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CHALLENGES AND OPPORTUNITIES OF USING VIRTUAL TECHNOLOGIES IN TEACHER EDUCATION FOR INTERCULTURAL COMPETENCE

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ABOUT ARTICLE

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Abstract: Virtual technologies, including virtual reality (VR), augmented reality (AR), social VR platforms, and online collaborative tools, have emerged as powerful instruments in teacher education for fostering intercultural competence (IC). This article explores the opportunities these technologies offer, such as immersive learning experiences, global collaboration, and enhanced engagement, alongside challenges like technical barriers, high costs, and limited curricular integration. Drawing from recent studies, it highlights how virtual technologies can bridge cultural gaps in preservice and in-service teacher training while addressing potential limitations. A comparative table summarizes key aspects, and implications for educational practice are discussed to guide future implementation.

O'QITUVCHILAR TA'LIMIDA MADANIYATLARARO KOMPETENTLIKNI SHAKLLANTIRISH UCHUN VIRTUAL TEXNOLOGIYALARDAN FOYDALANISHNING MUAMMO VA IMKONIYATLARI

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MAQOLA HAQIDA

Kalit so'zlar: madaniyatlararo kompetensiya, o'qituvchilarni tayyorlash, virtual voqelik, kengaytirilgan voqelik, ijtimoiy VR,

Annotatsiya: Virtual texnologiyalar, jumladan virtual reallik (VR), kengaytirilgan reallik, ijtimoiy VR platformalari va onlayn hamkorlik vositalari o'qituvchilar ta'limida

virtual almashuvlar, immersiv ta'lim, raqamli bo'shliq.

madaniyatlararo kompetensiyani (MK) rivojlantirishning kuchli vositalariga aylandi. Ushbu maqola bu texnologiyalar taqdim etadigan imkoniyatlarni, xususan, chuqur o'rganish tajribasi, global hamkorlik va kuchaytirilgan ishtirokni, shuningdek, texnik to'siqlar, yuqori xarajatlar va cheklangan o'quv dasturi integratsiyasi kabi qiyinchiliklarni o'rganadi. So'nggi tadqiqotlarga asoslanib, maqola virtual texnologiyalar potensial cheklovlarni hisobga olgan holda, o'qituvchilarni tayyorlash va malakasini oshirishdagi madaniy bo'shliqlarni qanday bartaraf etishi mumkinligini ko'rsatib beradi. Qiyosiy jadval asosiy jihatlarni umumlashtiradi va kelajakda qo'llash uchun ta'lim amaliyotiga oid xulosalar muhokama qilinadi.

ПРОБЛЕМЫ И ВОЗМОЖНОСТИ ИСПОЛЬЗОВАНИЯ ВИРТУАЛЬНЫХ ТЕХНОЛОГИЙ В ПЕДАГОГИЧЕСКОМ ОБРАЗОВАНИИ ДЛЯ МЕЖКУЛЬТУРНОЙ КОМПЕТЕНТНОСТИ

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О СТАТЬЕ

Ключевые слова: межкультурная компетентность, педагогическое образование, виртуальная реальность, дополненная реальность, социальная виртуальная реальность, виртуальные обмены, иммерсивное обучение, цифровой разрыв.

Аннотация: Виртуальные технологии, включая виртуальную реальность (VR), дополненную реальность (AR), платформы социальной виртуальной реальности и инструменты онлайн-сотрудничества, стали мощными инструментами в педагогическом образовании для развития межкультурной компетентности (МК). В данной статье рассматриваются возможности, которые предоставляют эти технологии, такие как иммерсивное обучение, глобальное сотрудничество и повышение вовлеченности, а также такие проблемы, как технические барьеры, высокая стоимость и ограниченная интеграция с учебными программами. Опираясь на недавние исследования, авторы показывают, как виртуальные технологии могут преодолеть культурные различия в процессе подготовки учителей до и во время их повышения квалификации, одновременно устраняя потенциальные ограничения. В сравнительной таблице обобщены ключевые аспекты, а также обсуждаются последствия для образовательной практики, которые

Introduction. Intercultural competence refers to the ability to effectively and appropriately communicate and behave in intercultural situations, encompassing knowledge, skills, attitudes, and awareness. In teacher education, developing IC is essential for preparing educators to handle diverse classrooms and promote inclusive learning environments. Virtual technologies—ranging from VR simulations to online platforms for virtual exchanges—provide innovative ways to achieve this by simulating real-world intercultural interactions without physical travel.

These technologies have gained traction in educational settings, enabling preservice teachers to engage with international peers and students, thereby building empathy, cultural awareness, and adaptive teaching strategies. However, their adoption is not without hurdles, including accessibility issues and the need for specialized training. This article examines the dual facets of opportunities and challenges, based on empirical insights from various studies, to offer a balanced perspective on integrating virtual technologies into teacher education programs for IC development.

Methods. This article employs a qualitative synthesis of existing empirical research on the integration of virtual technologies into teacher education programs for the development of intercultural competence (IC). The methodological approach included three main steps:

Literature Selection. Peer-reviewed journal articles, conference proceedings, and project reports published between 2007 and 2025 were reviewed. Sources were identified using Scopus, ERIC, and Google Scholar databases with keywords such as virtual reality in education, social VR, virtual exchanges, teacher education, and intercultural competence. Inclusion criteria emphasized empirical studies or applied projects focusing on preservice or in-service teacher training.

Thematic Analysis. Selected studies were coded thematically to identify recurring patterns in the opportunities and challenges of using virtual technologies. Four thematic categories were determined: accessibility and collaboration, immersion and engagement, training and integration, and ethical and social aspects.

Comparative Framework. The identified opportunities and challenges were compared across different studies to highlight consistencies and contradictions. A matrix (Table 1) was developed to visually summarize the findings.

This methodological approach provides a comprehensive, critical overview rather than a meta-analysis, aiming to synthesize insights across diverse contexts and propose directions for practice and research.

Opportunities. Virtual technologies present numerous opportunities to enhance IC in teacher education by creating immersive, interactive, and accessible learning environments. One key opportunity is the facilitation of global collaboration and virtual exchanges. Online platforms allow

teachers to connect with colleagues from different cultures, fostering communities of practice where they can share knowledge, reflect critically, and engage in problem-solving. For instance, virtual global engagement (VGE) programs enable preservice teachers to collaborate synchronously with international K-12 students, transforming challenges like language barriers into learning opportunities that build inclusive and digitally fluent educators. This approach extends beyond traditional exchanges by linking universities and global communities, promoting reflective practices and mentorship to support intercultural growth.

Another significant opportunity lies in immersive simulations provided by VR and social VR. These tools create safe spaces for cross-cultural engagement, allowing preservice teachers to practice intercultural communication in controlled environments. Studies show that social VR can be as effective as desktop-based online methods for learning intercultural communication, with participants reporting increased motivation through avatar customization and interactive cultural rooms. In teacher education, VR supports technical skill development and enhances engagement by making abstract cultural concepts tangible, aligning with constructivist learning theories. For example, 360° video-based VR can address geographic isolation by providing authentic, student-centered intercultural experiences, which are adaptable to various educational contexts.

Furthermore, virtual technologies increase access to diverse resources and support experiential learning. Interactive distance learning tools, such as email, chat, and videoconferencing, link students with contrasting cultural perspectives, enhancing awareness of international viewpoints. Projects like online intercultural exchanges between preservice teachers from different countries reduce cultural barriers and boost communication competence, offering flexibility and affordability. Cloud-based VR infrastructure can lower costs, making it feasible for underfunded institutions to implement, while partnerships with technology companies provide discounted hardware. These opportunities also extend to neurodiverse learners, offering structured environments that reduce anxiety and improve social skills.

Overall, virtual technologies empower teacher educators to create enriched contexts that prepare teachers for an interconnected world, emphasizing empathy, cultural sensitivity, and adaptive pedagogy.

Challenges. Despite their potential, virtual technologies pose several challenges in teacher education for IC development, which must be addressed for effective implementation. Technical and infrastructural barriers are prominent. High costs of VR hardware, such as headsets ranging from \$300 to \$1000, and licensing fees limit accessibility, particularly in rural or developing regions where stable internet is lacking. In virtual collaborations, logistical constraints embedded in personal and organizational cultures, along with disparities in program structures across countries, complicate activity design. Students and teachers often require intensive introductions to platforms

like social VR, facing difficulties with avatars and operations, exacerbated by time differences and varying internet access.

Health and safety concerns also arise. Prolonged VR use can cause eye strain, headaches, and motion sickness due to visual conflicts, while physical risks like tripping occur in educational settings. Psychological impacts from intense simulations may induce distress, necessitating adaptive strategies and controlled exposure.

Curricular integration and teacher preparedness present additional hurdles. VR often serves as a supplementary tool rather than a core component, with limited alignment to learning objectives across educational levels. Many teachers lack training in these technologies, leading to suboptimal outcomes; comprehensive professional development is essential but often insufficient. In IC-focused programs, virtual tools reduce cultural immersion cues, potentially overpowering host cultures and showing minimal evidence of intercultural adaptation. Language barriers and absence of non-verbal cues in online platforms can cause misinterpretations and disharmony.

Social and ethical issues include reduced face-to-face interactions impacting social development, data privacy concerns, and potential biases in content. Resistance to change among educators and students, due to skepticism or discomfort, further hinders adoption. In geographically isolated areas, limited empirical research on VR for young learners underscores the need for more evidence-based approaches.

These challenges highlight the importance of strategic planning to mitigate barriers and maximize the benefits of virtual technologies.

Category Opportunities Challenges

Accessibility and Collaboration Global virtual exchanges foster communities of practice and cultural sharing. High hardware costs and infrastructure gaps limit access in underserved areas.

Immersion and Engagement Immersive VR simulations enhance motivation and empathy through safe interactions. Health issues like motion sickness and reduced cultural immersion cues.

Training and Integration Flexible platforms support experiential learning and digital fluency. Lack of teacher training and poor curricular alignment.

Ethical and Social Aspects Structured environments for neurodiverse learners and reduced barriers. Data privacy concerns, biases, and resistance to technology adoption.

Table 1: Summary of Opportunities and Challenges in Using Virtual Technologies for IC in Teacher Education

Discussion. The findings of this study reaffirm the dual role of virtual technologies as both enablers and disruptors in teacher education. While VR, online exchanges, and cloud-based tools open up new pedagogical frontiers, their sustainable integration requires systemic readiness, inclusive design, and critical reflection.

One significant implication lies in the pedagogical shift toward constructivist and experiential learning. Virtual technologies facilitate authentic simulations that traditional classrooms cannot easily replicate. For example, VR intercultural role-plays allow preservice teachers to practice cultural sensitivity in scenarios that mirror real-world diversity. This aligns with Vygotsky's social constructivist theory, where learning occurs through mediated interaction. However, without explicit scaffolding, such experiences risk remaining superficial, emphasizing technical novelty over deep intercultural understanding.

Another point concerns equity and inclusivity. The review highlights stark inequalities between well-resourced institutions and those in rural or underfunded settings. While cloud-based VR and discounted technologies can mitigate these gaps, global partnerships are essential for broader accessibility. This echoes broader debates in digital education, where the "digital divide" extends beyond access to include quality of engagement, cultural representation, and adaptability for learners with disabilities.

The role of teacher preparation is equally crucial. Evidence suggests that without systematic professional development, teachers struggle to integrate VR and virtual exchanges effectively. IC training requires not only technical proficiency but also critical reflection on cultural values, communication styles, and potential biases embedded in virtual environments. Programs such as online intercultural exchanges (e.g., INTERACT, VGE) demonstrate that structured mentorship and reflection sessions amplify learning outcomes.

Finally, the ethical dimension cannot be overlooked. Data privacy, cultural stereotyping, and overreliance on virtual experiences raise concerns about authenticity and responsibility in intercultural education. While VR can complement traditional immersion, it should not replace direct human contact. Ethical guidelines and intercultural sensitivity must therefore underpin the design and implementation of such technologies.

Taken together, these discussions suggest that the success of virtual technologies in fostering IC depends on balanced integration: combining immersive experiences with reflective practice, ensuring equitable access, and embedding ethical safeguards. Future research should prioritize longitudinal studies that track how preservice teachers transfer virtual intercultural learning into their real-world classrooms, as well as comparative studies across cultural and national contexts to develop more globally adaptable models.

Conclusion. Virtual technologies offer transformative opportunities for enhancing IC in teacher education through immersive and collaborative experiences, yet they require overcoming significant challenges related to access, health, and integration. By leveraging strengths and mitigating weaknesses, educators can better prepare teachers for diverse global contexts, ultimately fostering more inclusive educational systems..

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