a cornerstone for their integration, psychosocial well-being, and long-term opportunities, yet conventional humanitarian interventions often fail to provide sustained, high-quality, and culturally relevant language education. Advances in artificial intelligence (AI) present new opportunities to deliver personalized, adaptive, and scalable learning experiences. However, the integration of AI into refugee education raises complex challenges concerning cultural inclusivity, ethical responsibility, and learner motivation. This paper addresses the central question: How can AI-powered language learning tools be designed to intrinsically motivate refugee children while respecting their cultural and linguistic diversity? Drawing on self-determination theory (SDT), co-design methodologies, and culturally responsive pedagogy, this study synthesizes theoretical insights with case analyses of initiatives such as Ahlan SimSim and Kolibri. The findings suggest that intrinsic motivation is cultivated when AI tools support children's autonomy, competence, and relatedness while embedding culturally resonant content. The paper argues for participatory co-design with refugee communities, hybrid human–AI facilitation models, and robust ethical safeguards to ensure that AI systems empower rather than marginalize. Ultimately, responsible innovation requires balancing technological potential with socio-cultural sensitivity, offering a framework for equitable AI deployment in refugee education.

Keywords: Refugee Education, AI in Education, Intrinsic Motivation, Cultural Diversity, Language Learning

1. Introduction

The global refugee crisis has reached unprecedented levels, with the United Nations High Commissioner for Refugees reporting that more than 43 million children are displaced worldwide [1]. These children face profound barriers to education, including inadequate infrastructure, a shortage of trained teachers, limited curricula in native languages, and widespread psychosocial trauma [2]. Language acquisition is particularly critical: without proficiency in either host-country

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languages or global lingua francas, refugee children are excluded from academic opportunities, social participation, and future employment [3].

Meanwhile, AI-driven educational technologies have begun to transform learning environments globally. Adaptive learning systems, natural language processing, and embodied conversational agents now enable individualized instruction at scale. These tools hold promise for refugee education, where resources are scarce and learning needs are highly diverse [4]. By tailoring learning trajectories and providing responsive feedback, AI can supplement overstretched educational systems and reach learners in remote contexts.

However, the uncritical adoption of AI in refugee education carries risks. Critics highlight that many systems are designed for dominant languages and Western cultural contexts, thereby reinforcing exclusion [5]. Moreover, AI platforms often rely on extrinsic incentives such as gamification, which may erode intrinsic motivation—particularly concerning for refugee children whose learning contexts are already fragile [6]. Ethical concerns regarding privacy, surveillance, and the replacement of human educators also remain unresolved [7].

This paper examines the central research question: How can AI-powered language learning tools be designed to intrinsically motivate refugee children while respecting their cultural and linguistic diversity? To address this, it integrates self-determination theory (SDT) as the motivational framework, co-design as a methodological approach, and culturally responsive pedagogy as a guiding principle.

The paper proceeds as follows: Section 2 reviews relevant literature on AI in early childhood education, refugee learning contexts, and motivational theory. Section 3 outlines the methodological framework. Section 4 analyzes case studies of Ahlan SimSim, Kolibri, and AI tutoring systems. Section 5 offers discussion and design recommendations, and Section 6 concludes with implications for research, policy, and practice.

2. Literature review

2.1. AI in early childhood education

AI technologies have become increasingly embedded in early childhood education. Adaptive systems such as Duolingo personalize instruction by tracking learner progress and dynamically adjusting task difficulty [8]. Relational robots like Tega employ affective computing to engage children in interactive narratives, aiming to sustain curiosity and emotional connection [9]. Empirical studies indicate that such systems can accelerate vocabulary acquisition and reading comprehension [10].

Yet concerns persist regarding motivation. Gamified elements—badges, leaderboards, points—may boost engagement in the short term but risk diminishing intrinsic motivation if children focus on rewards rather than learning itself [6]. Refugee children, many of whom experience instability and trauma, require educational experiences that build resilience and agency, not dependency on extrinsic reinforcement [11].

2.2. Refugee education challenges

Educational provision in refugee settings is consistently under-resourced. Host countries often lack policies or infrastructure to integrate refugee children, leading to segregated or informal schooling arrangements [12]. Language barriers exacerbate exclusion, as many children speak neither the host-country language nor humanitarian lingua francas [13].

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Innovations have emerged to address these gaps. Ahlan SimSim, an Arabic-language version of Sesame Street, provides culturally resonant educational programming to displaced children in the Middle East [14]. Kolibri, an offline, open-source learning platform, enables localized digital education in low-connectivity environments [15]. Both examples demonstrate that culturally and linguistically tailored interventions can mitigate exclusion. However, their scalability and adaptability to diverse refugee contexts remain limited.

2.3. Cultural and linguistic diversity in AI systems

Most AI systems are trained on data dominated by English and other global languages, marginalizing minority dialects and epistemologies [5] warns that AI in education risks homogenizing content and reinforcing linguistic hierarchies [15]. Platforms like Kolibri illustrate an alternative model by enabling offline access and multilingual content adaptation [15].

Culturally responsive pedagogy emphasizes that educational tools must draw on learners' cultural knowledge, values, and languages [16]. In refugee contexts, where cultural identities are often contested and fragile, failing to honor diversity risks alienating learners. Co-design with local educators, parents, and children is essential to ensure contextual appropriateness and avoid epistemic injustice [17].

2.4. Intrinsic motivation and self-determination theory

Self-determination theory (SDT) posits that intrinsic motivation flourishes when learners' needs for autonomy, competence, and relatedness are met [18]. For refugee children, autonomy may involve agency in choosing learning pathways; competence entails structured opportunities to experience mastery; relatedness reflects the importance of social belonging and cultural recognition [19].

AI systems that integrate these principles show promise. Relational agents that adapt feedback to foster curiosity and collaboration can enhance persistence [20]. However, designs that ignore cultural specificity or prioritize efficiency over inclusivity risk undermining learner motivation and identity.

3. Methodology

This study draws on three interrelated frameworks to guide analysis and design:

Self-Determination Theory (SDT): Provides the lens for evaluating how AI systems foster intrinsic motivation by addressing the core psychological needs of autonomy, competence, and relatedness [18].

Co-Design: Advocates for the active involvement of refugee stakeholders (children, parents, educators) in developing AI tools, ensuring cultural relevance and ethical accountability [21].

Culturally Responsive Pedagogy: Frames the necessity of embedding local languages, traditions, and values into educational tools to avoid cultural alienation and reinforce identity [16].

Methodologically, the study conducts a conceptual synthesis supported by case study analysis. Initiatives including Ahlan SimSim, Kolibri, and relational AI tutors are analyzed against the three frameworks above. This approach enables the derivation of transferable design principles applicable across diverse refugee contexts, balancing theoretical rigor with practical relevance.

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4. Results

4.1. Ahlan Simsim

Ahlan SimSim, launched by Sesame Workshop and the International Rescue Committee, offers early childhood programming tailored to displaced children in the Middle East [14]. By embedding Arabic cultural contexts (e.g., regional storytelling traditions, familiar community settings), multilingual representation (Arabic dialects + local minority languages), and psychosocial support (trauma-informed activities), it delivers both educational and therapeutic value.

Though not AI-driven, Ahlan SimSim illustrates three principles critical for AI tool design: (1) embedding familiar cultural symbols enhances relatedness (e.g., characters engaging in regional customs), (2) addressing trauma through scaffolded activities fosters competence (e.g., step-by-step problem-solving tasks), and (3) multilingual programming supports autonomy in identity formation (e.g., choosing to learn in a native dialect vs. host-country language).

4.2. Kolibri

Kolibri, developed by Learning Equality, is an offline platform designed for low-resource contexts [15]. Its open-source architecture allows for two key adaptations critical for refugees: (1) content localization (e.g., integrating community-generated lessons on local history or traditions) and (2) multilingual adaptation (supporting over 50 languages, including minority dialects like Rohingya or Tigrinya).

While not reliant on advanced AI, Kolibri highlights two non-negotiable features for AI tools in refugee settings: offline functionality (addressing unstable or non-existent internet access in camps) and community adaptability (enabling local stakeholders to modify content without technical expertise). These features directly address barriers to access that many AI systems overlook.

4.3. AI tutoring systems and relational robots

AI tutoring platforms such as Duolingo demonstrate the potential of adaptive personalization—e.g., adjusting vocabulary drills based on learner errors [8]. Relational robots like Tega use affective computing to engage children, such as modifying tone or feedback based on emotional cues [9]. However, both face critical limitations in refugee contexts:

Cultural misalignment: Robots designed for Western classrooms (e.g., Tega's focus on individual achievement) may not resonate with refugee children from collectivist cultures, where collaborative learning is prioritized.

Linguistic gaps: AI tutors like Duolingo lack support for low-resource languages (e.g., Somali, Chadian Arabic) that are widely spoken by refugee populations [8].

These limitations underscore the need for participatory co-design to ensure AI tools align with the cultural and linguistic realities of refugee children.

5. Discussion

5.1. Fostering intrinsic motivation through SDT

To cultivate intrinsic motivation in refugee children, AI tools must explicitly address autonomy, competence, and relatedness:

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Autonomy: Provide meaningful choices (e.g., selecting avatars that reflect cultural identities, choosing between story-based or game-based learning pathways) rather than rigid, one-size-fits-all curricula.

Competence: Scaffold tasks to ensure incremental progress (e.g., starting with basic vocabulary tied to daily life—"water," "school"—before advancing to complex sentences) and provide specific, growth-oriented feedback (e.g., "You remembered 3 new words about family—great work!" instead of "Correct/Incorrect").

Relatedness: Prioritize collaborative features (e.g., peer-learning modules where children work together to solve cultural puzzles) and culturally resonant narratives (e.g., stories about displaced children rebuilding communities, featuring characters with similar backgrounds).

5.2. Participatory co-design with refugee communities

Co-design is not a "nice-to-have" but a necessity for ethical AI in refugee education. Recommended practices include:

Ethnographic pre-design: Conducting interviews or observations with refugee children, parents, and educators to understand cultural norms (e.g., attitudes toward technology, preferred learning styles) before developing prototypes.

Iterative prototyping: Testing early versions of AI tools with refugee children in camps or host communities, and incorporating feedback into successive iterations (e.g., modifying a robot's appearance to avoid cultural offense, adding content on cultural holidays).

Capacity building: Training local educators or community leaders to maintain and adapt AI tools long-term, reducing dependency on external organizations.

5.3. Cultural and linguistic inclusivity

AI systems must be designed to center, not erase, refugee children's diversity:

Linguistic support: Invest in training AI models on low-resource languages, using community-generated data (e.g., recordings of local stories or conversations) to ensure accuracy.

Cultural representation: Avoid stereotypes (e.g., depicting refugees only as victims) and include diverse identities (e.g., refugee children with disabilities, LGBTQ+ refugee youth) in content.

Flexible customization: Allow local stakeholders to modify cultural elements (e.g., changing food references in lessons to reflect regional diets, adjusting holidays celebrated in activities).

5.4. Hybrid human–AI models

AI should supplement, not replace, human educators—especially in refugee contexts where relational trust is critical. Hybrid models include:

AI as a facilitator: AI tools handle administrative or repetitive tasks (e.g., grading vocabulary quizzes) so educators can focus on emotional support (e.g., addressing trauma, building relationships).

Human oversight: Educators or community leaders review AI-generated content to ensure cultural appropriateness and intervene when learners struggle (e.g., stepping in to explain a concept if the AI's feedback is confusing).

5.5. Ethical and practical safeguards

To ensure AI tools empower rather than harm refugee children:

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Data privacy: Adopt child-friendly data protection (e.g., not collecting biometric data like facial recognition, deleting data when a child leaves the program) and communicate policies in local languages.

Transparency: Explain AI decision-making in simple terms (e.g., "This lesson is about family because you liked the last family story") to avoid "black box" confusion.

Offline compatibility: Follow Kolibri's model to ensure tools work without internet, addressing connectivity barriers in camps and informal settlements [15].

Open-source licensing: Use open-source code to reduce dependency on corporate platforms and enable community modifications [22].

6. Conclusion

AI-powered language learning tools hold transformative potential for refugee education, but their success depends on centering intrinsic motivation and cultural diversity. Drawing on SDT, co-design, and culturally responsive pedagogy, this paper argues that effective AI tools must foster autonomy, competence, and relatedness while embedding culturally inclusive content.

Case studies of Ahlan SimSim and Kolibri demonstrate that culturally responsive, accessible designs are feasible—though scaling these principles to AI systems remains a challenge. Future research should prioritize empirical trials of AI prototypes in refugee camps and host communities, measuring both educational outcomes (e.g., language proficiency gains) and psychosocial impacts (e.g., increased sense of belonging).

For policymakers and practitioners, the imperative is clear: AI should augment, not replace, human educators. Technological innovation must align with human dignity, ensuring that refugee children receive not just language skills, but also the agency and confidence to thrive. Ultimately, equitable AI in refugee education requires balancing efficiency with cultural sensitivity—a balance that is not just ethical, but essential for meaningful learning.

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