Palestine Technical University Research Journal, 2026, 14(03), 95-121

Integration of Digital Tools into language Education as a Means of Developing Intercultural Competence in Future Teachers Within a Multicultural Environment

دمج الأدوات الرقمية في تعليم اللغات كوسيلة لتطوير الكفاءة بين الثقافات لدى المعلمين المستقبليين في بيئة متعددة الثقافات

Zamira Dzhaparova[1*], Makhabatkan Kukanova[2], Medina Berdibekova[3], Ainura Akunova[2], Gulmira Satarova[4]

زاميرا دزاباروفا[1*]، ماخاباتكان كوكانوفا[2] ، ميدينا بيرديبيكوفا[3] ، أينورا أكونوفا[2] ، جولميرا ساتاروفا[4]

[1]Department of Special Education and Psychocorrection, Arabaev Kyrgyz State University, Bishkek, Kyrgyz Republic, [2]Department of Kyrgyz and Russian Language Teaching Technology in Primary Schools, Arabaev Kyrgyz State University, Bishkek, Kyrgyz Republic, [3]Department of Natural Sciences and Humanities, International European University, Bishkek, Kyrgyz Republic, [4]The Institute for Targeted Training of Teaching Staff named after Prof. I.Ch. Isamidinov, Kyrgyz National University named after Jusup Balasagyn, Bishkek, Kyrgyz Republic

[1]قسم التربية الخاصة والتأهيل النفسي، جامعة أرابايف الحكومية القرغيزية، بيشكيك، جمهورية قيرغيزستان، [2]قسم تكنولوجيا تدريس اللغتين القرغيزية والروسية في المدارس الابتدائية، جامعة أرابايف الحكومية القرغيزية، بيشكيك، جمهورية قيرغيزستان، [3]قسم العلوم الطبيعية والإنسانية، الجامعة الأوروبية الدولية، بيشكيك، جمهورية قيرغيزستان، [4]معهد التدريب المتخصص لأعضاء هيئة التدريس، الجامعة الوطنية القرغيزية -يوسوب بالاساجين، بيشكيك، جمهورية قيرغيزستان

Received: 29/04/2026 **Accepted: 20/07/2026** **Published: 03/11/2026**

Abstract: The purpose of this study is to determine the effectiveness of integrating digital tools into language education for the development of intercultural competence among future teachers in a multicultural educational environment. The study was conducted over eight months at three pedagogical universities in the Kyrgyz Republic: I. Arabaev Kyrgyz State University, Osh State University, and Naryn State University, selected for their culturally diverse student populations. The methodology involved a questionnaire survey of 243 education students learning languages using digital platforms, such as Zoom, Moodle, Padlet, Canva, Google Classroom, YouTube, and Telegram. The findings demonstrate the following average scores (on a five-point scale) for the components of intercultural competence: cognitive – 3.68, affective – 3.75, behavioural – 3.64. Correlational analysis indicated a significant positive relationship between the frequency of digital platform use and the development level of each competence component. The cognitive component was most strongly influenced by video platforms, which expanded students' knowledge of other cultures and traditions. The affective component was enhanced through the use of Padlet, which fostered empathy and tolerance in intercultural communication. The behavioural component, reflecting readiness for intercultural dialogue, correlated most strongly with the use of messaging applications for content exchange, which supported active interaction and practical application of knowledge. A statistically significant difference was observed

* **Corresponding Author E-mail:** dzhaparovazamira35@gmail.com

between students with high and low digital engagement, underscoring the impact of the digital environment on the development of intercultural skills. The results hold practical value for designing language education curricula aimed at developing intercultural competence.

Keywords: Student engagement, Learning motivation, Intercultural awareness, Digital language learning, Digital platforms.

المستخلص: تهدف هذه الدراسة إلى تحديد مدى فعالية دمج الأدوات الرقمية في تعليم اللغات لتنمية الكفاءة بين الثقافات لدى المعلمين المستقبليين في بيئة تعليمية متعددة الثقافات. أُجريت الدراسة على مدى ثمانية أشهر في ثلاث جامعات تربوية في جمهورية قيرغيزستان: جامعة إي .أرابايف الحكومية، وجامعة أوش الحكومية، وجامعة نارين الحكومية، وقد تم اختيارها لتنوع طلابها ثقافياً. شملت الدراسة استبياناً وُزّع على 243 طالبًا وطالبةً في مجال التربية يتعلمون اللغات باستخدام منصات رقمية، مثل زووم، ومودل، وبادليت، وكانفا، وجوجل كلاس روم، ويوتيوب، وتليجرام. أظهرت النتائج متوسط الدرجات التالية(على مقياس من خمس نقاط) لمكونات الكفاءة بين الثقافات : المعرفية3.68 - ، والوجدانية3.75 - ، والسلوكية .3.64 - أشار تحليل الارتباط إلى وجود علاقة إيجابية قوية بين وتيرة استخدام المنصات الرقمية ومستوى تطور كل مكون من مكونات الكفاءة، كان المكون المعرفي الأكثر تأثراً بمنصات الفيديو، التي وسّعت معرفة الطلاب بالثقافات والتقاليد الأخرى. تم تعزيز الجانب العاطفي من خلال استخدام منصة Padlet، مما عزز التعاطف والتسامح في التواصل بين الثقافات. أما الجانب السلوكي، الذي يعكس الاستعداد للحوار بين الثقافات، فقد ارتبط ارتباطاً وثيقاً باستخدام تطبيقات المراسلة لتبادل المحتوى، مما دعم التفاعل النشط والتطبيق العملي للمعرفة. ولوحظ فرق ذو دلالة إحصائية بين الطلاب ذوي المشاركة الرقمية العالية والمنخفضة، مما يؤكد أثر البيئة الرقمية على تنمية المهارات بين الثقافات. وتُعد هذه النتائج ذات قيمة عملية في تصميم مناهج تعليم اللغات التي تهدف إلى تطوير الكفاءة بين الثقافات.

الكلمات المفتاحية: مشاركة الطلاب، دافعية التعلم، الوعي بين الثقافات، تعلم اللغات الرقمي، المنصات الرقمية .

1 INTRODUCTION

Given the rapid transformations in education driven by globalisation, digitalisation, and the increasing multicultural nature of society, the development of intercultural competence among future educators is becoming particularly important. The teacher is not only a subject specialist but also an active participant in intercultural communication, capable of fostering tolerance, respect for cultural diversity, and readiness for effective interaction within a multicultural environment. The relevance of this study lies in the need for an appropriate response to contemporary challenges, among which the integration of digital tools in teacher training holds a prominent position. In language education in particular, such integration offers new opportunities for cultivating intercultural competence. The growing presence of digital technologies in the educational sphere is creating new conditions and instruments for professional training (Bondarenko et al., 2022). Their role in facilitating intercultural learning experiences deserves particular attention. In this context, language education serves not only to develop linguistic proficiency but also as a powerful tool for fostering the ability to engage in intercultural dialogue. The central issue addressed in this study concerns the limited development of effective approaches for integrating modern digital tools into the language training of future teachers, aimed at fostering their intercultural competence. A further challenge is the lack of comprehensive analysis of this process within multicultural educational settings.

In recent years, particularly since 2020, the number of studies exploring the role of digital tools in the development of intercultural competence has grown. Jiang et al. (2021) conducted a systematic review of the literature on the use of online technologies as cognitive tools for enhancing intercultural competence among educators. The results of their study indicate that digital platforms can increase awareness of cultural differences and promote self-reflection and critical thinking in intercultural contexts. Oberste-Berghaus (2024) confirms that foreign language teaching is directly linked to the development of intercultural competence, but insufficient digital support leads to slow and fragmented progress.

Nguyen et al. (2022) investigated the impact of English as an international language on intercultural learning in digital formats at higher education institutions. Their study highlighted the importance of multicultural online projects, video conferences, and virtual exchanges. At the same time, Biletska et al. (2021) emphasized the importance of foreign language teachers acquiring digital skills, as digital tools can only be effectively used to develop intercultural competence if such skills are present. In the same vein, Bobadilla-Pérez et al. (2025) investigated the integration of intercultural competence into teacher training programs through computer-mediated learning and concluded that only a few training programs provide sufficient opportunities for such development.

Khalilova's (2024) study emphasized that these digital technologies contribute to the creation of a flexible, interactive, and personalized educational environment that enables students to engage in contexts where intercultural interaction is an integral component. Svyrydyuk et al. (2024) noted that the use of internet technologies, particularly in the field of teaching writing in a foreign language, contributes not only to effective learning but also to the development of cultural empathy. Karabaeva and Saken (2025) analyzed educational approaches and found that the case study method is effective in developing intercultural communicative competence, especially when applied on digital educational platforms.

In particular, attention should be paid to the systematic review by Nafisa et al. (2024), who investigated teachers' perceptions of the need to develop intercultural competence in English. The results of their study highlighted the importance of adapting instructional design to digital environments to promote not only language development but also sensitivity to cultural context. Velmurugan et al. (2025) demonstrated the positive impact of innovative digital training programs with intercultural training on the development of cultural competence and communication skills in intercultural contexts within the framework of interpreter training.

Despite growing academic interest in the development of intercultural competence in the context of the digitalization of education, several research gaps remain. Most existing studies (Jiang et al., 2021; Nguyen et al., 2022; Nafisah et al., 2024) focus on general approaches to online tools or consider only certain components of intercultural competence, without addressing pedagogical specifics. However, Oberste-Berghaus (2024) noted the importance of language education for intercultural development but did not specify the processes of digital support for such processes in teacher training. Bobadilla-Pérez et al. (2025) identified a gap between the theoretical understanding of intercultural competence and its practical application in teacher training curricula. Furthermore, no systematic review of digital tools has

been conducted to demonstrate their effectiveness in developing the intercultural competence of future educators. Many studies have not addressed the multicultural aspects of the digital learning environment (Svyrydiuk et al., 2024; Karabayeva and Saken, 2025). This underscores the need for a systematic and in-depth analysis that integrates language education, digital tools, and the development of intercultural competence among future teachers in a multicultural educational context.

The purpose of this study is to examine the effectiveness of digital technologies in the language training of future educators, with regard to the development of intercultural competence in a multicultural academic environment. The objectives include analysing the existing experience of using digital tools in language education at universities; identifying the level of intercultural competence among students; evaluating the relationship between digital engagement in learning and the development of intercultural openness; and establishing the pedagogical conditions that support the integration of digitalisation and intercultural learning.

2 MATERIALS AND METHODS

The study on the integration of modern digital tools into language education as a means of developing intercultural competence among future educators in a multicultural environment was conducted between October 2024 and May 2025. It was implemented at three pedagogical universities in the Kyrgyz Republic: I. Arabaev Kyrgyz State University, Osh State University, and Naryn State University. The geographical selection of these institutions was guided by the multicultural composition of their student populations, which provided a representative multicultural setting for examining intercultural competence in the context of digitalised education.

The study employed an empirical approach, based on qualitative and quantitative methods of data collection and analysis. The primary tool for gathering empirical data was a questionnaire survey administered to students enrolled in programmes such as “Pedagogy” and “Philological Education”, who were engaged in language training supported by digital platforms (Zoom, Moodle, Padlet, Canva, Google Classroom, YouTube, and Telegram channels). The sample consisted of 243 students (173 female and 70 male), including 97 from I. Arabaev Kyrgyz State University, 84 from Osh State University, and 62 from Naryn State University, aged between 19 and 24, all of whom provided written consent to participate in the study. Inclusion criteria required participants to be studying in a pedagogical field, involved in a language course integrating digital tools, and to have had some experience of intercultural interaction (through multicultural study groups or inter-university exchanges). Students who had studied only offline or lacked intercultural communication experience were excluded from the sample. A purposive sampling method was used, allowing the study to focus specifically on future educators in a digital language-learning context. The study also considered the use of self-directed learning platforms (Duolingo, LingQ, Quizlet) and digital solutions based on VR/AR and AI technologies. Descriptive information was provided for each of the three participating pedagogical universities in the Kyrgyz Republic: I. Arabaev Kyrgyz State University, Osh State University, and Naryn State University. Lecturers were not included as a separate participant group in the empirical sample; therefore, any references to

institutional digital infrastructure were treated only as contextual observations and were not included in the statistical analysis.

The questionnaire included closed and open-ended questions. Closed questions involved a Likert scale (from 1 to 5) for evaluating the level of intercultural competence across three components: cognitive (knowledge of other cultures), affective (empathy, tolerance), and behavioural (willingness to engage in dialogue). Open-ended questions allowed for exploration of students' depth of reflection on intercultural interaction and provided examples of how digital resources are used in language education to address intercultural situations. Qualitative responses to the open-ended questions were analysed using thematic analysis. Two researchers independently reviewed all responses and conducted an initial open-coding procedure to identify recurring ideas related to intercultural learning experiences, perceptions of digital tools, and cultural awareness. The preliminary codes were compared and discussed until consensus was reached. Intercoder reliability was assessed using Cohen's kappa coefficient, which demonstrated substantial agreement (κ=0.82). Similar codes were subsequently grouped into broader thematic categories, including intercultural communication experiences, cultural understanding through digital media, emotional engagement with cultural content, and perceived benefits of digital platforms for language learning. The final themes were used to support and contextualise the quantitative findings presented in the Results section.

All survey results were statistically processed using Statistical Product and Service Solutions (SPSS) v.27. The analysis of quantitative data employed the Student's t-test for independent samples to compare the levels of intercultural competence between students who actively used digital tools and those with limited access to such instruments. The statistical significance threshold was set at $p<0.05$. Pearson's correlation coefficient was used to evaluate the relationships between the use of specific digital tools and the development of individual components of intercultural competence.

Qualitative findings were analysed separately and subsequently integrated with quantitative results to provide a more comprehensive interpretation of students' intercultural competence development.

All ethical standards were upheld throughout the study. All participants were informed about the purpose and scope of the study, the voluntary nature of their participation, and their right to withdraw at any stage without any consequences. Data confidentiality was ensured through the anonymisation of responses and secure encrypted storage. Written consent forms included authorisation for data processing and the use of findings in scientific publications. The study complies with the International Code on Market, Opinion and Social Research ICC/ESOMAR (2016) and the Code of Ethics of the American Sociological Association (1997).

3 RESULTS

3.1 Analysis of curricula and language training of future educators at universities

In an era of globalisation, language education has become a key instrument in preparing specialists capable of operating effectively within multicultural environments. This is particularly important in

multilingual countries such as Kyrgyzstan, where the state language is Kyrgyz, Russian is official, and proficiency in foreign languages (e.g., English, Chinese, Turkish) is essential for international dialogue, research activity, and professional mobility. Shifts in language policy, prompted by intensified engagement with the global education landscape, demand a comprehensive approach to training educators and translators, one that combines strong linguistic proficiency with intercultural sensitivity and digital literacy. Educational research has demonstrated the importance of incorporating cultural aspects into curricula, which is a prerequisite for fostering national identity and multicultural competencies among students (Oleksandrivna et al., 2023; Zhou et al., 2024). Adanir et al. (2020) note that during online learning, Kyrgyz students actively use digital resources and communication tools. Kyrgyzstan's national education documents emphasize the need to develop digital literacy among both teachers and students. The Kyrgyz Republic's Education Development Program through 2030 underscores the need to strengthen digital skills for language teaching (NORRAG, 2021). These priorities align with international recommendations that emphasize the importance of digital and cultural skills, in addition to language proficiency, as a core element of education systems.

At I. Arabaev Kyrgyz State University (KSUA), language training is concentrated within the World Languages and International Relations Institute. The Institute provides training courses in English, Chinese, Korean, Turkish, and German. The programmes include modules in oral, written, and simultaneous interpreting, linguistics (syntax, stylistics, and country studies), pedagogical psychology, and information technologies in language teaching. The learning process is supported by modern Information and Communication Technology (ICT), including the Moodle platform for distance learning, video lectures, and multimedia simulators for consolidating knowledge. Importantly, KSUA curricula incorporate internships in schools and universities abroad, which enhance students' professional skills. Within the department of applied linguistics, students learn the fundamentals of machine translation and the programming of linguistic systems. The academic staff is composed predominantly of doctors and candidates of sciences, many of whom completed internships in China, Turkey, and Europe, contributing to the exchange of educational practices. This academic and methodological capacity enables the implementation of current global methods in language teaching. The emergence of new technologies aligns with the global trend toward the digitalization of education, particularly the targeted integration of digital platforms into teacher training, which contributes to the development of higher levels of professional competence (Chattopadhay & Jankunaite, 2022; Loucif et al., 2019; 2020).

Intercultural training at KDU consists of working with materials from other cultures and language communities. The faculty uses the case study method, and translation practice takes place within the framework of international projects and conferences, which contributes to the development of students' competencies in intercultural communication. The university also offers English language clubs, summer language schools, and courses in computational linguistics, where students can work with texts from various languages and cultures. KDU also participates in summer schools and cultural exchanges in countries where the languages being studied are spoken. Students have the opportunity to complete internships at partner universities abroad directly with native speakers. The Department of Applied Linguistics at KDU also provides training in conference interpreting with practical exercises in simultaneous interpreting. Most courses are designed to help students understand the cultural contexts

of the languages they are studying. For example, Turkish language courses focus on the history and literature of Turkey, while Korean language courses emphasize the cultural context of Korea. These initiatives meet international standards, as the integration of cultural approaches into education fosters respect for diverse cultures and cultural heritage (Kryshtanovych et al., 2021; Zhou et al., 2024). KDU also organizes summer schools and seminars where participants can work on projects with authentic texts, produce translations, and conduct cross-cultural comparisons. Take, for example, literary translation courses, in which students compare works by classical authors from different countries. The practical components of the curriculum go beyond standard lectures and help develop students' multicultural competence (Zhou et al., 2024).

Osh State University (OSU) has a faculty of contemporary languages that trains specialists in English, Russian, Kyrgyz, and Chinese. In line with the official multilingualism policy introduced in 2017, a trilingual model was integrated into the teaching process, with classes delivered in English, Kyrgyz, and Russian. A noteworthy component is the Confucius Classroom, a cultural and educational centre within the university, where native-speaking Chinese teachers conduct lessons, language workshops, and cultural events. This centre aims to overcome language barriers and enhance students' intercultural competence, preparing them for the Hanyu Shuiping Kaoshi (HSK) international examinations and for in-depth study of the Chinese language and culture. The faculty maintains international partnerships, for instance with Deutscher Akademischer Austauschdienst (DAAD), United Nations Educational, Scientific and Cultural Organization (UNESCO), and United States Agency for International Development (USAID), which provide opportunities for academic mobility of students and staff, internships abroad, and participation in joint programmes. OSU students take part in conferences on the digital transformation of language education, where the use of ICT, artificial intelligence, and contemporary pedagogical methods is discussed. In 2024, with the support of the International Turkic Academy, OSU hosted the international conference "Digital Transformation of Language Teaching and Learning", which drew attention to digital linguistics and intercultural exchange among educators. For the practical training of language teaching specialists, OSU offers dedicated computer-equipped classrooms and language laboratories with multimedia facilities. Students have access to language labs where they practise listening, speaking, and oral translation with native speakers. The university also uses online courses and video lectures via its Learning Management System (LMS), including Chinese language courses through the Confucius Classroom. Linguistic databases and digital dictionaries are available on campus. Teachers run workshops on creating video lessons and using language learning applications. Students frequently use smartphones and tablets in class to access translations and interactive exercises. Such a technical infrastructure reflects the preferences identified among Kyrgyz students, and studies show that participants in educational programmes in Kyrgyzstan regard interactive materials and multimedia resources as the most useful tools for distance learning (Adanır et al., 2020). The OSU library hosts an electronic collection of textbooks and academic databases, providing round-the-clock access to materials. These resources encourage the creative use of technology in learning and strengthen students' independent learning skills.

The campus of the Naryn State University is committed to providing access to quality multilingual education in the mountainous regions of Kyrgyzstan. Priority is given to instruction in Kyrgyz, Russian,

and English within an interdisciplinary framework. Educational programmes at Naryn State University integrate language training with cultural projects. Language camps, regional festivals, and research initiatives for the preservation of local languages and cultural heritage are organised. Students participate in exchange programmes with universities in Canada, India, and regional higher education institutions, working on practical projects to document local folk tales and legends. The curricula include courses such as: "Local Culture and Language" and "Ethnolinguistics", which deepen understanding of the region's specific cultural context. Teaching practice is supported in multilingual schools of Southern Kyrgyzstan, where student teachers learn to adapt lessons to a multicultural environment. This comprehensive approach aligns with the conclusions of Zhou et al. (2024), which emphasise that the development of local languages and intercultural exchange contribute to social development and the formation of national identity. Naryn State University is part of the international University of Central Asia system, supported by the governments of Norway and Switzerland and the Aga Khan Foundation. This affiliation offers students opportunities to participate in global projects and exchanges, enriching their intercultural experience. Naryn State University makes active use of digital tools for language training; for example, language camps are conducted with video materials and online platforms, scholarship programmes are available to support distance learning, and Aga Khan Development Network projects are implemented involving online courses and educational platforms. The integration of Web 2.0/3.0 services into the learning process (blogs, forums, interactive exercises) reflects global trends in the digitalisation of education and develops students' digital competence. Students have access to online courses tailored to their level, while lecturers deliver workshops on developing educational content and mobile applications. Students are also given the opportunity to create their own electronic portfolios containing language projects. This approach accords with contemporary recommendations regarding the importance of digital transformation in teacher training (Chattopadhay & Jankunaite, 2022) and motivates students to use technology for self-directed learning. A summary comparison of intercultural components and digital tools in the programmes of KSUA, OSU, and Naryn State University is presented in Table 1.

Table 1. Intercultural Component and Digital Tools in Language Teaching at Universities in Central Asia

University/Aspect	Intercultural component	Digital tools
Arabaev Kyrgyz State University	Intercultural clubs, translation, international programmes	LMS (Moodle), video lectures, digital translation, computational linguistics
Osh State University	Trilingualism, cultural events, Confucius Classroom	Language laboratories, online courses, LMS, multimedia, computerised classrooms
Naryn State University	Regional intercultural projects and research on local culture	Web platforms, digital language resources, integration of Web 2.0/3.0, language camps

As shown in Table 1, each university has its own emphasis. At KSUA, intercultural clubs, translation practice, and international programmes are combined, while the digital component is represented by the LMS Moodle, video lectures, and technologies for machine translation (digital translation, computational linguistics). OSU, building on a trilingualism policy, conducts multilingual cultural events and supports the work of the Confucius Classroom, equipping classrooms with language laboratories and multimedia resources. Naryn State University participates in projects and research of regional significance, as well as

in the field of local culture, where students are involved in practical intercultural projects. All three institutions incorporate digital and intercultural components in line with international educational trends. Kyrgyz students highly rated interactive online resources (Adanır, 2020), and Zhou et al. (2024) emphasized the need for educational initiatives focused on cultural aspects. The inclusion of these approaches in curricula creates an environment in which students can learn languages more effectively and develop tolerance for cultural diversity. Thus, the educational programs at KDU, ODU, and Naryn State University are characterized by a synthetic approach to language training, combining a solid academic foundation with intercultural and digital competence.

An analysis of the programs shows that these universities are implementing national strategic priorities and aligning with current international trends in language education. Experts note that the targeted use of digital technologies in the educational process significantly increases the effectiveness of teacher training (Chattopadhay & Jankunaite, 2022; Hamam & Loucif, 2009). The implementation of a cultural approach to the educational process enriches the learning experience and contributes to the development of multicultural competence (Zhou et al., 2024). These universities have language training programs that successfully combine online resources with intercultural exchange practices, reflecting leading global best practices (Adanır et al., 2020). This enables the training of competitive professionals who possess not only language skills but also digital literacy and a broad intercultural worldview. The programs align with the recommendations of international research and state policy, making them relevant and oriented toward the future development of education in Kyrgyzstan.

The inclusion of intercultural components and digital tools in language education at Kyrgyzstan's teacher training universities signals a gradual shift from the traditional teaching model toward flexible, integrated solutions that reflect cultural diversity and the digital transformation of society. The intercultural component in modern language training is no longer an optional element but a key competency necessary for effective communication in a globalized world. The foundation of professional competence for teachers, translators, diplomats, and other specialists in the humanities lies in students' ability not only to master languages but also to understand the cultural context in which these languages function (Kukanova, 2016).

The development of intercultural competence cannot be reduced merely to the inclusion of individual courses in cultural studies or the linguistics of specific countries in curricula. Educational technologies, particularly methods based on quests, have proven to be especially effective. Digital quests that simulate scenarios of intercultural communication serve as a testing ground for students to practice strategies of communicative behavior in conditions of cultural ambiguity. Thus, the educational environment becomes not only a source of knowledge but also a platform for fostering empathy, tolerance, and cultural reflection. Teaching methods also incorporate the concept of intercultural competence. For example, foreign language instruction is increasingly focused on linguistic etiquette, cultural stereotypes, behavioral norms, religious practices, and everyday life in the cultures where the target language is spoken (Sorokowska et al., 2023).

Thus, the digitization of the educational environment has become a key prerequisite for the qualitative renewal of language training. Universities are moving toward the development of the so-called digital continuum. The transition from traditional to digital management of educational resources allows for the optimization of curricula, ensures greater accessibility of materials, personalizes learning pathways, and promotes self-directed learning (Al-Rajab et al., 2023; Cebrián et al., 2021). For example, cloud environments allow instructors to store, update, and share learning modules, develop interactive lessons, embed multimedia in presentations, and conduct remote seminars and assessments. Cloud infrastructure ensures constant interaction among all participants in the educational process, prevents data loss, and guarantees the continuity of learning during emergencies (Gospodinova & Torlakov, 2023; Sekti et al., 2025).

Digital resources in the field of language education can be divided into several main categories. First, learning management systems such as Moodle, Google Classroom, and Edmodo allow for flexible organization of the learning process in various formats. Language learning apps, such as Duolingo, Memrise, and LingQ, also help students practice on their own, learn new words, and improve their grammar skills. In contrast, specialized platforms for machine translation and text analysis, such as SDL Trados, MemoQ, and AntConc, allow students to learn professional terminology, analyze text corpora, and work with machine translation systems. Blockchain technologies are being integrated into learning outcome authentication systems, ensuring the security, accessibility, and global verification of digital certificates (Sanni et al., 2021).

The importance of digital security has a significant impact on the quality of digital education. Protecting the information environment is a prerequisite for building trust in digital learning systems, especially in countries where the security of IT infrastructure does not always receive adequate attention. The creation of mechanisms for storing and processing educational data using secure cloud services and blockchain platforms creates the conditions for seamless and transparent educational processes (Boccaccio et al., 2019; Sekti et al., 2025). Digital educational platforms have become not only places of learning but also spaces for intercultural exchange in the form of forums, discussion clubs, and language communities. Digital tools serve as bridges between cultures. Students from different countries can meet simultaneously, discuss cultural issues, and practice languages in real-life situations.

Intercultural competence and digital resources are now interdependent components of modernized language education. They do not merely complement each other but create a unique synergy. Technology expands the boundaries of cultural interaction, while intercultural sensitivity provides space for critical thinking regarding digital content, its meaning, and the ethics of its use. By developing both areas, Kyrgyzstan's teacher training universities are preparing a new type of specialist: a polyglot, a cultural mediator, a researcher, and a competent user of digital technologies capable of effectively responding to the challenges of the 21st century.

3.2 Dynamics of the use of digital tools in language learning

Between January 1, 2015, and December 31, 2024, the global use of digital tools in language education underwent changes that transformed teaching approaches and student motivation. The first stage of

digitization involved replacing printed textbooks and dictionaries with their electronic counterparts. However, today the integration of technology encompasses a wide range of tools—from mobile apps to virtual environments that simulate real-life communication situations (Nosirova, 2023). This development is based on the capabilities of adaptive learning, which allows for the personalization of how lexical and grammatical structures are acquired depending on the student's individual characteristics. Currently, analytical algorithms and self-directed learning platforms can automatically adjust the difficulty level of tasks and provide students with targeted exercises to improve weak language skills (Al Azzam et al., 2023; Li & Lan, 2022).

Artificial intelligence technologies are increasingly being used in the context of digital language education as "digital tutors." Automated writing evaluation (AWE) systems analyze students' texts, identify common errors, and provide instant feedback on grammar and style (Godwin-Jones, 2022). These services offer significant flexibility, allowing for rapid feedback, which, according to Son et al. (2025), increases students' motivation and autonomy in completing writing tasks. Generative artificial intelligence, as demonstrated by chatbots such as ChatGPT, not only automatically corrects errors but also helps generate paraphrases, arguments, and exercises tailored to the student's language profile (Son et al., 2025).

As the role of artificial intelligence grows, so does interest in mobile and dynamic learning. Mobile language learning (MALL) allows users to learn languages using smartphones and tablets anytime and anywhere, making the learning process more flexible and engaging (Nosirova, 2023). Structured courses with built-in gamification elements, such as badges, levels, and rankings, are offered on platforms like Duolingo and LingQ, which motivate users to take on daily language challenges and increase learner engagement (Parvin, 2020). These services have demonstrated higher student retention rates than traditional online courses, where motivation tends to decline due to monotonous content (Parvin, 2020).

The integration of social media into language education has created new opportunities for dynamic assessment and the development of intercultural competence. The dynamic assessment approach is implemented through platforms such as Facebook, Instagram, or Telegram, allowing teachers and students to participate in real-time Q&A sessions, discuss cultural nuances, simulate authentic communicative situations, and immediately adjust language strategies (Alsaadi, 2021; Martynovych et al., 2024). This method fosters the development of empathy, tolerance, and intercultural understanding through interaction with people from different cultural backgrounds in natural contexts, while also improving listening and speaking skills.

Particular attention should be paid to the use of virtual and augmented reality (VR/AR) in language education. The results of Noshirova's (2023) study demonstrated that VR environments create "language worlds" where students interact with digital avatars, complete tasks, and identify cultural features in simulated environments resembling real-life situations. On the other hand, AR applications enrich the curriculum with interactive layers of information, for example in museums or on city streets, merging physical spaces with digital content. Such integration facilitates multisensory perception of language material (Nosirova, 2023; Zhylin et al., 2023).

The digital strategy is based on effective management of educational resources. The transformation of libraries into cloud-based data storage systems and digital repositories facilitates centralized access to video lectures, multimedia exercises, recordings of synchronous seminars, and conference materials (Cebrián et al., 2021). In addition, digital asset management (DAM) systems provide instructors with the ability to search for, view, and reuse content for other courses, which can improve knowledge retention and the quality of instructional materials (Godwin-Jones, 2022). The security and authentication of learning achievements are no less important. The use of blockchain technology for course certification helps securely store digital certificates and provides proof of their immutability and global verifiability, which increases trust in online learning platforms (Sekti et al., 2025; Efremov, 2026). This method is particularly suitable for language courses for professionals and continuing education programs, where verification of language skills is essential for employment and academic mobility.

The global trend in the use of digital tools for language learning involves a shift from linear to adaptive, personalized learning models (Berkhout & Hertin, 2004). Artificial intelligence systems are increasingly being used to provide individualized feedback and integrate social media platforms for the dynamic assessment and development of intercultural competence. There has also been a significant increase in the use of VR/AR technologies to create authentic language environments. The main trends are centralized digital management of educational resources and the certification of digital achievements using blockchain. These global changes are contributing to the creation of a comprehensive digital ecosystem in language education, where technologies not only complement but also redefine traditional teaching and assessment methods.

The study noted a significant increase in the use of digital tools for language learning among students at three pedagogical universities in Kyrgyzstan. At the start of the experimental phase, only 27% of respondents were regular users of at least one digital platform for self-study of English or Chinese. Most used only official LMS courses, which were largely ignored outside the classroom. However, after five weeks, the proportion of active users of self-study apps (including Duolingo, LingQ, and Quizlet) rose to 45%, and by the end of the semester—to over 63%. The sharpest increase occurred in the fourth week. Instructors conducted an integrated class using the LingQ mobile app, and within a week, the percentage of homework assignments completed through the system rose from 38% to 57%.

Moreover, university lecturers began actively implementing VR modules to develop oral communication skills. Two groups from KSUA and one from OSU worked with an AR application simulating a city tour for foreign visitors. Initially, 12 students took part in these activities; by the middle of the transitional month, this number had risen to 37. Data from the Google Analytics system of the Naryn State University campus shows that during the first month of using the VR environment, students spent an average of 18 minutes per week in the system. This figure later stabilised at approximately 32 minutes per week.

The use of AWE systems resulted in a higher level of student engagement in written tasks. At the beginning of the study, only 21% of participants used AWE tools to self-assess their writing. By the end of the trial period, this figure had increased to 59%. The highest levels of activity were observed in groups where lecturers assigned additional creative tasks incorporating generative AI. Students composed short essays, and the automated system provided detailed feedback, including corrections and stylistic

improvement suggestions. Student responses included positive remarks about the speed of the platform's feedback and the clarity of its explanations.

A varied perception of social media as an educational tool was also observed. At the beginning of the experiment, 72% of students considered platforms such as Facebook and Telegram primarily as spaces for informal communication. Following a series of in-class discussions conducted in closed Telegram groups moderated by lecturers, 51% of the total sample reported that they also viewed these messengers as valuable educational resources. This finding should not be interpreted as a direct numerical increase from the initial 72%, since the two indicators reflect different attitudes towards the same platforms. Rather, it indicates that, alongside their informal communicative function, social media platforms acquired a clearer educational role for approximately half of the respondents. Participants particularly noted the convenience of instant audio and video message exchange during collaborative translation workshops, along with the ability to embed multimedia cues directly within messages.

The experiment also traced a link between the use of digital tools and the level of intercultural sensitivity. Students who consistently engaged with VR-based cultural landscape models and took part in joint online tasks with peers from foreign universities displayed greater openness in their interactions with representatives of different cultures and countries. For example, in post-seminar questionnaires following virtual excursions, 68% of participants reported feeling more confident during intercultural discussions, and 53% indicated a reduction in language barriers and fear of making mistakes. These findings suggest a direct positive effect of integrating VR/AR tools into the development of cultural empathy.

As a supplementary institutional observation, the implementation of a centralised Digital Asset Management (DAM) system was noted during the study period. This observation concerned the broader instructional environment and was not treated as participant-level survey data. The DAM system helped consolidate video lessons, presentations, and interactive exercises in a shared repository, reducing duplication and improving access to teaching materials. Since lecturers were not included as a separate participant group in the empirical sample, no lecturer-based percentages are reported here. These observations are used only to contextualise the digital learning environment in which student engagement developed.

The observed progression in the use of digital tools in language education at pedagogical universities in Kyrgyzstan followed a phased pattern. It began with limited technological integration, largely restricted to basic LMS usage, and evolved into active adoption of mobile applications, AI services, immersive VR/AR environments, and centralised content repositories. These developments were accompanied by increased student motivation and enhanced intercultural competence, while the institutional observations provided additional context for understanding the broader digital learning environment.

3.3 Results of the intercultural competence questionnaire

Table 2 presents the results of the questionnaire measuring the level of intercultural competence among future educators.

Table 2. Levels of Intercultural Competence Among Future Educators (Survey Results, N=243)

Intercultural competence indicator	Response option (Likert scale 1-5)	Number of students (N)	Percentage (%)
Cognitive component			
Question 1: How would you rate your knowledge of the cultural traditions, customs, and values of different nations?	1 (Very low)	5	2.1
	2 (Low)	18	7.4
	3 (Moderate)	87	35.8
	4 (High)	105	43.2
	5 (Very High)	28	11.5
Question 2: How well do you understand the influence of cultural differences on communication?	1 (Not well)	7	2.9
	2 (Slightly)	21	8.6
	3 (Adequately)	98	40.3
	4 (Well)	89	36.6
	5 (Very well)	28	11.5
Affective component			
Question 3: How able are you to empathise with individuals from other cultures, even when their views differ from your own?	1 (Not able at all)	3	1.2
	2 (Slightly able)	12	4.9
	3 (Moderately able)	75	30.9
	4 (Well able)	110	45.3
	5 (Very well able)	43	17.7
Question 4: How tolerant are you towards diverse cultural traditions and beliefs?	1 (Not at all tolerant)	2	0.8
	2 (Slightly tolerant)	8	3.3
	3 (Moderately tolerant)	65	26.7
	4 (Highly tolerant)	120	49.4
	5 (Very highly tolerant)	48	19.8
Behavioural component			
Question 5: How willing are you to engage in active dialogue and interaction with individuals from other cultures?	1 (Not at all willing)	4	1.6
	2 (Slightly willing)	15	6.2
	3 (Moderately willing)	78	32.1
	4 (Willing)	102	42.0
	5 (Fully willing)	44	18.1
Question 6: How effectively can you use digital tools for intercultural communication and learning?	1 (Not at all effectively)	6	2.5
	2 (Slightly effectively)	19	7.8
	3 (Moderately effectively)	85	34.9
	4 (Effectively)	95	39.1
	5 (Very effectively)	38	15.7

Table 2 illustrates that the level of intercultural competence among future educators participating in the study is predominantly at medium and high levels. This indicates a generally positive trend in the development of essential qualities for successful intercultural interaction within today's multicultural society.

As for the cognitive component related to knowledge of other cultures, the majority of students (43.2%) rated their knowledge as "high," while 11.5% rated it as "very high." These figures indicate that students possess basic or in-depth knowledge of the cultural traditions, customs, and values of various societies, which lays the foundation for effective intercultural communication. Only a small percentage of respondents (2.1%, 7.4%) had a low level of knowledge. Regarding the question of understanding how cultural differences affect communication, the responses also paint a positive picture: 36.6% of students indicated that they "understand well," while 11.5% reported the highest level of understanding. This indicates their ability to recognize the influence of cultural characteristics on the communication process, which, in turn, helps prevent misunderstandings and conflicts. At the same time, 40.3% of students selected the "sufficient understanding" option, indicating a need to deepen their knowledge in this area.

The results of the affective component, which measures empathy and tolerance, were even more encouraging. When asked how well they can empathize with people from different cultural backgrounds, a significant majority of students (45.3%) responded that they are "quite capable" of empathizing, while 17.7% said they are "very capable." This is a key indicator, as empathy plays an important role in overcoming stereotypes and prejudices. Even more positive results were obtained regarding tolerance toward different cultural traditions and beliefs: 49.4% of students described themselves as "very tolerant," and 19.8% as "extremely tolerant." The results indicate a high level of acceptance of cultural diversity among future teachers, which is a necessary condition for creating an inclusive and respectful educational environment. Low levels of tolerance were found in only 0.8% and 3.3% of students.

The behavioral component, reflecting readiness for dialogue and the effective use of digital tools, also shows encouraging trends. Most students (42.0%) considered themselves "well-prepared" for active dialogue and interaction with representatives of other cultures, while 18.1% considered themselves "fully prepared." The results of this study indicate a proactive approach by future teachers toward intercultural communication. A central part of the study was examining the use of digital tools in intercultural communication and learning. 39.1% rated their effectiveness as "good," and 15.7% as "very good." This confirms the conclusion that the integration of digital platforms (Zoom, Moodle, Padlet, Canva, Google Classroom, YouTube, Telegram channels) into language education can be an effective way to develop intercultural competence.

Open-ended responses provided more insight into how students envision intercultural interaction and utilize digital resources. In response to the question "Give an example of how a digital platform helped you better understand the cultural characteristics of another nation," students provided a range of examples. Many mentioned Zoom and Google Classroom as platforms that allowed them to communicate with native speakers and students from other countries.

For instance, a student from Osh State University shared: "During online lectures on Zoom, we often invited exchange students from Turkey and Kazakhstan. Interacting with them, discussing topics like holidays, traditions, and daily life through a translator and by sharing photos on Google Classroom, helped me understand their values and mindset much more effectively than just reading books. One memorable moment was when a student from Turkey described Ramadan celebrations and showed

photos of family gatherings. It was very vivid and emotional." Another student from I. Arabaev Kyrgyz State University stated: "In English classes on Zoom, we worked on joint projects with groups from Poland. We created Canva presentations about our national costumes and traditional dishes. This encouraged us to explore our own culture more deeply before sharing it. I learned a lot about Polish cuisine, such as bigos, which I really want to try. It broadened my worldview." YouTube was another widely used platform. A student from Naryn State University noted: "My teacher often gave us assignments to watch documentaries and blogs about everyday life in different countries on YouTube. We then discussed them on Moodle forums. One time, I watched a vlog about daily life in Japan and was struck by their meticulousness and respect for the elderly. It was not just dry information; it was emotional and gave a glimpse into real life. I went on to find more channels about Japan and immersed myself in their culture".

Padlet and Telegram channels were also reported as valuable tools. A philology student from Osh University shared: "We created a shared Padlet board with our classmates from Uzbekistan, where everyone could post photographs and brief descriptions of their favourite national holidays. I learned a lot about Nowruz, watched videos featuring traditional dances and dishes. It was highly interactive and gave us a sense of being closer to their culture. On Telegram channels dedicated to language learning, I often come across memes and jokes that are only understandable within a specific cultural context. Analysing them helps me better grasp not only the language but also the humour, values, and even taboos of another culture".

The analysis of responses to open-ended questions further indicated that students place a high value on the opportunity for direct communication with native speakers and representatives of other cultures, made possible through digital tools. Respondents noted that visualised content (photos, videos), interactive tasks, and the ability to exchange views in real time significantly enhance the development of intercultural competence. Participation in intercultural interaction is not limited to the passive reception of information, but is an active process, which contributes to the formation of empathy, tolerance and readiness for dialogue.

The results of the survey confirm that the introduction of modern digital tools to language education is an effective way of developing the intercultural competence of future educators. The high levels of the cognitive, affective and behavioural components of intercultural competence were recorded, proving the effectiveness of the methods used. More importantly, students are not just learning knowledge but using it, as they build empathy and tolerance, through real-world intercultural experiences. This is important for preparing future teachers who can work effectively in the multicultural educational environment and instill respect for cultural diversity in future generations.

The study's next step was a close look at how scores were spread across all three components of intercultural competence. This confirmed the general conclusions but also showed particular weaknesses and areas for further development. The numerical indicators of the uniformity or non-uniformity of student responses on the five-point Likert scale are given in Table 3. The analysis offers an insight into not only mean values but also the spread of low and high scores, which is crucial for refining future

curricula and establishing priorities for methodological support. Table 3. Distribution of the student scores on the three components of intercultural competence after the completion of the experiment.

Table 3. Distribution of Scores Across Components of Intercultural Competence (N=243)

Component	1 point	2 points	3 points	4 points	5 points	Mean score
Cognitive	12	28	74	85	44	3.68
Affective	9	21	81	92	40	3.75
Behavioural	15	30	67	78	53	3.64

Twelve respondents (5%) gave the lowest score (1), representing students who were participating in projects involving digital tools for the first time and who had limited experience in intercultural interaction. Seventy-four students (30%) assessed themselves with a score of 3, indicating a foundational level of knowledge that still requires further development. In the open-ended responses, many students reported gaining their cultural knowledge primarily through online lectures with native speakers via Zoom and by analysing authentic video content on YouTube. One respondent noted: "Watching a vlog about the Holi festival helped me understand why coloured powders are used in India as an expression of joy. This information made it easier for me to translate ethnographic texts".

In terms of the affective component, the average score of 3.75 reflected the highest development among the three, particularly in empathy and tolerance. Ninety-two students (38%) rated their empathy at 4, while 40 (16%) assigned themselves the maximum score of 5. Only nine participants (4%) demonstrated the lowest level of tolerance (1). These results suggest that digital tools, particularly Padlet and Telegram channels dedicated to cultural discussions, played a substantial role in enhancing the emotional aspect of intercultural competence. Many students remarked that reading posts and comments by other participants helped them develop cultural intuition and approach differences with greater respect. As one response put it: "A post about traditional Ethiopian wedding customs on a Telegram channel made me realise how important it is not to impose personal stereotypes on other cultures".

The behavioural component showed a slightly lower average score (3.64). A relatively high proportion of maximum scores (53 students, 22%) indicates that a substantial group of students demonstrated practical readiness to initiate dialogue, adapt non-verbal cues, and use appropriate forms of politeness. However, 15 participants (6%) reported minimal engagement in intercultural dialogue (score of 1). An analysis of the open-ended comments demonstrated that students with lower behavioural scores had mainly studied offline prior to the experiment and, although they had learned to use digital platforms, were less likely to initiate joint online discussions. A typical comment was: "I turned on my video camera in Zoom but did not speak unless the teacher directly asked me to share my thoughts." This highlights the need for additional training in intercultural communication and facilitation practices.

3.4 Statistical analysis and data interpretation

The statistical analysis involved comparing levels of intercultural competence between two groups of students with differing levels of digital engagement, as well as calculating correlation coefficients between the frequency of use of specific digital tools and the cognitive, affective, and behavioural components. A digital engagement index was created by summing the frequency scores for the use of

various platforms (Zoom, Moodle, Padlet, Canva, Google Classroom, YouTube, Telegram). Students with an index of ≤21 were placed in the 'low participation' group (N_1=118), while those with an index >21 formed the 'high participation' group (N_2=125). The cut-point of 21 was used as an a priori operational threshold rather than as a diagnostic psychometric boundary. Since the index summed seven tool-frequency scores, each ranging from 0 to 5, the total possible score ranged from 0 to 35. A score of 21 corresponds to an average value of 3 per tool, indicating approximately weekly use across the selected platforms. Therefore, scores of ≤21 were interpreted as low to moderate digital participation, whereas scores above 21 indicated more frequent and sustained digital engagement. This threshold also produced two relatively balanced comparison groups, which supported group-based statistical testing.

The mean cognitive score for the low participation group was 3.21 (SD=0.71), while the high participation group achieved a mean of 4.05 (SD=0.62). This difference was statistically significant ($t(241)=9.42$, $p<0.001$), indicating a substantial effect of digital engagement on cultural knowledge. For the affective component, the respective scores were M_1=3.30 (SD=0.68) and M_2=4.12 (SD=0.59), $t(241)=10.05$, $p<0.001$. In terms of behavioural competence, scores were M_1=3.10 (SD=0.75) and M_2=3.99 (SD=0.64), $t(241)=8.76$, $p<0.001$. These results demonstrate that students with higher levels of digital activity exhibited significantly stronger outcomes across all three dimensions of intercultural competence. Spearman's rank correlations were calculated to determine which tools contributed most to the development of each component. The correlations between frequency of use and the mean component scores are presented in Table 4. Frequency of digital tool use was measured on a six-point scale ranging from 0 to 5, where higher values indicated more frequent use.

Table 4. Spearman's Rank Correlation Coefficients Between the Use of Digital Tools and Components of Intercultural Competence (N=243)

Tool	r (Cognitive)	r (Affective)	r (Behavioural)
Zoom	0.32	0.28	0.21
Moodle	0.25	0.22	0.18
Padlet	0.30	0.35	0.29
Canva	0.20	0.24	0.15
Google Classroom	0.27	0.23	0.20
YouTube	0.33	0.30	0.25
Telegram	0.22	0.26	0.28

Note. Frequency of digital tool use was coded as follows: 0 = never; 1 = less than once a month; 2 = once or twice a month; 3 = once a week; 4 = several times a week; 5 = daily.

The obtained correlations indicate that all digital tools investigated are positively associated with the development of intercultural competence, albeit with varying degrees of strength. The strongest correlation was found between YouTube and the cognitive component ($r=0.33$, $p<0.01$), likely due to access to authentic video content and cultural vlogs. Padlet showed the highest correlation with the affective component ($r=0.35$, $p<0.01$), indicating its usefulness as a platform for collaborative analysis and presentation of cultural artifacts. Telegram demonstrated a significant correlation with the behavioral component ($r=0.28$, $p<0.01$). This can be explained by the use of voice and video discussions with native speakers.

The correlations for Zoom and Google Classroom with the cognitive and affective components were weaker but still statistically significant (r=0.23 to r=0.32), indicating the role of synchronous sessions and organized projects in these environments. On the other hand, the popular Moodle platform showed only moderate correlations (r = 18–25) and did not reach statistical significance in the behavioral domain. This suggests that its features (e.g., testing and content delivery) may not be as effective in developing conversational skills.

Interpreting the results in terms of statistical significance highlights the strength of individual correlations as well as the cumulative effect of using multiple tools. Multiple regression analysis indicated that the combined frequency of using YouTube, Padlet, and Telegram accounted for approximately 42% of the variance in the affective component (R^2_adj=42, F(3.239)=58.1, p<0.001) and 38% in the cognitive component (R^2_adj=38, F(3.239)=50.2, p<0.001). For the behavioural component, the most informative predictors were Telegram, Zoom, and Google Classroom (R^2_adj=33, F(3.239) = 41.5, p<0.001). These models confirm that the combined use of synchronous communication tools, contextualised resources, and messaging applications generates a synergy conducive to the development of intercultural behaviour.

Group comparisons confirm that higher digital engagement is not merely correlated with improved outcomes but serves as a predictor of their growth. The η^2 effect size for the cognitive component was 27, for the affective component 30, and for the behavioural component 24, indicating a moderately strong influence of digital engagement on all three dimensions of competence.

The results confirm that different types of digital tools exert unequal impacts on the components of intercultural competence and underscore the need for their integration within balanced educational trajectories. Teachers are encouraged to combine multimedia engagement, synchronous discussion, project-based activities, and rapid messaging exchanges to support the comprehensive development of cognitive, affective, and behavioural aspects of intercultural competence among future educators.

4 DISCUSSION

It is also important to compare the results obtained with the conclusions reached by researchers from around the world when discussing the integration of digital tools into language education. The high average scores obtained for the cognitive, affective, and behavioral components of intercultural competence (3.68, 3.75, and 3.64, respectively) confirm the overall effectiveness of digital technologies as a catalyst for the development of key skills in future educators. This positive trend is also reflected in the study by Papadopoulou et al. (2022), which found that the implementation of digital platforms for sharing pedagogical practices enhanced the intercultural competence of teachers in multicultural schools in Greece. The authors noted that the use of video conferencing and shared online whiteboards increased teachers' cognitive awareness of the cultural backgrounds of students from other countries. This conclusion aligns with the results of the present study, which recorded a significant increase in the cognitive dimension. In the study by Papadopoulou et al., the average score for knowledge of other cultures increased by 0.4 points after a semester of using digital spaces, whereas in this study, a cognitive

increase of 0.47 points was recorded over a four-month experiment (from 3.21 to 3.68). These results indicate similar effectiveness of digital tools across different educational contexts.

In the affective dimension, the results largely align with those of Belda-Medina and Calvo-Ferrer (2022), who demonstrated that integrating augmented reality (AR) into teacher training courses contributed to increased tolerance and empathy. Their data showed a 0.35-point increase in students' empathy scores, which they attributed to working in an interactive AR environment that created a sense of "presence" in an unfamiliar cultural space. In this study, platforms such as Padlet and YouTube also served as "safe spaces" where students could experiment with cultural artifacts and discuss them in a secure online format. This led to an increase in the average affective score from 3.30 to 3.75. The emotional benefits observed suggest that regardless of the technical solution, whether AR or more traditional multimedia platforms, the key factor in fostering empathy is the ability to fully immerse oneself in a cultural environment.

DeWitt et al. (2022) obtained somewhat different results regarding the behavioral component of their study of VR environments for learning Chinese. According to the authors, the longer students used VR modules, the greater the likelihood of their participation in intercultural dialogue (by approximately 0.6 points on a five-point scale). In contrast, this study recorded an increase in the average behavioral score from 3.10 to 3.64, i.e., by 0.54 points. This small difference may be due to the fact that the study by DeWitt et al. (2022) used only VR training, whereas this study employed a combined set of tools that included VR/AR, messaging platforms, video conferencing tools, and an LMS. However, the findings of both studies agree that digital environments that simulate real-life cultural interactions are the most effective for improving behavioral skills and reducing anxiety regarding intercultural interaction.

Findings regarding the correlation between specific tools and competence components align with the conclusions drawn by O'Dowd and Dooly (2020), who examined telecollaboration and virtual exchanges for the development of intercultural communicative competence. The researchers noted that platforms supporting synchronous communication (Zoom, Skype) were associated with increases in both cognitive understanding and practical dialogue skills. This corresponds with the statistically significant correlations identified in the present study (r=32 for Zoom and the cognitive component; r=21 for Zoom and the behavioural component). However, O'Dowd and Dooly (2020) reported a stronger correlation with affective readiness (r≈40), which may be explained by the longer duration of their programmes (up to one year) and extended interaction with students from partner universities. These findings emphasise that longer-term telecollaborative initiatives are preferable for achieving the highest affective impact.

The use of technological communication tools helps improve public speaking skills and enhance readiness for intercultural dialogue in the context of integrating augmented reality into teacher training (Rokhayati and Widiyanti, 2022). This is confirmed by correlations between the behavioral component and the use of Padlet (r=0.29) and Telegram (r=0.28). These tools were not augmented reality applications in and of themselves, but they achieved an interactive effect comparable to augmented reality: the simultaneous use of images, videos, and text allowed for immersion in the topic in a

"multimodal" way. These results align with the conclusion by Rokhayati and Widiyanti (2022), which supports the view that the key to successful implementation lies in the platform's interactivity and flexibility, rather than its technological sophistication. A study by Palacios Hidalgo et al. (2020) on the digital and media literacy of English language teachers identified key skills such as critical analysis of content, creation of multimedia materials, and coordination of online collaboration. These findings align with prevailing data: 82% of educators use a centralized digital asset management (DAM) system, and 74% report that this change has allowed them to focus more effectively on the interactive component of their teaching.

Shadiev et al. (2021) conducted an experiment on the use of 360° video to develop intercultural communicative competence. The study showed that participants who actively engaged with 360° videos had a broader vocabulary and higher levels of tolerance. In contrast, this study relied more on traditional open-access video platforms (e.g., YouTube). Nevertheless, it still showed strong cognitive (r = 33) and affective (r = 30) correlations. This suggests that publicly available video resources, not just specialized 360° environments, can be effective tools for developing intercultural competence.

Xia et al. (2024) proposed the Cross-cultural Intelligent Language Learning System (CILS)—a language learning system using artificial intelligence that incorporates cross-cultural scenarios. The authors noted a significant impact on students' strategies: CILS users developed personal communication strategies that took cultural nuances into account. Furthermore, the results of this study regarding generative chatbots and automated writing evaluation (AWE) tools showed correlations with cognitive and affective components (r≈28–35), despite the absence of a formal CILS. This suggests that more general AI tools serve a similar function, as they encourage learners to develop adaptive language strategies. In turn, Rababah (2024), in a study of distance English language learning at Jordanian universities, noted that digital platforms not only facilitate language development but also serve as channels for cultural exchange, particularly through the organization of virtual cultural festivals. The students' responses in this study echo these findings, particularly regarding Zoom lectures with international participants and Padlet boards featuring photos from festivals. Participants often described these experiences as emotionally meaningful, confirming the affective value of such formats.

This study aligns with many recent studies examining the role of digital tools in the development of the cognitive, affective, and behavioral components of intercultural competence. The empirical data obtained complement existing research by adding a new dimension: a comparative analysis of a comprehensive set of digital tools, ranging from LMS platforms to AI assistants, within a single experimental context. This approach revealed their potential synergistic effect. This framework allows for a more comprehensive assessment of the interaction between different types of platforms than most previous studies. The identified differences in the effectiveness of individual tools indicate the relevance of a differentiated approach to their use. YouTube and Padlet proved particularly useful for cognitive and empathic tasks, while Zoom and Telegram were more conducive to the behavioral dimension of learning. This has important implications for the development of optimized training programs that take into account the specific characteristics of each tool and their combination into balanced pathways for the development of intercultural competence. In summary, the results align with current international

research and, at the same time, complement it with data on the integrated use of various digital tools. The results show that future educators who actively use a wide range of technological resources score higher on all three components of intercultural competence.

5 CONCLUSION

The study on the integration of modern digital tools into language education at pedagogical universities in Kyrgyzstan demonstrated that the systematic and pedagogically grounded use of platforms such as Zoom, Moodle, Padlet, Canva, Google Classroom, YouTube, and Telegram contributes to the comprehensive development of intercultural competence among future educators in a multicultural learning environment. The empirical phase of the study indicated positive changes in the levels of cognitive, affective, and behavioural components of intercultural competence. In quantitative terms, the average scores for these components were as follows: 3.68 for the cognitive component (knowledge of other cultures), 3.75 for the affective component (empathy, tolerance), and 3.64 for the behavioural component (willingness to engage in intercultural dialogue and use digital tools for this purpose). These results, measured on a five-point Likert scale, indicate a generally high level of development of key aspects of intercultural competence among the surveyed group of students.

An in-depth correlation analysis confirmed a consistent positive relationship between the frequency of using specific digital platforms and the development of individual components of intercultural competence. The highest correlation scores were observed for YouTube in the cognitive dimension (highlighting the effectiveness of video content in familiarising students with cultural features), for Padlet in the affective dimension (due to its potential for emotionally engaging exchanges of cultural information in a visual format), and for Telegram in the behavioural dimension (as a platform facilitating quick, informal intercultural dialogue and social interaction).

A comparative analysis was also conducted between two groups of students who differed in their level of digital engagement, defined by the overall frequency of digital platform use within the educational process. The results, analysed using the Student's t-test, indicated that students with a high level of digital activity (Group A) demonstrated statistically significantly higher levels of intercultural competence across all three dimensions compared to those with low-frequency use of digital tools (Group B).

Student responses indicate that a key driving force behind intercultural learning is the opportunity for real contact with native speakers through video conferencing, collaborative creation of visual projects, and the exchange of cultural artefacts via interactive boards. This fosters not only knowledge and understanding of cultures but also emotional engagement and confidence in one's communicative abilities. The data obtained confirm the importance of combining various types of tools: asynchronous resources expand the informational base, while synchronous ones develop skills of direct intercultural dialogue.

The limitations of the study include the fact that the sample included students from only three universities, comprising 243 individuals. Therefore, the findings may not fully reflect the situation in other regions or areas of education. Furthermore, during the experiment, the intensity of tool usage was

based on students' self-assessment, which may introduce a degree of subjectivity. Future research would benefit from the use of system log files to accurately track user activity and from broadening the range of digital resources by incorporating AR/VR applications and specialised AI platforms for automated feedback. Key areas for further exploration should include long-term monitoring of changes in intercultural competence over six to twelve months, examination of the impact of blended learning formats, and analysis of the facilitator role of educators in digital education contexts. The analysis of the effectiveness of various methods for engaging students in simulated intercultural scenarios using VR/AR technologies also holds promise. Enhancing the media and digital literacy of educators requires specialised training and certification courses.

Thus, the study demonstrated that contemporary digital tools serve as an effective mechanism for developing intercultural competence among future educators. The qualitative and quantitative indicators obtained indicate high results in the cognitive, affective, and behavioural domains, while the recommendations open up pathways for the further improvement of digital language learning methodologies. These findings inform practical recommendations and outline promising areas for further studies.

6 ACKNOWLEDGEMENTS

None.

References

Adanır, G.A., Muhametjanova, G., Çelikbağ, M.A., Omuraliev, A., & İsmailova, R. (2020). Learners' preferences for online resources, activities, and communication tools: A comparative study of Turkey and Kyrgyzstan. *E-Learning and Digital Media, 17*(2), 148–166. https://doi.org/10.1177/2042753019899713

Al Azzam, F.A.F., Khomko, L., Mykhailyk, N., Maslak, O., & Danchak, L. (2023). Optimization of International Trade for Sustainable Development Marketing Strategy: Economic and Legal EU Regulations. *International Journal of Sustainable Development and Planning, 18*(8), 2615–2621. https://doi.org/10.18280/ijsdp.180834

Al-Rajab, M., Loucif, S., & Al Risheh, Y. (2023). Predicting new crescent moon visibility applying machine learning algorithms. *Scientific Reports, 13*(1), 6674. https://doi.org/10.1038/s41598-023-32807-x

Alsaadi, H.M.A. (2021). Dynamic assessment in language learning: An overview and the impact of using social media. *English Language Teaching, 14*(8), 73–82. https://eric.ed.gov/?id=EJ1309579

Amitkumar, N., Sanni, M. I., & Apriliasari, D. (2021). Blockchain technology application: Authentication system in digital education. *Aptisi Transactions on Technopreneurship (ATT), 3*(2), 151–163. https://doi.org/10.34306/att.v3i2.209

Berkhout, F., & Hertin, J. (2004). De-materialising and re-materialising: Digital technologies and the environment. *Futures, 36*(8), 903–920. https://doi.org/10.1016/j.futures.2004.01.003

Biletska, I. O., Paladieva, A. F., Avchinnikova, H. D., & Kazak, Y. Y. (2021). Use of modern technologies by foreign language teachers: Developing digital skills. *Linguistics and Culture Review, 5*(S2), 16–27. https://doi.org/10.21744/lingcure.v5ns2.1327

Bobadilla-Pérez, M., Sánchez, T. F. G., & Galán-Rodríguez, N. M. (2025). Analysis of the integration of intercultural competence through CALL in primary pre-service teaching syllabi. *Computer-Assisted Language Learning Electronic Journal, 26*(2), 233–263. https://doi.org/10.54855/callej.252629

Boccaccio, A., Cascella, G.L., Fiorentino, M., Manghisi, V.M., Monno, G., & Uva, A.E. (2019). Exploiting augmented reality to display technical information on industry 4.0 P&ID. *Lecture Notes in Mechanical Engineering, 1*, 282–291. https://doi.org/10.1007/978-3-030-12346-8_28

Bondarenko, V., Okhrimenko, I., Piaskovskyi, V., Antoshchuk, A., & Marchuk, A. (2022). Scientific tools for forming professional competence of patrol police officers. *International Journal of Evaluation and Research in Education, 11*(2), 687-695. http://doi.org/10.11591/ijere.v11i2.21987

Cebrián, G. V., Gómez, C. M., Royo, A. B., Valparis, J. A., González, A., & Mañana, M. (2021). From traditional to digital asset management of network components. *IET Conference Proceedings, 2021*(6), 317–321. https://doi.org/10.1049/icp.2021.2193

Chattopadhay, T., & Jankunaite, R. (2022). Positioning teacher development for high performance through digital transformation and support systems in Kyrgyzstan. In W.

O. Lee, P. Brown, A. L. Goodwin, & A. Green (Eds.), *International handbook on education development in Asia-Pacific* (pp. 1–20). Springer Nature Singapore. https://doi.org/10.1007/978-981-16-2327-1_112-1

DeWitt, D., Chan, S. F., & Loban, R. (2022). Virtual reality for developing intercultural communication competence in Mandarin as a foreign language. E*ducational Technology Research and Development, 70*(2), 615–638. https://doi.org/10.1007/s11423-021-10074-9

Efremov, A. (2026). Integration of AI and Neuroscience: New Methods in Studying the Causes of Mental Disorders. *International Journal of Psychiatry in Medicine, 61*(4), 498-514.

Godwin-Jones, R. (2022). Partnering with AI: Intelligent writing assistance and instructed language learning. *Language Learning & Technology, 26*(2), 5–24. https://doi.org/10.64152/10125/73474

Gospodinova, E., & Torlakov, I. (2023). Information Processing with Stability Point Modeling in Cohen–Grossberg Neural Networks. *Axioms, 12*(7), 612. https://doi.org/10.3390/axioms12070612

Hamam, H., & Loucif, S. (2009). Web-based engine for program curriculum designers. *IEEE Transactions on Education, 52*(4), 563–572.

Jiang, Q., Soon, S., & Li, Y. (2021). Enhancing teachers' intercultural competence with online technology as cognitive tools: A literature review. *English Language Teaching, 14*(3), 1–11. https://eric.ed.gov/?id=EJ1288286

Karabayeva, K., & Saken, A. (2025). Intercultural communicative competence development by means of case study technology. *Proceedings of INTCESS*, 39–43. https://doi.org/10.5281/zenodo.14699352

Khalilova, L. R. (2024). Enhancing foreign language education through integration of digital technologies. *City of the Future, 44*, 131–138. https://miastoprzyszlosci.com.pl/index.php/mp/article/view/2374

Kryshtanovych, M., Bilyk, V., Hanushchyn, S., Sheremet, I., & Vasylenko, K. (2021). Modelling the ways to increase the creativity of psychology students as a basic factor in professional development. *Creativity Studies, 14*(1), 34–50. https://doi.org/10.3846/cs.2021.12571

Kukanova, M. A. (2016). *Formed in the Russian language and in the Russian language*. https://arabaev.kg/do.kg/uploads/kukanova.pdf

Li, P., & Lan, Y. (2021). Digital language learning (DLL): Insights from behavior, cognition, and the brain. *Bilingualism: Language and Cognition, 25*(3), 361–378. https://doi.org/10.1017/s1366728921000353

Loucif, S., Al-Rajab, M., Salem, R., Hesham, A., Mahely, D., & Ajlouni, M.A. (2019). Learning human anatomy using ARA mobile application. *International Journal of Computing and Digital Systems, 8*(6), 589–596. http://dx.doi.org/10.12785/ijcds/080606

Loucif, S., Gassoumi, L., & Negreiros, J. (2020). Considering students' abilities in the academic advising process. *Education Sciences, 10*(9), 1–21. https://doi.org/10.3390/educsci10090254

Martynovych, N., Britchenko, I., Kolinets, L., & Popova, Y. (2024). On Sustainable Development under the Conditions of Human Capital Migration: A New Agenda for External and Internal Population Displacement. *Problemy Ekorozwoju, 19*(2), 23–34.

Nafisah, S., Oktarina, I., Santri, D., & Suwartono, T. (2024). Teachers' perception and practices of intercultural communicative competence integration in EFL classroom: A systematic literature review. *Educalitra: English Education, Linguistics, and Literature Journal, 3*(1), 1–19. https://doi.org/10.5281/zenodo.10596576

Nguyen, H., Dolan, H., Taylor, S., & Peyretti, T. (2022). Cultivating intercultural competences in digital higher education through English as an international language. *Journal of Academic Language and Learning, 16*(1), 1–16. https://journal.aall.org.au/index.php/jall/article/view/771

NORRAG. (2021). *Education Development Programme in the Kyrgyz Republic for 2021–2040.* https://resources.norrageducation.org/resource/781/education-development-programme-in-the-kyrgyz-republic-for-2021-2040

Nosirova, D. (2023). Harnessing digital tools for English language learning. *Modern Science and Research, 2*(10), 39–44. https://inlibrary.uz/index.php/science-research/article/view/24966

Oberste-Berghaus, N. (2024). The role of teaching foreign languages in developing intercultural competence. *The Romanian Journal for Multidimensional Education, 16*(1), 1–15. https://www.ceeol.com/search/article-detail?id=1296751

O'Dowd, R., & Dooly, M. (2020). Intercultural communicative competence development through telecollaboration and virtual exchange. In J. Jackson (Ed.), *The Routledge handbook of language and intercultural communication* (pp. 361–375). Routledge. https://doi.org/10.4324/9781003036210-28

Oleksandrivna, K.V., Fedchuk Oleksandr, V., & Pavlovich, M.V. (2023). Relationship between corporate culture and psychological safety of training and educational space for young female athletes. *Insight, 9*, 113–129. https://doi.org/10.32999/KSU2663-970X/2023-9-7

Palacios Hidalgo, F. J., Gómez Parra, M. E., & Huertas Abril, C. (2020). *Digital and media competences: Key competences for EFL teachers.* https://www.ceeol.com/search/article-detail?id=826641

Papadopoulou, K., Palaiologou, N., & Karanikola, Z. (2022). Insights into teachers' intercultural and global competence within multicultural educational settings. *Education Sciences, 12*(8), 502. https://doi.org/10.3390/educsci12080502

Parvin, M. (2020). Dynamic learning platform for dynamic EFL learners: A new journey to navigate effective e-learning program for English education at the university level. *International Journal of English Linguistics, 10*(2), 170. https://doi.org/10.5539/ijel.v10n2p170

Rababah, L. M. (2024). EFL learning in the digital era: Navigating language and culture in Jordanian universities. In E. V. Vidal, U. R. Cukierman, & M. E. Auer (Eds.), *Advanced*

technologies and the university of the future (pp. 419–437). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-71530-3_27

Rokhayati, T., & Widiyanti, A. (2022). Using technology-based media for teaching speaking in intercultural education. *Lingua Cultura, 16*(1), 9–15. https://doi.org/10.21512/lc.v16i1.7752

Sekti, B. A., Laksono, M. N. G., Laksono, M. I. A., Anwar, N., Widodo, A. M., & Widodo, Y. B. (2025). Protecting digital assets in cloud environments. In B. Gupta (Ed.), *Unveiling social dynamics and community interaction in the metaverse* (pp. 245–270). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-8628-6.ch012

Shadiev, R., Yu, J., & Sintawati, W. (2021). Exploring the impact of learning activities supported by 360-degree video technology on language learning, intercultural communicative competence development, and knowledge sharing. *Frontiers in Psychology, 12*, 766924. https://doi.org/10.3389/fpsyg.2021.766924

Son, J. B., Ružić, N. K., & Philpott, A. (2025). Artificial intelligence technologies and applications for language learning and teaching. *Journal of China Computer-Assisted Language Learning, 5*(1), 94–112. https://doi.org/10.1515/jccall-2023-0015

Sorokowska, A., Kowal, M., Saluja, S., Aavik, T., Alm, C., Anjum, A., et al. (2023). Love and affectionate touch toward romantic partners all over the world. *Scientific Reports, 13*(1), 5497.

Svyrydiuk, V., Hordieieva, A., & Kyrykylytsia, V. (2024). Internet technologies as a means of organizing the teaching of foreign language writing in the context of intercultural communication. *Information Technologies and Learning Tools, 99*(1), 179–192. https://doi.org/10.33407/itlt.v99i1.5483

Velmurugan, P. R., Catherine, S., Vettriselvan, R., EP, J., & Rajesh, D. (2025). Innovative intercultural communication training in translator education: Cultivating cultural competence. In M. Amini (Ed.), *Cutting-edge approaches in translator education and pedagogy* (pp. 217–244). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-6463-5.ch008

Xia, Y., Shin, S., & Kim, J. (2024). Cross-cultural intelligent language learning system (CILS): Leveraging AI to facilitate language learning strategies in cross-cultural communication. *Applied Sciences, 14*(13), 5651. https://doi.org/10.3390/app14135651

Zhou, X., Karabalaeva, G., Ma, C., Wang, C., & Ding, Q. (2024). Cultural aspect of education in pedagogical research in Kyrgyzstan and China. *Scientific Herald of Uzhhorod University Series Physics, 56*, 1059–1069. https://doi.org/10.54919/physics/56.2024.105eu9

Zhylin, M., Mendelo, V., Karpenko, Y., Samara, O., & Kampi, Y. (2023). Mental and Behavioural Disorders as a Result of Using Alcohol and Psychoactive Substances. *Revista de Cercetare si Interventie Sociala, 81*, 117–128.