

Conceptualizing cultural adaptation through game-based learning among international students: evidence from a systematic scoping review

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ABSTRACT

International students frequently experience acculturative stress and social isolation during their transition to higher education. This systematic scoping review investigates how game-based learning (GBL) serves as a structured experiential system to support this cultural transition. Following the preferred reporting items for systematic reviews and meta-analyses extension for scoping reviews (PRISMA-ScR) protocol and population, concept, and context (PCC) framework, we screened five academic databases (2015–2025), identifying eight peer-reviewed articles from an initial pool of 608 records. Data were synthesized using a three-stage thematic analysis to map the structural pathways between pedagogical design and adaptation outcomes. The results indicate that GBL design elements, such as immersive simulations and role-play, foster cultural awareness by activating core learning mechanisms like social negotiation and reflective feedback. These findings reveal a three-layered conceptual architecture where GBL facilitates shifts across cognitive, affective, and behavioral dimensions to support identity-level transformation. This study implies that GBL can move beyond superficial engagement to provide a predictive roadmap for educators. Ultimately, this framework advances theoretical understanding by reconceptualizing adaptation as an iterative, mechanism-driven learning process rather than a passive transition, offering a theoretically grounded approach for designing robust cultural adaptation (CA) interventions in higher education.

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1. INTRODUCTION

The rapid evolution of educational technology (EdTech) has fundamentally reshaped how we approach modern learning experiences by offering innovative and interactive methods to enhance student engagement and knowledge retention. Moving away from conventional teaching methods, this shift centers on game-based learning (GBL), which provides immersive, interactive environments that make learning

more engaging and enjoyable. Research indicates that GBL enhances academic performance, increases student participation, and improves cognitive skill development [1]. Moreover, recent evidence suggests that GBL environments are particularly effective for facilitating cross-cultural communication and supporting language acquisition, thereby providing students with the cognitive and social skills necessary for successful adaptation [2], [3]. Specifically, GBL has been shown to foster creativity and improve learning efficacy in various educational contexts [4]. However, for many international students, the journey of adaptation often entails acculturative stress and psychological challenges. These difficulties may lead to significant psychological strain, anxiety, and social disconnection during the early stages of intercultural transition [5], [6]. To mitigate these hurdles, interactive game-based platforms have been highlighted as strategic pedagogical instruments for reinforcing the communicative foundations and cognitive competencies required for effective acculturation and supporting language acquisition, thereby providing students with the cognitive and social skills necessary for successful adaptation [7].

Drawing from international student perspectives and anecdotal evidence, GBL is already a popular choice for cultural exchange and orientation programs because it offers an immersive and interactive environment that makes cross-cultural learning more engaging and enjoyable. Although these potential advantages exist, rigorous research investigating GBL's effectiveness in facilitating cultural adaptation (CA) among overseas students is conspicuously lacking [8], [9]. Most of the current literature focuses on how GBL influences language acquisition and engagement, with far less attention given to social adaptation and cultural integration. Despite these clear advantages, we currently face a notable shortage of systematic evidence regarding GBL's role in significantly shaping international students' educational experiences, which in turn affects their overall well-being, social integration, and academic achievement [10]. For many international students, the journey of adaptation often involves acculturative stress, isolation, and difficulty adjusting to a new environment. These challenges can lead to significant difficulties, particularly psychological strain and social disconnection [11], [12].

GBL has emerged as a promising approach to enhancing student engagement and fostering intercultural competencies [13]. However, the specific role of GBL in facilitating CA remains underexplored. As universities seek more effective ways to support an increasingly diverse student body, there is a growing need for innovative strategies that go beyond traditional orientation programs [14]. This study addresses that gap by conducting a systematic scoping review to map the characteristics and impact of GBL on CA in higher education [15], and by offering insights to help educators enhance international students' experiences. Specifically, it aims to identify critical gaps in the existing literature, particularly regarding innovative instructional approaches such as GBL, which have the potential to transform how international students adapt both culturally and academically [16]–[18]. For example, Wilczewski and Alon's [9] bibliometric analysis highlights the fragmented nature of adaptation research and the lack of integrated pedagogical perspectives.

To address this research gap, the present study conducts a systematic scoping review to examine the extent and characteristics of research on GBL as a strategy to support CA among international students in higher education, following the preferred reporting items for systematic reviews and meta-analyses extension for scoping reviews (PRISMA-ScR) guidelines [19]. Drawing on population, concept, and context (PCC) framework, this review maps existing evidence, identifies research trends, and offers actionable insights for educators and policymakers. By synthesizing current knowledge, the study seeks to contribute to the development of inclusive and innovative learning environments that more effectively support the cultural and academic experiences of international students.

This systematic scoping review aims to address a critical gap in the literature regarding the role of GBL in facilitating CA among international students in higher education. Specifically, this study is guided by the following research questions:

- How has GBL been used to support CA among international students? (RQ1)
- What pedagogical components and learning mechanisms are reported in the literature for designing GBL to support CA? (RQ2)

These questions provide a clear direction for the research, strengthen the justification for this systematic review, and enable a structured exploration of the existing evidence to inform future instructional design and theoretical development in the field. By addressing these specific inquiries, the study seeks to bridge the gap between theoretical acculturation frameworks and practical GBL implementations for international students. Ultimately, this inquiry-driven approach ensures that the synthesis remains focused on identifying actionable pedagogical strategies for educational stakeholders.

2. METHOD

This study employed a systematic scoping review methodology, adhering to the guidelines of the Joanna Briggs Institute (JBI) and the PRISMA-ScR protocols. The objective was to map the characteristics of GBL supported CA and identify research gaps within this rapidly evolving field. This approach was chosen

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to address the conceptual diversity and expanding evidence base of the subject matter, prioritizing a comprehensive literature mapping over statistical analysis. A scoping review was deemed the most suitable methodology due to its focus on examining the extent, range, and characteristics of the available literature, elucidating key concepts, and identifying research gaps in this emerging, interdisciplinary domain [20], rather than evaluating intervention effectiveness or statistically aggregating outcomes [21].

Scoping reviews are particularly suitable for topics characterized by conceptual diversity, methodological variation, and evolving evidence bases, such as GBL, CA, intercultural competence, and international student experiences across educational contexts [22]–[24]. To ensure methodological transparency, this review adhered to the JBI guidance for scoping reviews. It was reported in accordance with the PRISMA-ScR [19], [25].

2.1. Search strategy

The literature search was conducted across five academic databases: ERIC, Scopus, IEEE Xplore, Web of Science, and ProQuest. The search was limited to peer-reviewed articles published in English between 2015 and 2025. To ensure comprehensive retrieval, specific search strings were developed using Boolean operators [26]. An example of the primary search string is:

("game-based learning" OR gamification OR "educational games" OR "serious games")
AND ("cultural adaptation" OR acculturation OR "intercultural competence" OR "cross-cultural adjustment")
AND ("international students" OR "foreign students" OR "exchange students").

2.2. Study selection and screening

The initial search yielded 608 records, which were imported into EndNote for duplicate removal. After removing two duplicates, 606 unique records underwent a double screening process to minimize bias. Two reviewers independently screened titles and abstracts to exclude non-research outputs (e.g., book chapters and editorials) while retaining peer-reviewed conference proceedings and journal articles that provided empirical data on GBL for CA among international students.

2.3. Eligibility criteria (PCC framework)

Full-text articles were retrieved and assessed based on the PCC framework:

- Population: international students in higher education institutions.
- Concept: GBL approaches, including digital games, serious games, and simulations.
- Context: CA, intercultural competence, and related sociocultural outcomes.

Studies were excluded if they lacked empirical evidence, conceptual clarity, or direct relevance to educational settings, as detailed in the PRISMA flow diagram, as shown in Figure 1.

2.4. Included studies

Following the eligibility assessment, eight studies met all criteria and were included in the final review. The systematic process of identification, screening, and inclusion, conducted in accordance with PRISMA-ScR guidelines, is illustrated in Figure 1. This diagram provides a transparent overview of the literature selection stages and the specific reasons for exclusion at each step [19], [27]. The inclusion of these specific eight studies ensures that the resulting synthesis is based on high-quality, peer-reviewed empirical evidence directly relevant to the higher education context.

2.5. Data analysis and thematic synthesis

Data from the included studies were systematically charted using an Excel spreadsheet, capturing key information such as author(s), publication year, research design, and GBL approaches. To ensure methodological transparency and replicability, a three-stage thematic synthesis was conducted:

- Open coding: identifying recurring concepts and learning design elements across the included studies.
- Categorization: grouping related codes into broader conceptual categories, such as experiential learning, narrative design, social interaction, and reflective feedback.
- Theme refinement: integrating these categories into a three-layer conceptual architecture consisting of structural inputs, learning mechanisms, and CA outcomes.

This analytical procedure allowed for a robust synthesis of the evidence, providing a clear framework for understanding how GBL facilitates the CA process.

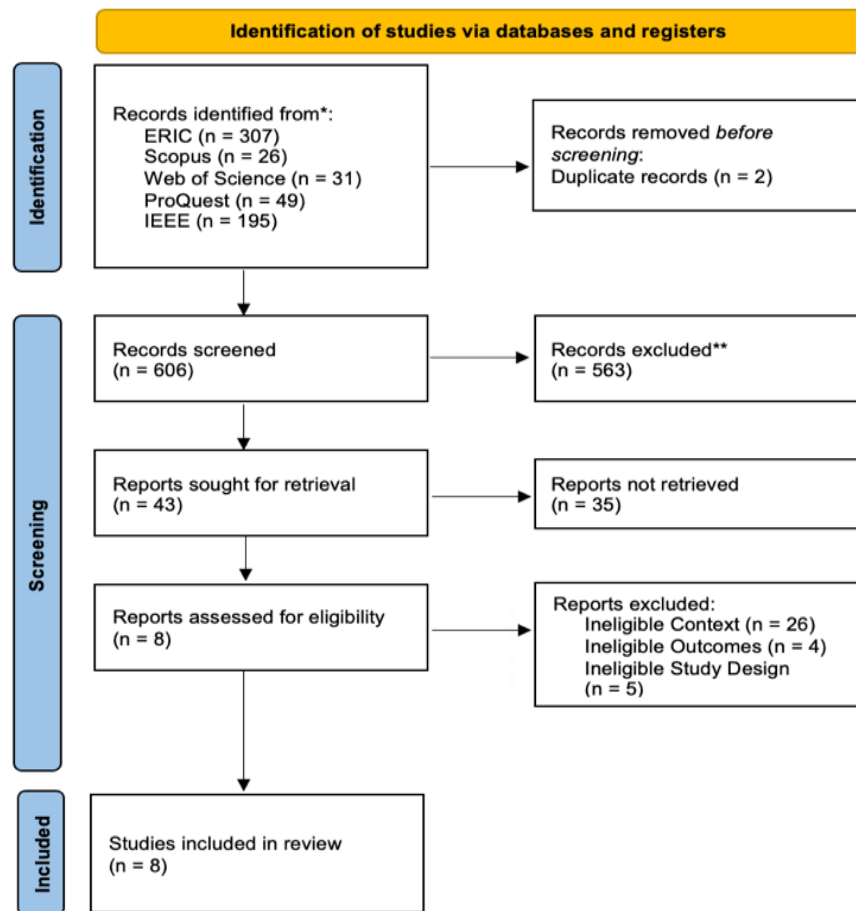


Figure 1. PRISMA flow diagram of the study selection process for the scoping review

3. RESULTS AND DISCUSSION

The eight included studies were published between 2015 and 2025, showing a clear concentration in recent years. Specifically, one study was published in each of the years 2016, 2017, 2018, 2019, and 2024 (12.5% each), with a notable increase in 2025, when three studies were published, accounting for 37% of the total literature. This temporal distribution, visualized in Figure 2, demonstrates a rapidly growing scholarly interest in GBL as a pedagogical approach to supporting CA among international students, particularly in the post-pandemic period.

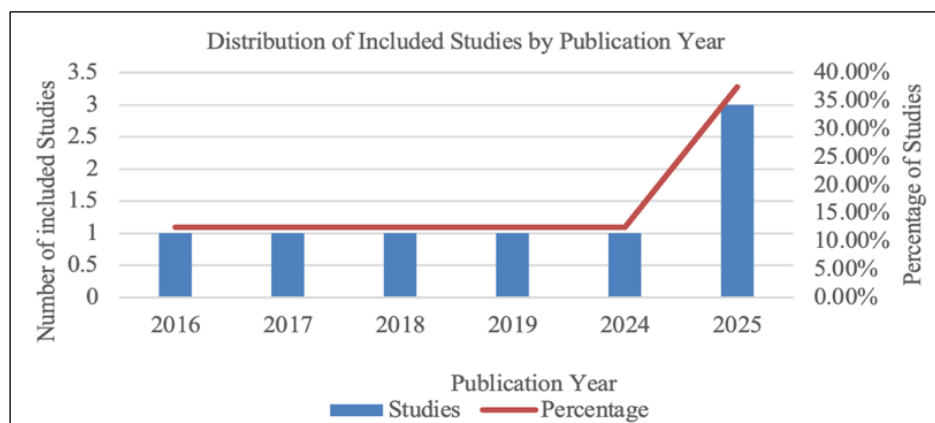


Figure 2. Distribution of included studies on GBL and CA

Furthermore, the systematic and transparent screening process ensured methodological rigor and established a robust foundation for data charting and thematic synthesis in this scoping review. The core characteristics and outcomes of the eight studies identified through the scoping review process are summarized in Table 1.

Table 1. Characteristics of included studies on GBL for CA

Study (Citation)	Country	Population	Design	GBL type	Cultural focus	Outcomes	Key findings
[28]	Australia	158 Chinese intl. students	Mixed methods	Game-based orientation programs	Intercultural adaptation	Adaptation, communication, social engagement	Game-based programs improved study understanding and social engagement
[29]	Ireland	Chinese and Irish students	Design/development	3D virtual collaborative game	CA, collaboration	Well-being, isolation reduction	Virtual collaboration reduced cultural shock and isolation symptoms
[30]	Netherlands	209 higher education students	Quantitative	Serious game (Ecotonos)	Cross-cultural competence	Awareness, skills	Serious games enhanced intercultural competence
[31]	USA	University students	Experimental	Simulation game (BAFÁ BAFÁ)	Intercultural sensitivity	Sensitivity, communication competence	BAFÁ BAFÁ increased intercultural sensitivity and communication
[32]	Turkey	52 pre-service ELT teachers	Quasi-experimental	Digital escape room	Intercultural competence	Intercultural competence	Digital escape rooms significantly improved intercultural competence
[33]	Europe (ERASMUS+)	University students	Blended intensive program	Gamification escape room game design	Cultural integration	Integration, employability skills	Escape room design promoted cultural integration and skills
[34]	Malaysia	61 IT course students	Quasi-experimental	Culturally enhanced serious game	Cultural enhancement in games	Academic achievement	Culturally enhanced games significantly increased academic achievement
[35]	UK	302 business students	Survey with SEM	Serious games (business ethics)	Cultural differences	Learning performance, effectiveness	Cultural dimensions affected learner engagement with serious games

An analysis of the included studies reveals that certain game design elements are more effective in supporting CA. Specifically, social interaction mechanics like multiplayer collaboration, social negotiation, and narrative immersion are more impactful than basic gamification features like points or badges [28], [35]. Social mechanics create a secure environment for behavioral rehearsal, allowing international students to practice real-world social interactions in a low-stakes digital setting. The game's reflective feedback loops shifted students from passive experience to active learning, aligning with experiential learning principles [19], [28]. In contrast, interventions that relied solely on superficial mechanics often failed to achieve long-term transformative growth or “identity-level adaptation” [35]. According to Figure 3, these included studies can be synthesized into three analytical layers. Through this analytical categorization, the synthesis reveals a structural pathway linking GBL design elements, the underlying learning mechanisms, and specific CA outcomes.

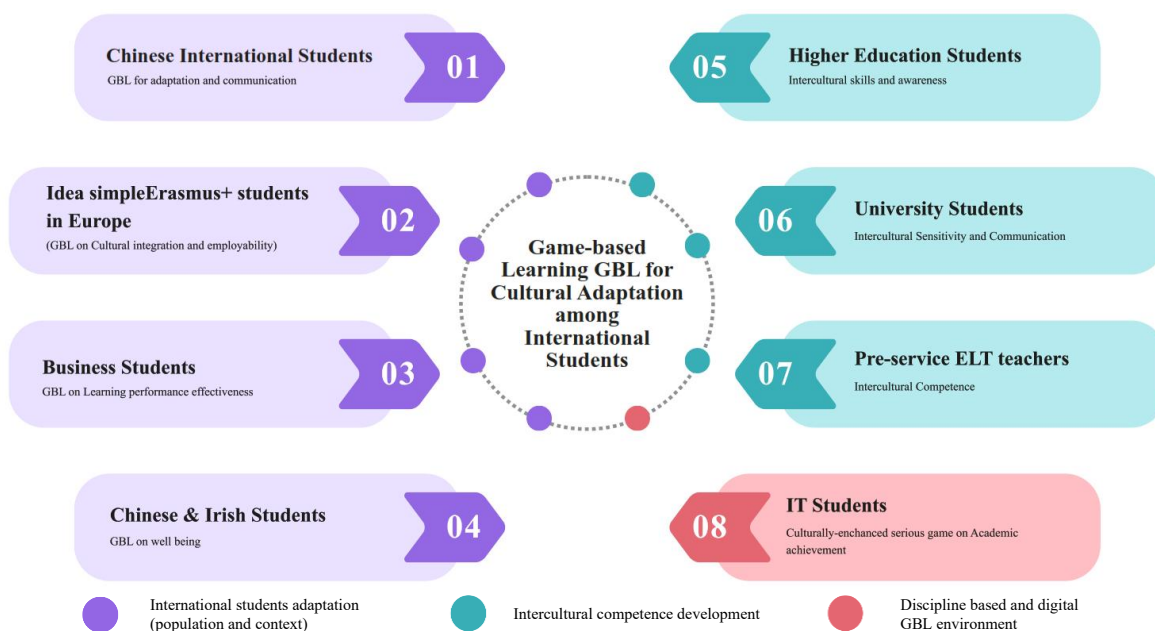


Figure 3. Conceptual clustering of study focus and population in GBL on CA

The word cloud analysis in Figure 4 provides a visual synthesis of the most frequently occurring concepts identified across the eight included studies. This visualization specifically highlights the strong scholarly emphasis on GBL, intercultural competence, and international student adaptation. By presenting these high-frequency terms, the figure effectively illustrates the current thematic landscape and reinforces the central focus of the scoping review.



Figure 4. Word cloud analysis of key concepts in GBL for CA studies

3.1. GBL interventions support cultural adaptation

The analysis of the eight included studies reveals that GBL is applied in various ways to help international students in higher education adjust to their new culture [13]. Digital games and simulations that immerse students in culturally relevant scenarios, such as classroom interactions and social communication styles, have been shown to significantly enhance student achievement across diverse learning contexts when supported by pedagogical scaffolding [36]. Facilitating gradual adaptation and reducing anxiety around real-world cross-cultural interactions, students were encouraged to reflect on cultural misunderstandings, practice culturally appropriate responses, and develop intercultural awareness through repeated gameplay, scenario-based tasks, immersive simulations, and role-playing activities [37]. Collaborative game tasks

facilitated social negotiation and intercultural dialogue, and structured feedback systems promoted reflective learning [38]. By emphasizing active participation and decision-making, these approaches helped international students view CA as a dynamic learning process, not passive knowledge acquisition [36]. Recent evidence suggests that active engagement is a critical psychological mechanism that transforms cultural challenges into manageable growth, ultimately fostering both well-being and academic success [39]. Across the reviewed studies, GBL was shown to support CA through several key mechanisms: immersive simulations providing tangible experiential exposure [40]. Collectively, these mechanisms deepen cognitive understanding of cultural norms, increase affective empathy toward host communities, and enhance behavioral competence in intercultural communication [41].

3.2. Thematic synthesis of key components

A thematic analysis was conducted to identify recurring themes and educational ideas across eight studies that used GBL to promote intercultural learning outcomes or cultural adaptability. The analysis offers insights into how GBL has been developed and applied to promote cultural awareness, intercultural competency, and sociocultural adjustment in higher education, even if not all the research focused exclusively on international students.

Through systematic data charting and iterative coding, recurring patterns were identified and organized into four overarching themes: i) experiential and situated learning; ii) narrative and scenario-based design; iii) social interaction and collaboration; and iv) feedback, reflection, and adaptive support. Collectively, these findings suggest that effective GBL interventions for CA are grounded in experiential and situated learning, enriched by narrative and scenario-based design, and reinforced through opportunities for social interaction, feedback, and reflection [42], [43]. Although the focus on international students varies, recent research by [13], [28] demonstrates that GBL can be structured pedagogically to support cultural learning and adaptation. Furthermore, Cabrera-Solano [44] illustrates how these pedagogical structures specifically enhance student performance and social integration in higher education. Furthermore, the synthesis identifies a research gap in the literature regarding the integration of these components into a coherent, theory-driven GBL model specifically designed to facilitate the CA of international students. Addressing this gap provides a compelling rationale for developing a conceptual GBL model, which is pursued in the subsequent phase of this study.

3.3. Theoretical integration and conceptual framework development

The proposed conceptual architecture, as shown in Figure 5, transitions from descriptive insights toward an analytical mapping of the pathways linking pedagogical design to sociocultural adjustment. By synthesizing fragmented findings into this three-layered structure, the framework provides a predictive roadmap that clarifies the progression from pedagogical design to transformative adaptation outcomes.



Notes: This framework addresses the critical gap of ‘gamification without cultural depth’ by focusing on identity level adaptation

Figure 5. Three-layered conceptual architecture of GBL for CA: from structural inputs to acculturation outcomes

Based on the thematic synthesis of the findings, a comprehensive framework was developed to map the relationship between game design and adaptation outcomes. The resulting three-layer conceptual architecture is presented in Figure 5, which links structural inputs and learning mechanisms to specific CA outcomes. This framework consists of:

- Level 1: GBL design elements (structural inputs): these include immersive simulations, narrative-driven scenarios, role-play tasks, and collaborative feedback systems that serve as the foundation of the GBL environment.
- Level 2: learning mechanisms (the process): these design elements activate core learning mechanisms, specifically experiential immersion, role enactment, social negotiation, and reflective feedback loops.
- Level 3: CA dimensions (outcomes): these mechanisms facilitate shifts across three dimensions: cognitive (understanding host-country norms), affective (reduced anxiety and increased empathy), and behavioral (communication competence and social engagement).

The synthesized evidence indicates that GBL functions as a structured experiential system that facilitates cultural adjustment through iterative cycles of experience and reflection. This process aligns with Kolb's [45] experiential learning cycle, wherein knowledge is constructed through active experimentation in a secure digital environment. While Berry's [46] acculturation framework often portrays cultural adjustment as a stressful or largely passive process, GBL offers a contrasting, proactive approach. By creating a safe, interactive space for students to rehearse social interactions before real-life application, GBL addresses a critical gap in traditional models that frequently overlook the role of protected practice in adaptation [47]–[49]. Consequently, this study provides a significant theoretical advancement by synthesizing Kolb's [45] experiential learning theory with Berry's [46] acculturation model. By reconceptualizing CA as a dynamic, experiential learning process facilitated within digital environments, this integration extends traditional acculturation frameworks [50], [51]. It also demonstrates how interactive platforms can bridge the development of intercultural competence, offering a more nuanced understanding of adaptive learning pathways for international students in the digital age.

The study is further distinguished by its development of the three-layer conceptual architecture, which moves beyond viewing GBL as merely a motivational tool. Instead, the framework maps the structural pathways linking pedagogical design to identity-level cultural transformation. Unlike previous fragmented studies, it offers a predictive roadmap by organizing synthesized themes into structural inputs, learning mechanisms, and acculturation outcomes. In doing so, it presents CA as an iterative, mechanism-driven learning process unfolding within a structured experiential system.

4. CONCLUSION

This systematic scoping review underscores that GBL functions as a structured experiential system that significantly facilitates the CA of international students. The primary contribution of this work is the three-layered conceptual architecture, which provides a predictive roadmap by linking specific design elements to cognitive, affective, and behavioral outcomes. By reconceptualizing adaptation as an iterative, mechanism-driven learning process rather than a passive transition, this study advances the theoretical understanding of digital acculturation. However, the scope of this review is subject to several limitations, including its restriction to peer-reviewed journal articles published in English between 2015 and 2025, which may have excluded relevant findings from other languages or gray literature.

Furthermore, the review identifies a prevalent risk of “gamification without depth,” where superficial mechanics may overshadow the meaningful engagement required for identity-level transformation. Consequently, future research should prioritize longitudinal and design-based studies to validate the proposed framework across diverse geographic and cultural contexts. Scholars are encouraged to move beyond viewing GBL as a supplementary orientation aid, instead investigating culturally responsive design elements that foster sustained identity-level integration and meaningful sociocultural adjustment.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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Ophat Kaosaiyaporn	✓			✓						✓		✓		
Warapark Maitreephun	✓			✓						✓		✓		

C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

E : Writing - Review & Editing

Vi : Visualization

Su : Supervision

P : Project administration

Fu : Funding acquisition

CONFLICT OF INTEREST STATEMENT

To ensure fair and impartial decision-making, the authors clarify that they have no known conflicting financial interests or personal relationships that could have impacted the work reported in this paper.

ETHICAL APPROVAL

This systematic scoping review exclusively used data from previously published literature and publicly available sources. No human participants, animals, or identifiable personal data were involved, so ethical approval and informed consent weren't required.

DATA AVAILABILITY

As part of our commitment to open research and transparency, the authors have made the evidence supporting our results available for review. The data underlying this work are available from the corresponding author, [OK], upon reasonable request.

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