Localized Intelligence: Designing an AI-Enhanced OER Course for Faculty Development in a Low-Resource Language Context

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Abstract

This study presents findings from a design-based research (DBR) project exploring the integration of generative AI tools into the instructional design of a Universal Design for Learning (UDL)-based faculty development course in Kazakh, a low-resource, non-English language context in Kazakhstan. Tools including ChatGPT, DALL·E, YesChat, and H5P were used to develop asynchronous modules aligned with UDL principles. The course was iteratively refined using the Successive Approximation Model (SAM) and informed by direct faculty feedback.

Findings reveal three key design tensions: *linguistic mismatch*, *cultural drift*, and the need for *human-in-the-loop* instructional adaptation. The paper introduces the concept of *localized intelligence*, a pedagogical principle that frames instructional design with AI as a situated and context-responsive practice, guided by human expertise. This approach challenges assumptions of AI scalability and offers a replicable model for designing inclusive, culturally aligned professional learning experiences, with implications for multilingual faculty development across global contexts.

Keywords: localized intelligence, Universal Design for Learning, AI in education, low-resource languages, faculty development, generative AI, instructional design.

Introduction

Most current research and design practices in AI-supported instruction operate under assumptions of English fluency and high-bandwidth digital environments. However, the realities of faculty development in much of the world, especially in linguistically underrepresented contexts, are starkly different. In these settings, generative AI often struggles to produce coherent, culturally grounded content (Mills, Bali, & Eaton, 2023; Bradshaw & McDonald, 2023). This paper presents early-stage findings from a design-based research (DBR) study on how generative AI tools can be leveraged to support Universal Design for Learning (UDL) in a faculty professional development course delivered in Kazakh, an agglutinative language with limited digital resources (CAST, 2024).

Rather than reporting on learning outcomes, this study explores the instructional design process itself: examining the tensions, decisions, and insights that emerged when adapting a UDL-aligned course into a linguistically and culturally specific format. In doing so, the paper introduces the concept of *localized intelligence* as a pedagogical principle informed by iterative co-design, situated cognition, and the recognition of linguistic diversity as a form of epistemic value. While grounded in instructional design, it draws conceptually from frameworks such as cultural-historical activity theory and indigenous knowledge systems, which position learning as relational and context-bound.

Design Context

This research took place within the development of an asynchronous faculty training course focused on inclusive teaching through UDL. Initially created in English, the course was adapted into Kazakh using a combination of generative AI tools and interactive design platforms. ChatGPT was used to scaffold translated instructional texts, develop culturally appropriate case examples, and reframe assessments. DALL·E supported the creation of visuals aligned with local classroom environments. YesChat, a freely available Kazakh-language AI chatbot, was incorporated during course development to enhance linguistic fidelity and provide localized phrasing (Shilibekova, 2025), acknowledging broader national efforts to integrate AI into education (Zholdigaly, Zhumabayeva, & Abdykerimova, 2024). H5P modules were embedded to support the UDL principle of multimodal engagement and learner interaction.

Refinement of all AI-generated content was led by the author, a native Kazakh speaker and instructional designer, drawing on direct feedback from faculty reviewers. Instructional goals remained grounded in the three UDL pillars: engagement through contextual relevance, representation through diverse formats, and expression through multiple modes of participation (CAST, 2024). These principles directly informed the AI integration strategy, for instance, DALL·E was employed to enhance visual representation, ChatGPT supported multimodal textual explanations, and H5P modules enabled learners to express understanding through interactive elements.

Design-Based Research (DBR) Phases 1 and 2 included cycles of prototype creation, internal critique, and feedback from Kazakh-speaking faculty participants. These iterative cycles shaped not only the surface content but also the prompt engineering, linguistic tone, and interactive structure of the course materials. The course was hosted on Articulate Rise. All participants engaged voluntarily, and the project followed institutional ethical guidelines. The course was released as an open educational resource (OER) under a Creative Commons Attribution license, enabling adaptation and reuse in other non-English educational contexts. This open model supports future scalability and localization beyond Kazakhstan.

Methodology

This paper draws on data and design decisions from DBR Phases 1 and 2. A mixed-methods approach was used to document design iterations and collect qualitative feedback from faculty. Data sources included:

- **Instructional Design Logs**: Documenting prompt iterations, design rationales, and revision cycles across multiple drafts and platforms.
- **AI Output Artifacts**: Capturing raw and revised content generated through ChatGPT (text), DALL·E (visuals), YesChat (linguistic refinement), and H5P (interactive elements).
- **Faculty Feedback**: Thematic insights gathered from structured peer reviews and narrative reflections provided by Kazakh-speaking faculty reviewers after testing early prototypes.

The overall instructional design approach followed the Successive Approximation Model (SAM), which emphasizes quick prototyping, regular feedback, and continuous iteration (Allen, 2018). This framework enabled rapid testing of AI-generated instructional elements within each cycle, integrating local language and cultural specificity through targeted revision. Each phase involved collaborative critique between the instructional designer (author) and pilot faculty participants, ensuring alignment with UDL principles while accommodating context-specific constraints. This iterative refinement process was central to uncovering how AI tools could support, or limit, localized instructional coherence in low-resource environments.

In alignment with DBR principles, the study integrated both formative design insights and structured feedback cycles into the research process. Six faculty members from pedagogy, philology, and educational sciences departments were involved in the initial design review phase, providing feedback on early prototypes. These same participants, along with nineteen additional faculty members from related disciplines, later completed the asynchronous course and submitted embedded surveys and open-ended reflections.

Thematic analysis was used to identify recurring concerns related to translation quality, conceptual clarity, and cultural alignment. Thematic coding was conducted inductively to allow grounded insights to emerge from faculty responses. Triangulation across faculty input, AI outputs, and design logs enhanced the trustworthiness of emerging findings. Feedback data were manually coded and compared with instructional design logs to confirm thematic consistency, while AI outputs were reviewed against faculty critiques to validate interpretation and revision patterns. This ensured that design decisions reflected grounded, context-specific insights and were shaped by multiple forms of evidence.

Findings

Three design tensions emerged as central to the adaptation process:

Linguistic Mismatch

Outputs generated by ChatGPT in Kazakh were often grammatically sound but semantically ambiguous. YesChat improved sentence-level fluency but lacked discipline-specific terminology and pedagogical clarity. Faculty reviewers noted that AI-generated translations of key instructional concepts, such as 'inclusive instruction,' often defaulted to vague or policy-neutral phrasing. While technically correct, these translations did not reflect the institutional discourse commonly used in Kazakh higher education and were revised accordingly. Faculty reviewers played an essential role in adapting these terms into contextually coherent academic expressions, illustrating the importance of human co-authorship in refining semantic intent.

Cultural Drift

English-source content frequently included metaphors or examples that did not align with the Kazakh educational context. AI-generated visuals from DALL·E reflected Western norms, requiring reprompting and manual curation. One reviewer noted that DALL·E-generated images of classrooms often depicted Western posters and student attire, which felt unfamiliar and disconnected from local norms. Prompt engineering evolved to include cultural cues and localized semantic anchors.

Human-in-the-Loop Instructional Adaptation

Effective course development required cycles of prompting, critique, editing, and adaptation. H5P was used not only for content delivery but as a prototyping space for learner engagement patterns. Instructional quality improved as prompt templates were refined and reviewed alongside feedback from faculty reviewers.

In many cases, linguistic ambiguity and cultural misalignment compounded one another, particularly around pedagogical idioms, reinforcing the need for sustained human-AI iteration. Faculty noted appreciation for context-sensitive examples and multimodal activities, while also flagging issues with tone, abstraction, and consistency in AI-generated phrasing. The need for academic precision in Kazakh and sensitivity to local educational expectations was emphasized repeatedly.

Discussion

The concept of *localized intelligence*, as proposed in this study, refers to a pedagogical principle that positions AI-supported instructional design as an inherently human-led, culturally aware, and linguistically responsive process. As a principle, *localized intelligence* guides the intentional and iterative design of instructional content through human-AI collaboration, emphasizing linguistic clarity, cultural relevance, and pedagogical integrity in

non-English, low-resource settings. While *localized intelligence* overlaps with personalization and adaptive learning, it differs in its emphasis on linguistic agency, human-in-the-loop refinement, and epistemic sovereignty. These findings are limited to the design and feedback phases of one course in a single linguistic context. Further work is needed to explore its transferability across different languages, cultures, and institutional settings.

This case challenges the assumption that generative AI is easily scalable across languages and contexts, whether in terms of linguistic precision, cultural relevance, or pedagogical applicability. As the Brookings Institution notes, generative AI systems are predominantly trained on data-rich languages, which structurally disadvantages low-resource languages in terms of model performance and representation (Brookings Institution, 2023). Instead, it reveals how instructional design must be adapted for multilingual equity and inclusion (Bozkurt, 2023; Bradshaw & McDonald, 2023).

The findings illustrate that AI in education cannot be divorced from human oversight, particularly in contexts where translation is not simply linguistic but also cultural and epistemic. This aligns with the U.S. Department of Education's position that educators must remain central in the design and deployment of AI to ensure its adaptability to local pedagogical contexts and community needs (U.S. Department of Education, 2023).

These insights echo the work of Ghaderi (2023), who emphasizes equity in instructional design, and Williamson et al. (2024), who call for localized, relational approaches to educational inclusion. Localized intelligence offers a lens for multilingual, equity-centered adaptation that extends beyond OER contexts into wider instructional ecosystems.

Conclusion and Future Directions

This study offers a research-informed model for designing inclusive, AI-supported instructional content in low-resource, non-English contexts. By introducing *localized intelligence* as a pedagogical principle, the paper provides a conceptual framework for integrating human-in-the-loop instructional adaptation with generative AI technologies. Grounded in Universal Design for Learning (UDL) and operationalized through the Successive Approximation Model (SAM), the course design demonstrates how tools like ChatGPT, YesChat, DALL·E, and H5P can be meaningfully aligned with local pedagogical goals. Rather than promoting universal solutions, the study emphasizes responsiveness to linguistic and cultural nuance, positioning faculty as active co-designers.

The results underscore the need for continued human oversight in AI-enhanced learning environments, particularly in linguistically marginalized settings. Developed in the Kazakh language and released as an open educational resource (OER), the course

contributes to the global movement toward equitable, adaptable, and context-sensitive professional development for educators working in underrepresented linguistic contexts.

Future work will test localized intelligence in other non-English contexts, measure learning outcomes beyond design quality, and evaluate scalability across institutions.

Disclaimer

The views expressed in this paper are solely those of the author and do not represent the positions of Simon Fraser University, University Canada West, Atyrau State University, or any affiliated institutions.

Ethical Compliance

This study received approval from the Ethics Council at Atyrau State University (Protocol 4, May 15, 2024). All participant interactions, data handling, and research practices complied with approved ethical standards.

Licensing

AI Assistance

This manuscript was supported by Grammarly for grammar and clarity. All substantive content, analysis, and intellectual contributions remain the sole work of the author.

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