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Transformation of the linguistic environment in Kazakhstan's megacities in the era of digitalisation and changing educational paradigms

This article examines the process of transformation of the linguistic environment in Kazakhstan's megacities (Astana, Almaty, Shymkent) in the context of digitalisation, the internationalisation of higher education, and a shift in educational paradigms. The relevance of this study is determined by the fact that the period 2024-2025 is characterised by a unique convergence of factors: the consistent implementation of the Concept for the Development of Language Policy, the scaling up of the Coursera platform localisation project, the increase in the number of international students at higher education institutions in Kazakhstan, the explosive growth in the impact of generative artificial intelligence on the educational process and, in connection with this, the emergence of a new configuration of the linguistic environment in megacities, which requires academic analysis. The aim of this study is to conduct a comprehensive analysis of these factors affecting the linguistic environment in Kazakhstan's megacities. The analysis is based on data from strategic documents on the implementation of language policy, taking into account their adjustment in response to sociolinguistic realities, the results of a survey of first-year students from non-language faculties, a survey of service infrastructure respondents, and a study of student comments in messenger chats (Telegram, WhatsApp), as well as on the implementation metrics of localisation projects (Coursera, Kaztest, national LLMs). Based on a comparison of the target indicators of the State Programme for 2020-2025 and the Concept for the Development of Language Policy for 2023-2029, it is noted that the quantitative targets of the latter are closer to the actual level of citizens' proficiency in the state language, as they are based on the 2021 population census, which included an assessment of language skills (reading/writing). Accordingly, the adjustment of the ambitious targets set out in the State Programme reflects a shift towards more realistic language planning. The authors examine the reasons for the transition from declarative trilingualism to the functional use of language capital, highlight the link between bilingualism and a high level of digital literacy, identify the uneven distribution of digital competencies along the urban gradient, and reveal the development of digital translingualism among students, which is characteristic of 48 % of those surveyed. The study examines the risks of data scarcity when using generative artificial intelligence technologies in relation to the Kazakh language. The need to develop national language models to overcome the data scarcity when using generative AI with the Kazakh language is substantiated. Based on the research conducted, we propose the local implementation of the Language Policy Concept through the integration of three languages into the content of academic disciplines, the use of elements of the CLIL approach in teaching, the use of authentic and digital resources to address the unevenness of digital access, the overcoming of language asymmetry in digital content, the development of intercultural and academic communication skills among the younger generation, and the training of teachers with a new set of competencies.

Keywords: language environment, language policy, metropolis, digitalisation, trilingualism, digital literacy, translingualism, artificial intelligence.

Introduction

Digitalisation and shifting educational paradigms have shaped, and continue to shape, complex and multi-layered processes within the linguistic environment of Kazakhstan’s major cities, combining political, technological and socio-cultural components that influence the construction of a new model of multilingualism, in which official language policy is becoming increasingly intertwined with the practice of digital communication and the reformed education system. Thus, for example, in modern urban communities, digitalisation is a key factor determining new norms of linguistic behaviour. Social media, messaging apps, online platforms and digital services create an additional ‘layer’ of the linguistic environment, where Kazakh, Russian and English are used simultaneously.

There is also no doubt that the educational paradigm directly influences the linguistic structure of Kazakhstan’s major cities. The implementation of the state Concept for the Development of Language Policy

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for 2023-2029 envisages strengthening the role of the Kazakh language in the education sector, including raising proficiency requirements for teachers and students [1]. Digital educational resources in the Kazakh language play an important role in this: electronic textbooks, online courses, distance learning platforms and interactive applications, which serve not only as a means of knowledge transfer but also as a tool for linguistic socialisation.

Moreover, the current period (2024-2025) is characterised by a unique convergence of the following factors: the completion of the current phase of state language policy [2], the active internationalisation of higher education [3] and, most critically, the influence of artificial intelligence and digital platforms on the educational process [4, 5, 6].

Thus, a 'trilingual' urban norm is taking shape, according to which the Kazakh language fulfils the important function of a state language, ensuring state governance, national consolidation and the preservation of cultural identity; the Russian language retains its position as the language of inter-ethnic communication, fulfilling communicative, educational, informational and integrative functions; and the English language, serving as the language of international communication, science and technology, ensures entry into the global educational and professional sphere.

Works devoted to the study of the dynamics of urban multilingualism, the linguistic environment of the city and its linguistic environment have become an integral part of sociolinguistic science in recent years. However, this study aims to provide a comprehensive analysis that, in the context of digitalisation, allows for the deconstruction of current linguistic processes in the major cities of Kazakhstan (Almaty, Astana, Shymkent), where real-world communication is intertwined with digital communication, and language choice is determined not only by ethnic identity but also by search engine algorithms, content accessibility and the quality of neural network training datasets.

Research materials and methods

The research was prompted by the rapid digitalisation and the shift in the educational paradigm, which highlighted the need to study the transformational processes within the linguistic environment of Kazakhstan's major cities in order to gain a deeper understanding of social stability and identity, support language policy and governance, and adapt or reformat educational programmes, and further digital development. Kazakhstan represents a unique case for global linguistics and sociolinguistics, as two forces take precedence here: the language of national statehood and the global digital English-speaking environment, whilst a layer of Russian-language heritage characteristic of the post-Soviet environment remains.

The general methodological framework of this study was based on sociolinguistic methods, which allow for the analysis of linguistic variation depending on social factors (age, education, place of residence). Questionnaire methods, correction of the local effect to ensure data representativeness, statistical processing of the data, and discourse analysis were also employed. Corpus analysis of comments was used to study language practices in messaging apps.

The empirical basis of the study was a survey of students, for which a questionnaire comprising five sections was developed to assess their level of language proficiency and digital literacy. The first section — demographic (gender, age, place of residence, year of study, specialisation) — served to describe the sample. The second section comprised a self-assessment of proficiency in Kazakh, Russian and English according to the CEFR scale (A1-C2) and across the skills of reading, writing, listening and speaking. The diagnostic section on language competence comprised 11 tasks: 7 multiple-choice (recognising linguistic norms, word insertion, error correction) and 4 productive tasks (sentence completion, mini-essay, text analysis), assessed on a scoring system with a maximum of 30 points and interpreted according to the CEFR scale: 0-8 — A1-A2, 9-16 — B1, 17-24 — B2, 25-30 — C1. The digital literacy diagnostic section comprised general questions and 10 tasks (maximum 15 marks), involving the use of online dictionaries, digital libraries, educational platforms, artificial intelligence tools and basic personal computer administration; proficiency levels were assessed as low (0-5), medium (6-10) or high (11-15). The final score for each student was determined by the sum of the scores from the language and digital sections, whilst the group average was used to analyse patterns in relation to demographic and educational factors.

The study was conducted in three stages: Stage 1 — setting the aim, objectives and hypothesis, developing the questionnaire, and selecting respondents; Stage 2 — conducting the survey; Stage 3 — data analysis and conclusions.

In addition, a survey was conducted among 122 respondents (café managers, café waiters, sales staff in coffee shops, shops and pharmacies, residents of nearby houses, university students and canteen staff in Al-

maty) regarding the practice of using English when interacting with international students. The composition of the respondent group was determined by the need to achieve maximum coverage of the target categories available in the selected area at the time of the survey.

Results and Discussion

The period 2024-2025 would have marked the final stretch of the 'State Programme for the Implementation of Language Policy in the Republic of Kazakhstan for 2020-2025' [2], which was repealed by Resolution No. 912 of the Government of the Republic of Kazakhstan dated 16 October 2023 following the adoption of the longer-term Concept for the Development of Language Policy for 2023-2029 [1]. However, despite the fact that the State Programme emphasised the development of competitive citizens proficient in three languages, and the Concept is a strategic document which, taking into account international experience and new challenges, defines the principles, directions and vision for the long-term development of language policy ensuring the equal functioning of languages, the creation of high-quality education systems, the development of terminology and digital resources, and, most importantly, the expansion of the scope of use of the state language, both documents are aimed at developing the Kazakh language as the state language and ensuring the equal functioning of languages in the country.

Table 1

Indicators of the State Programme for the Implementation of Language Policy in the Republic of Kazakhstan for 2020-2025 and the Concept for the Development of Language Policy in the Republic of Kazakhstan for 2023-2029

Indicator	State Programme	Concept	Indicator implementation
Share of the population proficient in the state (Kazakh) language	2020 — 90,5 %; 2021 — 91 %; 2022 — 92 %; 2023 — 93 %; 2024 — 94 %; 2025 — 95 %.	2023 — 81 %; 2024 — 81.5 %; 2025 — 82 %; 2026 — 82.5 %; 2027 — 83 %; 2028 — 83.5 %; 2029 — 84 %.	80-81 % (according to the Bureau of National Statistics [7] and published drafts of the Concept).
Share of the population proficient in three languages (Kazakh, Russian, English)	2020 — 26 %; 2021 — 27 %; 2022 — 28 %; 2023 — 29 %; 2024 — 30 %; 2025 — 31 %.	Emphasis on the development of language capital and the functional use of three languages.	28-29 % (according to the 2021 population census data).
Share of school graduates with non-Kazakh language of instruction achieving B2 level in Kazakh	–	2023 — 45 %; 2029 — 75 %.	45 %
Share of adults proficient in English	–	2020 — 27.5 %; 2021 — 28 %; 2022 — 28,5 %.	27-28 % (according to the 2021 population census data [7]).
Standards and levels of Kazakh language proficiency	Implementation of a multi-level Kaztest assessment system aligned with the Common European Framework of Reference (A1-C2).	The Concept is based on the same national standard and expands its application in education, public service, digital services, and socio-cultural practices.	B1 — 37 %; B2 — 35 % [8]

We consider it necessary to comment on certain indicators presented in the table in order to avoid any ambiguity in the subsequent analysis of the data. For instance, it is not possible to present attainment figures for the proportion of school leavers from non-Kazakh-medium-of-instruction schools who have a B2 level of proficiency in Kazakh, as official statistics are published only in a piecemeal fashion. Data on this indicator for 2022 is available on the official website of the Language Policy Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan [9].

The KazTest system is fully operational, with regular examinations and certification taking place; the number of those certified at levels B1-B2 is growing, but the proportion of citizens with a documented level of B2 or higher remains significantly below the target figures, indicating a 'lag' in the achievement of level-based targets [9].

The adjustment of the target indicators in the policy documents has sparked significant debate among experts and in the media, as well as among the general public in Kazakhstan. For example, the author of an article in the Kazakhstani online socio-political publication 'QMonitor', having subjected the current Concept to close analysis, asks the question: 'To what extent is Kazakhstan's new «language programme» adequate?' [10]. Without entering into a debate with the author, we shall take the liberty of presenting several arguments in favour of its adequacy. As we see it, when assessing the level of proficiency in the state language among Kazakhstan's citizens, the developers of the old plans relied on door-to-door surveys or questionnaires reflecting respondents' self-assessment, in which people often overestimate their language proficiency by 5-10 % due to social pressure or a desire to 'conform' (the 'social desirability' effect). This approach led to an overestimated indicator of the population's proficiency in the state language and necessitated a review of the measurement methodology. The concept is based on the 2021 population census, which included an assessment of language skills (reading/writing), enabling the discrepancy between the actual situation and the figures to be identified and more objective data to be presented — 80,1 %. Furthermore, factors such as migration, urbanisation and the quality of education objectively alter language proficiency figures, reducing them from 85,9 %, according to the 2018 survey, to 80,1 % as a result of the 2021 population census. Accordingly, by shifting from an ambitious 95 % (2020-2025) to a realistic 84 % (2029), the Concept acknowledges an error in the baseline data, revealing not only stagnation but also systemic problems requiring substantive measures.

As can be seen from the table, the Concept's quantitative targets, when compared with the indicators of the State Programme, are closer to the actual 'snapshot', which suggests that the discrepancy between the planned and actual rates of transformation of linguistic capital in Kazakhstan has been resolved.

An analysis of the target indicators shows that the quantitative targets set out in policy documents are undergoing a qualitative transformation under the pressure of reality. For example, according to the State Programme, by 2025 the proportion of the population fluent in three languages (Kazakh, Russian and English) was supposed to reach 31 %. The Concept, however, emphasises the development of linguistic capital and the functional use of the three languages. This is primarily due to the fact that today's sociolinguistic reality is reshaping our understanding of this proficiency. Whereas trilingualism was previously viewed as the parallel coexistence of three linguistic codes within an individual's mind, contemporary educational paradigms — in particular the introduction of CLIL (Content and Language Integrated Learning) methodologies since 2010 — have gradually shifted the focus towards the functional use of languages. Dictionaries also reflect this shift in focus. For example, the Dictionary of Linguistic Terms provides the following definitions of the term 'trilingualism': '1. The functioning of three languages within a territorial community: a state, region, city or town, where each language corresponds to a specific sphere of communication. 2. An individual's command of three languages within the scope of their communicative needs' [11]. A similar definition is also provided in the Dictionaries of Sociolinguistic Terms [12, 13]. Turning to the practical aspect, we can say that, for example, in the Nazarbayev Intellectual Schools (NIS), the trilingualism model is implemented through the teaching of subjects in different languages, which creates an elite group of young people with high linguistic competence [14]. However, scaling up this experience to general education schools and regional universities is still not feasible due to a shortage of staff and a lack of methodological readiness. Nor can we rule out the possibility that the 'top-down', which dictates the introduction of English, is meeting with 'bottom-up' resistance, stemming from a situation where teachers are required to teach physics or chemistry in English, whilst their cognitive and professional foundations have been formed in Kazakh or Russian.

Consequently, indicators of language proficiency in particular, and the linguistic environment of Kazakhstan as a whole, are shaped by a complex of interrelated factors, ranging from constitutional norms and language policy to demographics, the economy, education, the digital environment, and ethnic and identity processes. In metropolitan areas, these factors have a particular influence, making the urban linguistic environment both an indicator and a tool for transforming the linguistic situation. Let us consider some of these factors.

One of the key factors reshaping the linguistic environment of megacities in 2025 has been the policy of internationalising higher education. Today, the growing number of international students in Kazakhstan al-

lows our country to position itself as an educational hub of Central Asia. According to data from the Ministry of Science and Higher Education, 35,075 international students are studying at universities in the Republic of Kazakhstan in the current 2025-2026 academic year, which is 11 % more than in the previous academic year [15]. The geographical origin of this influx has a direct impact on the linguistic situation on campuses.

Table 2

Demographic structure of cities in Kazakhstan in terms of the number of international students and its impact on the linguistic environment

Country of origin	Number of students (2025-2026)	Dominant linguistic needs	Impact on the linguistic environment
India	9,959	English (medicine)	Formation of English-speaking micro-enclaves in areas surrounding medical universities (Almaty, Astana, Shymkent)
Turkmenistan	9,089	Russian / Turkmen / Kazakh	Strengthening of Turkic-language communication; maintenance of Russian as a lingua franca
Uzbekistan	4,136	Russian / Kazakh	Integration into the existing bilingual environment
China	3,367	Kazakh / Russian / English	Increased demand for Kazakh-as-a-foreign-language courses
Russia	2,426	Russian	Support of Russian-language academic discourse

The presence of nearly 10,000 students from India, who are taught predominantly in English, is creating a precedent in Almaty and Astana for the practical, rather than academic, use of the English language (See Table 2). A service infrastructure (cafés, shops, accommodation) is developing around the universities (Asfendiyarov Kazakh National Medical University, Al-Farabi Kazakh National University), which is compelled to switch to English to cater for this student body. Thus, in a survey of 122 respondents, when asked 'Have you ever had to use phrases or words in English when communicating with students from India?', 62 % answered in the affirmative, with 25 % of respondents (mostly café waiters and shop assistants in shops, cafés and pharmacies) noting that they do so on a daily basis, whilst staff with a basic level of English are beginning to use a minimal set of phrases. Respondents noted that the use of English has increased over the last three years. Communication takes place in simple service English (frequently using words such as 'order', 'card', 'cash', 'chicken', 'spicy', 'not spicy', 'sit here', 'takeaway', 'table' and 'wait'). In a number of shops, we noticed signs on the counters reading 'Namaste' (roughly translated as 'I greet you'). In our view, this is the first instance in Kazakhstan's recent history where English, albeit at a basic service level, has become the language of everyday communication for a significant social group that is not comprised of oil sector expatriates.

Another, no less important factor shaping the linguistic environment is the reform linked to the transition of the Kazakh language to the Latin script, which cannot be ignored in the context of educational paradigms. Although the reform was scheduled to be completed by 2025, we are witnessing that the process is proving more complex than expected. There are objective reasons for this, since, according to T.E. Nurgaziev and A.B. Kyrykbaev, 'One of the issues causing concern is the impact of this shift on the Kazakh language itself, including changes in the nature of the language, as well as the risks, boundaries and practice of new spelling rules and norms. Furthermore, the lack of consensus among contemporary scholars regarding the spelling of Latin alphabet characters is also a problem that must be resolved during the transition process' [16; 54]. We cannot but agree with the authors' view, for in the education system the transition to the Latin script creates a situation of graphic diglossia, where textbooks, digital resources and signage exist in parallel in both Cyrillic and Latin scripts. This factor places an additional strain on pupils' cognitive abilities and requires teachers to develop further adaptive skills.

One of the most significant developments in the linguistic environment over the past two years has been the large-scale project to localise the Coursera platform, which represents not merely an educational initiative, but a powerful act of corpus-based language planning in the digital age [17]. Thus, the Ministry of Science and Higher Education of the Republic of Kazakhstan has facilitated the translation and localisation of over 12,000 courses from leading global universities [18]. In our view, the scale of this project's impact on the linguistic situation in our country is difficult to overestimate. Firstly, during the translation process, new professional terms and scientific concepts were introduced and standardised in the Kazakh language, effectively resolving the problem of a shortage of modern scientific and technical literature in the state language,

which had hindered the development of Kazakh-language science for decades. Secondly, the scale of the certification programme is undeniable: the number of certificates obtained by Kazakhstani students on the platform has exceeded 32,295 [18]. This means that tens of thousands of students have, for the first time, gained experience of studying complex disciplines (Python, Data Science, management) not in Russian, as was traditionally the case, but in the Kazakh language. Thirdly, with the launch of the project, institutionalisation processes have intensified due to the project's scaling up; its scope has now expanded, and there are already around 95 participating universities [18]. The localisation of the Coursera platform is another factor shaping the linguistic environment of Kazakhstan as a whole and its major cities in particular.

Thus, we see that at the state level, the language development programme is being implemented through the creation of high-quality, competitive content, and the Kazakh language is beginning to function in domains that were previously monopolised by Russian or English.

Another factor shaping the linguistic environment of Kazakhstan is digital transformation, which proceeds unevenly and thereby generates the risk of a new form of social stratification. An analysis of the accessibility of digital infrastructure reveals significant disparities both between metropolitan areas and regions, and within urban agglomerations themselves. Based on the synthesis and aggregation of data from multiple sources, the following conclusion can be drawn: in 2025, high-speed internet coverage in metropolitan areas (Astana, Almaty, Shymkent) and large cities reached 98-99 %, across urban areas of Kazakhstan it ranged from 95-99 %, while in rural areas it averaged 84 %, with connection speeds remaining lower than in cities and metropolitan centres [19, 20, 21, 22, 23].

It should also be noted that the capital demonstrates a high level of integration of digital platforms and successful implementation of online learning. Almaty and Shymkent show relatively stable internet access, although «blind spots» persist in newly urbanised districts, not to mention remote areas. Students arriving from regions with poor internet connectivity find themselves effectively excluded from emerging linguistic resources. This, in turn, preserves local linguistic norms and reduces their competitiveness in comparison with students from Astana and Almaty (the issue of linguistic norm and the influence of digital communication is examined in detail in the work of Ordabayeva Z., Mazhitayeva Sh., et al. [24]).

These observations are further supported by the results of our empirical study. In order to verify theoretical assumptions with empirical evidence, it was considered necessary to conduct a survey among students residing in metropolitan areas, as well as those from regional centres, small towns, district centres, and rural localities. To avoid bias towards the «elitism» of metropolitan hubs — where not only international students but also a substantial proportion of local urban students are concentrated — the survey was conducted among students of Buketov Karaganda University. This institution has long been recognised as a leading regional university in Kazakhstan, particularly strengthening its position following the acquisition of national and research university status.

The university possesses a representative student body formed through the inflow of applicants from different regions of the country. This is determined by several factors: the multidisciplinary nature of higher and postgraduate training programmes, the implementation of state-funded grants under the «Serpin» programme for graduates of schools in southern regions, the diversity of teacher education programmes (which have recently gained increased popularity), the shortage of places in leading metropolitan universities, the presence of highly qualified academic staff, and a well-developed material and technical infrastructure, including a sufficient number of comfortable dormitories for non-resident students.

Thus, in the 2025-2026 academic year, 208,9 thousand applicants were admitted to higher education institutions in Kazakhstan, of whom 40,8 thousand were enrolled in universities of the Karaganda region [25], accounting for 19,5 % of all first-year students in the country. A considerable proportion of these students were admitted to Buketov Karaganda University, which accounts for 35,2 % of all entrants in higher education institutions of the Karaganda region. This makes it possible to construct a stratified sample reflecting the urban gradient among respondents.

First-year students were deliberately selected, as at the beginning of the academic year (first semester) they still retain the influence of their school and regional environments, while the university has not yet had sufficient time to equalise their level of linguistic norm proficiency and digital competence.

Between September and October 2025, a total of 710 first-year students from non-linguistic faculties (with Kazakh/Russian as the language of instruction) at Buketov University were surveyed. To eliminate local bias associated with the geographical proximity of the university — which could distort representativeness due to regional specificity — and to enhance the validity of the stratified sample, a standard data-

weighting procedure based on actual population shares was applied. As a result, questionnaires from 130 respondents who indicated permanent residence within the Karaganda region were excluded from the dataset.

Consequently, 580 questionnaires were included in the analysis: 45 respondents from metropolitan areas (Almaty — 20, Astana — 15, Shymkent — 10), 90 from regional centres, 145 from small towns, 130 from district centres, and 170 from rural areas. Based on the analysis of the survey data, respondents were classified according to language group and type of settlement, and the results are presented in the Figure below.

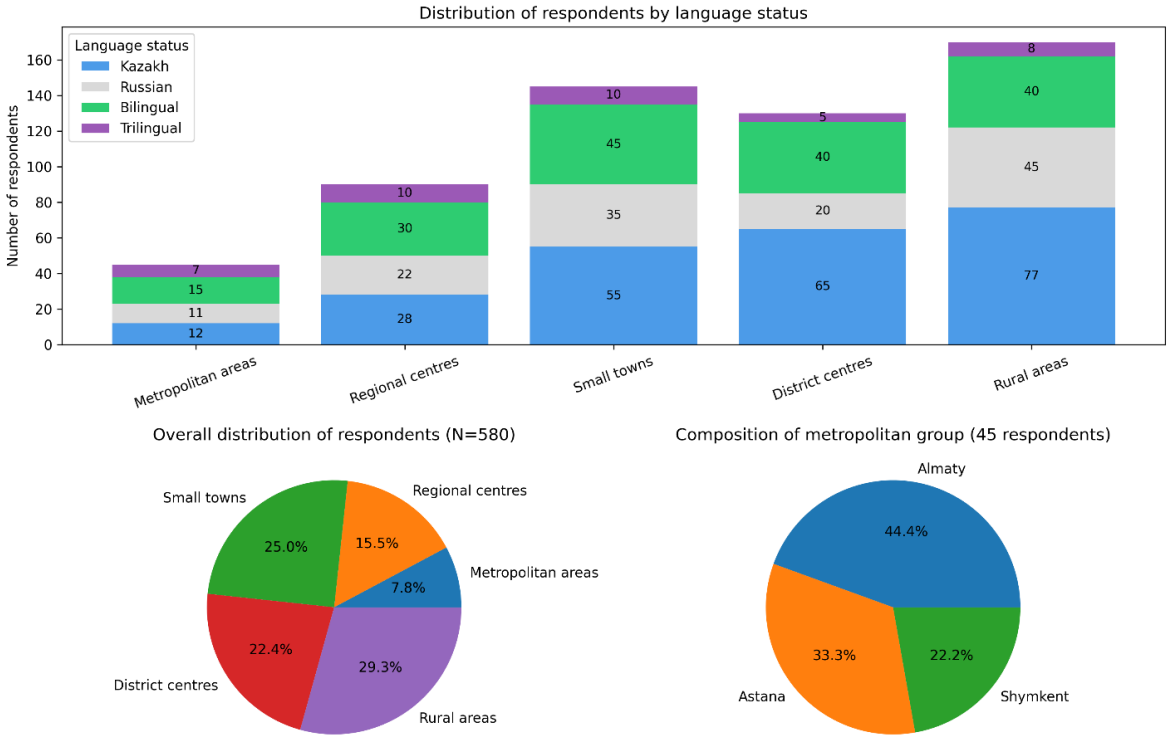


Figure 1. Distribution of respondents by language groups and type of settlement.

The average results of respondents' proficiency in linguistic norms are presented in Table 3.

Table 3

Results of students' task performance by place of residence and language proficiency

No.	Student group	Metropolitan area	Regional centre	Small town	District centre	Rural area
1.	Monolinguals (Kazakh)	17,3	17,3	15,7	15,0	12,7
2.	Monolinguals (Russian)	16,0	15,7	14,3	12,5	11,3
3.	Bilinguals	20,0	18,7	16,7	16,0	15,3
4.	Trilinguals	22,0	19,7	17,3	16,7	15,3

As we can see, trilinguals and bilinguals from major cities lead the way in terms of language proficiency; in Almaty, the average score is 21-22 points, which can be attributed to a strong Russian-Kazakh bilingual environment, widespread access to English (universities, language courses), and the city's globalisation. In Astana, the average score is 20-21, thanks to state support for the Kazakh language and the active use of Russian as a language of inter-ethnic communication. However, the high proportion of migrants from the regions results in a mixed level of bilingualism. In Shymkent, the figures are 18-19, which is linked to the dominance of the Kazakh language (~92 %), the low level of Russian usage, and the relatively low level of English proficiency (~22 %). In some cases, bilingual students demonstrated a higher level of proficiency in a particular language than monolingual students from major cities. We believe this is primarily due to the fact that bilinguals demonstrate active language practice and are accustomed to switching from one language to another, which improves attention to linguistic form and, in turn, develops metacognitive skills. These in-

dicators for bilinguals may also be linked to the social and educational advantages gained in a bilingual environment. Monolinguals who have chosen Kazakh as their primary language show higher results than monolinguals who have chosen Russian as their primary language. In our view, this is explained by the fact that Kazakh is often the native and everyday language of communication for residents of villages, district centres and parts of towns and cities. Although Russian is widely spoken, it is not always the native language and may be a second language for monolinguals of Kazakh origin. Among monolinguals who speak Russian, particularly in small towns and villages, the second language (Kazakh) is mastered to a lesser extent, which lowers the average score across the three languages. Monolinguals in rural areas have significantly lower average scores, particularly in the second language and English, the latter of which remains the weakest area of proficiency across all groups.

To assess digital literacy, respondents were asked questions such as 'How would you rate the quality of the internet connection where you live?', 'Which type of internet (mobile, fixed-line) was most frequently available?', 'How often did you use the internet to study languages before entering university?', 'What resources did you use (online dictionaries, online courses, language apps, automatic translators, other)?'. To assess their level of digital literacy, respondents were asked to look up the meaning of a word in an online dictionary, find an example of the word's usage, check the correct spelling, and check a text using an online tool familiar to the respondent (e.g. Grammarly, Yandex. Speller), find an article on digital literacy in academic databases known to the respondent (e.g. Google Scholar, eLibrary), list digital libraries known to the respondent, including those in Kazakhstan, and generative artificial intelligence systems, including those in Kazakhstan, demonstrate proficiency in using one of them, list image and presentation creation programmes known to the respondent (e.g. Canva, PP, Gamma), which online storage services the respondent uses for documents, images and other files (e.g. Yandex.Disk, Google Drive, OneDrive), which online services are known for accessing public services, demonstrate the ability to install software (e.g. Microsoft Office, Kaspersky), and the ability to connect devices. Thus, 54 respondents (9,3 %) demonstrated a high level of digital literacy, 280 (48,3 %) an average level, and 246 (42,4 %) a low level. Broken down by type of settlement, this is shown in the table below.

Table 4

Level of digital literacy of students by type of settlement

No.	Type of settlement	Total (n)	Low	Medium	High
1	Metropolitan areas	45	5	24	16
2	Regional centre	90	20	56	14
3	Small towns	145	45	90	10
4	District centres	130	90	35	5
5	Rural areas	170	86	75	9
Total		580	246	280	54

As can be observed, students from metropolitan areas (with a particularly high proportion represented by respondents from Almaty — 27,7 % of those demonstrating a high level of digital literacy) and regional centres exhibit higher levels of digital literacy compared to students from rural areas, who demonstrate only moderate basic skills and encounter difficulties in content creation, critical evaluation of information, and digital problem-solving. The higher levels of digital literacy among students from metropolitan areas and regional centres can be attributed to the quality of prior education (including attendance at prestigious schools), access to private tutoring, and reliable internet connectivity, whereas district centres and rural areas remain, to a considerable extent, within a «blind zone».

High levels of digital literacy are most frequently observed among students with Russian as the language of instruction and among bilingual students. Of the 54 respondents who demonstrated a high level of digital literacy, 32 were bilinguals (59,3 %), 12 were monolinguals who identified Russian as their primary language (22,2 %), and 10 were monolinguals who identified Kazakh as their primary language (18,5 %).

From a sociolinguistic perspective, these findings are significant insofar as they support the following proposition: access to high-speed internet correlates with access to English-language, Russian-language, and high-quality Kazakh-language content, since digital consumption constitutes one of the three core components of digital literacy (the other two being digital security and digital competence) [26; 37].

It is important to emphasise that digital literacy in Kazakhstan is closely associated with language proficiency [27; 360], as language remains the primary medium of information transmission in digital environ-

ments [28; 51]. The interfaces of many professional software systems, platforms, and professional social networks continue to be oriented towards English [28; 51] or Russian. Prior to the implementation of the Coursera localisation project, the absence of high-quality Kazakh-language interfaces and content created a barrier for monolingual users, forcing them either to acquire another language or to refrain from using advanced tools. At present, however, the linguistic situation is evolving: the development of language capital, the acquisition of additional languages, and their functional use enable users to engage with digital resources while simultaneously enhancing their digital literacy.

Another factor influencing the formation of Kazakhstan's linguistic environment is that the most dynamic processes occur within students' informal digital communication. An analysis of chats on Telegram and WhatsApp shows that code-switching has become the norm rather than the exception. The typology of switching includes the following types:

1. Intra-sentential switching, involving the insertion of words or phrases, for example: «Срочно нужно сдать *assignment* до дедлайна»;
2. Inter-sentential switching, involving a shift between languages at sentence boundaries, for example: «Бүгін сабақ болмайды. *The teacher is sick*»;
3. The formation of neologisms and grammatical hybrids, for example: «*Like* етіп қойыңдар» («Leave a like»), «*Гуглен* жібер» («Google it»).

The results of our survey indicate that such switching is characteristic of 48 % of respondents. This points to the emergence of a specific form of translanguaging, in which a Kazakh or Russian grammatical base is supplemented by English terminology and internet slang. This hybrid practice functions both as a marker of group identity and as a mechanism of adaptation to the global information flow.

Another important factor shaping the country's linguistic environment is the use of artificial intelligence technologies, which have emerged as a new actor within the linguistic environment. In 2024-2025, generative artificial intelligence technologies (LLMs, ChatGPT) rapidly entered the educational domain. However, this process has been accompanied by fundamental challenges associated with the problem of global linguistic inequality, commonly referred to as the «data gap».

Since large-scale language models, such as GPT-4, are trained predominantly on English-language corpora, the representation of Kazakh in their training datasets remains negligible. This leads to a number of adverse consequences. First, performance is reduced: ChatGPT and similar models demonstrate significantly weaker results in text generation, question answering, and reasoning in Kazakh compared to Russian and English [29]. Second, when operating in Kazakh, these models often produce fabricated information or rely on unnatural grammatical constructions, frequently calqued from English or Russian. Third, students who wish to use artificial intelligence technologies for academic purposes are compelled to formulate prompts in English or Russian and subsequently translate the output, thereby reinforcing the perceived secondary status of Kazakh in the cognitive domain among younger users.

The results of our study indicate that bilingual students demonstrate a distinctive capacity to adapt to the technical limitations of artificial intelligence, which correlates with higher levels of digital literacy. Such a strategy reflects the cognitive flexibility characteristic of bilingual individuals in conditions of incomplete digitalisation of national languages.

At the same time, the academic community in Kazakhstan, recognising the risk of entrenching the secondary status of Kazakh in the cognitive sphere, has initiated the development of national language models — KazLLM, KazMMLU, Sherkala-8B-Chat [30]. These initiatives have already demonstrated that Kazakh has the potential to function as a language of advanced technologies [31]. In parallel, the phased implementation of the strategic state project AI-Sana has been launched, aimed at training a new generation of specialists capable of developing and deploying artificial intelligence–based solutions across key sectors of the economy.

Conclusion

The study has demonstrated that the linguistic environment of Kazakhstan's metropolitan areas is shaped by a range of interrelated factors, including the target indicators of state policy documents, the internationalisation of higher education, the reform of the phased transition of the Kazakh alphabet to the Latin script, the localisation project of the Coursera platform, digital transformation, and the accessibility of digital infrastructure. The data indicate a correlation between access to the internet and the level of digital literacy. At the same time, digital literacy exhibits a clear urbanisation gradient, declining from metropolitan areas to district centres and rural localities.

More broadly, it can be argued that a fundamental shift is taking place within the linguistic environment of Kazakhstan's metropolitan areas. In large cities, the visual environment — signage, advertising, and urban information systems — continues to reflect a bilingual or trilingual structure, while in the period 2024-2026 there has been a strengthening of the objective requirement to use the Kazakh language in official and infrastructural domains. This process gradually reshapes the urban verbal environment, in which Kazakh becomes increasingly visible at the level of state symbols, institutions, and official media.

The Kazakh language is also gaining a significant presence in TikTok content, online courses, educational platforms, and digital public services, which contributes to its vitality in everyday urban practice. At the same time, Russian retains its role as a language of interethnic communication and everyday urban interaction, as well as a language of business practices and mass culture. A significant and timely factor in these processes is the modification of the constitutional formulation concerning the status of the Russian language: the shift from the wording «on an equal footing» to «alongside» underscores that the official status of Russian is preserved, while the priority of the Kazakh language is strengthened.

As a result, the linguistic environment of Kazakhstan's metropolitan areas acquires a distinctly stratified structure. At the upper, status-based level, Kazakh dominates as the state language, the language of official documentation, symbolic identity, and public communication. At the intermediate, urban level, Russian continues to be used in everyday life, in the service sector, entertainment, and private business. At the lower — yet rapidly expanding — functional level of the digital economy and highly skilled labour, English plays a central role, alongside mixed forms of linguistic practice characterised by code-switching and borrowing. In this sense, metropolitan areas function as a laboratory of linguistic transformation, where Kazakh gradually shifts from an «ethno-national» context into an urban and global one, while Russian and English act as complementary elements within a new linguistic ecosystem.

Thus, in the context of digitalisation and shifting educational paradigms, the linguistic environment of Kazakhstan's metropolitan areas is evolving towards greater multilingual pluralism. This configuration combines the institutionally strengthened role of the Kazakh language with the persistence of Russian-speaking urban traditions and the growing presence of English as the language of digital and professional environments. The outcome is the emergence of a new type of urban multilingualism, in which institutional and digital factors jointly shape hybrid linguistic practices that reflect both national language policies and the demands of the global urban economy.

The data obtained through the survey may be of practical value for optimising educational programmes, which should not be standardised but rather regionally adapted (with a gradual increase in the complexity of programme modules for rural educational institutions). They may also inform the development of educational strategies that integrate language learning with digital practice, the regional optimisation of digital infrastructure, and the systematic training and retraining of teaching staff.

Despite large-scale state initiatives that have contributed to strengthening the status of the state language, developing Kazakhstan's digital infrastructure, and modernising the education system in line with international standards, further efforts are required to implement the Concept for the Development of Language Policy, particularly at the local level. This may be achieved through the integration of three languages into the content of academic disciplines, the application of the CLIL approach, the use of authentic and digital materials with equitable access, the reduction of linguistic imbalance in digital content, and the development among young people of competencies in intercultural and academic communication.

CRediT authorship contribution statement

Abisheva M.S. — Conceptualization, Project Administration, Investigation, Data Curation, Methodology, Writing — Original Draft, Writing — Review & Editing;

Ibraimova Zh.Zh. — Investigation, Project Administration, Methodology, Writing — Original Draft, Writing — Review & Editing;

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Цифрландыру және білім беру парадигмаларының ауысу дәуірінде Қазақстан мегаполистерінің тілдік кеңістігінің трансформациясы

Мақалада Қазақстанның мегаполистерінің (Астана, Алматы, Шымкент) тілдік кеңістігін цифрландыру, жоғары білімнің интернационалдануы және білім беру парадигмасының ауысу жағдайындағы трансформация процесі қарастырылды. Зерттеудің өзектілігі 2024-2025 жылдар кезеңінің ерекше факторлардың бірігуімен сипатталуымен анықталады: Тіл саясатын дамыту концепциясының жүйелі жүзеге асырылуы, Coursera платформасын локализациялау жобасының кеңейтілуі, Қазақстан ЖОО-ларында шетелдік студенттер санының өсуі, генеративті жасанды интеллектінің білім беру процесіне өзіндік әсері және осыған байланысты мегаполистердің тілдік ортасының жаңа конфигурациясының қалыптасуы, бұл ғылыми талдауды талап етеді. Зерттеудің мақсаты — Қазақстан мегаполистерінің тілдік кеңістігіне әсер ететін осы факторларды кешенді талдауға бағытталған. Талдау әлеуметтік лингвистикалық шындықтың ықпалымен оларды түзетуді ескере отырып, тіл саясатын іске асыру жөніндегі стратегиялық құжаттардың деректеріне, тілдік емес факультеттердің бірінші курс студенттерінің сауалнамасының нәтижелеріне, сервистік инфрақұрылым респонденттерінің сауалнамасына және мессенджерлер чаттарында (Telegram, WhatsApp) студенттік түсініктемелерді зерделеуге, сондай-ақ локализациялық жобаларды (Coursera, ҚАЗТЕСТ, ұлттық LLM) енгізу көрсеткіштеріне сүйенеді. 2020-2025 жылдарға арналған Мемлекеттік бағдарламаның және 2023-2029 жылдарға арналған Тіл саясатын дамыту концепциясының мақсатты индикаторларын салыстыру негізінде, соңғысының сандық бағыттары азаматтардың мемлекеттік тілді меңгеру деңгейіне жақын екендігі байқалады, өйткені ол 2021 жылғы халық санағына негізделген, онда тілдік дағдылар (оқу/жазу) тексерілген. Сәйкесінше, Мемлекеттік бағдарламаның амбициялы көрсеткіштерін түзету реалистік тілдік жоспарлауға көшуін көрсетеді. Авторлар декларативті үштілділіктен тілдік капиталдың функционалдық қолданылуына өту себептерін зерттейді, билингвизм мен жоғары деңгейлі цифрлық сауаттылық арасындағы байланысты көрсетеді, урбанистік градиент бойынша цифрлық құзыреттіліктің біркелкі еместігін анықтайды және студенттік ортада сауалнамаға қатысқандардың 48 %-ына тән цифрлық транстілділіктің қалыптасуын байқайды. Генеративті жасанды интеллект технологияларын қазақ тіліне қатысты қолданғандағы деректер тапшылығының тәуекелдері қарастырылды. Қазақ тілімен жұмыс істегенде генеративті ЖИ-де деректер тапшылығын жеңу үшін ұлттық тілдік модельдерді дамыту қажеттілігі негізделеді. Жүргізілген зерттеу негізінде үш тілді пән мазмұнына интеграциялау, оқытуда CLIL-тәсіл элементтерін қолдану, цифрлық қолжетімділіктің біртектілігін жою кезінде шынайы және цифрлық ресурстармен жұмыс істеу, цифрлық контенттің тілдік асимметриясын еңсеру, өскелең ұрпақтың мәдениетаралық және академиялық коммуникация дағдыларын қалыптастыру, құзыреттердің жаңа жиынтығымен оқытушыларды даярлау арқылы тіл саясаты тұжырымдамасын жергілікті имплементациялау ұсынылады.

Кілт сөздер: тілдік кеңістік, тіл саясаты, мегаполис, цифрландыру, үштілділік, цифрлық сауаттылық, транстілділік, жасанды интеллект.

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Трансформация языкового пространства мегаполисов Казахстана в эпоху цифровизации и смены образовательных парадигм

В данной статье рассматривается процесс трансформации языкового пространства мегаполисов Казахстана (Астана, Алматы, Шымкент) в условиях цифровизации, интернационализации высшего образования и смены образовательных парадигм. Актуальность исследования определяется тем, что период 2024-2025 гг. характеризуется уникальной конвергенцией факторов: последовательной реализацией Концепции развития языковой политики, масштабированием проекта по локализации платформы Coursera, ростом числа иностранных обучающихся в вузах Казахстана, взрывным ростом влияния генеративного искусственного интеллекта на образовательный процесс и, в связи с этим, формированием новой конфигурации языковой среды мегаполисов, что требует научного осмысления. Цель настоящего исследования заключается в комплексном анализе этих факторов, влияющих на языковое пространство мегаполисов Казахстана. Анализ опирается на данные стратегических документов по реализации языковой политики с учетом их корректировки под влиянием социолингвистической реальности, результаты анкетирования студентов первого курса неязыковых факультетов, опроса респондентов сервисной инфраструктуры и изучения студенческих комментариев в чатах мессенджеров (Telegram, WhatsApp), а также на показатели внедрения локализационных проектов (Coursera, Казтест, национальные LLM). На основе сопоставления целевых индикаторов Государственной программы на 2020–2025 гг. и Концепции развития языковой политики на 2023–2029 гг. отмечается, что количественные ориентиры последней ближе к фактическому уровню владения государственным языком гражданами, так как основываются на переписи населения 2021 г., включающей проверку языковых навыков (чтение/письмо). Соответственно, корректировка амбициозных показателей Государственной программы отражает переход к реалистичному языковому планированию. Авторы изучают причины перехода от декларативного трехъязычия к функциональному использованию языкового капитала, указывают на связь между билингвизмом и высоким уровнем цифровой грамотности, выявляют неравномерность цифровых компетенций по урбанистическому градиенту и формирование цифрового трансъязычия в студенческой среде, свойственного 48 % опрошенных. Рассмотрены риски дефицита данных при использовании технологий генеративного искусственного интеллекта применительно к казахскому языку. Обосновывается необходимость развития национальных языковых моделей для преодоления дефицита данных при работе генеративного ИИ с казахским языком. На основе проведенного исследования предлагается локальная имплементация Концепции языковой политики через интеграцию трех языков в содержание дисциплин, применение элементов CLIL-подхода в обучении, работа с аутентичными и цифровыми ресурсами при устранении неоднородности цифрового доступа, преодоление языковой асимметрии цифрового контента, формирование у подрастающего поколения навыков межкультурной и академической коммуникации, подготовку преподавателей с новым набором компетенций.

Ключевые слова: языковое пространство, языковая политика, мегаполис, цифровизация, трехъязычие, цифровая грамотность, трансъязычие, искусственный интеллект.

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