



Technology for Creating a Language Learning Environment for Teaching English

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Article Info

Received: May 30, 2024

Accepted: September 24, 2024

Published: November 2, 2024

 10.46303/jcsr.2024.20

How to cite

Ismagulova, A., Rakisheva, G.,
Chernigovtseva, O., Sabitova, D., &
Gerfanova, E. (2024). Technology for
Creating a Language Learning
Environment for Teaching English.

*Journal of Curriculum Studies
Research*, 6(2), 234-258.

<https://doi.org/10.46303/jcsr.2024.20>

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ABSTRACT

The study aims to examine methods for developing technology to bridge the learning gap between rural and urban schools by adapting to changes in the educational environment and meeting the demands of modern education. It describes the design of a technology and a method for creating a language-focused educational environment based on the factors mentioned. This method uses a structured approach to describe business processes, enabling subject matter experts to present situations as an organized sequence of events while simultaneously detailing objects directly related to the process. The study surveyed 1,926 teachers from urban and rural schools across several regions in Kazakhstan, with an average participant age of 39.9 years. It used a mixed-methods approach, combining quantitative and qualitative analysis, and processed data through MS Excel and Statistica/R software. Data collection was conducted using Google Forms on the Google Cloud Platform. As a result of the research, the authors propose psychopedagogical technology "5F" to bridge the learning gap between rural and urban schools. The technology is based on evaluating five functions of building a language educational environment in urban and rural schools. The five functions are "Problem and conflict assessment", "Analysis of the school's educational system organization", "Development of an action plan", "Implementation of the project solution based on a tutorial", "Marketing of project results". These functions were identified during the decomposition of the language learning environment and its interaction with the external environment. This technology adapts to changes in the educational environment, meets modern education requirements, and effectively identifies and addresses real-world problems and tasks related to language teaching and learning in specific schools. This study also provides insights into the language educational environment in Kazakhstan, highlighting significant disparities between urban and rural schools in assessing language preparation, resource availability, and the integration of technology. The findings of the study demonstrate that reliance on personal test materials rather than standardized assessments raises concerns about the objectivity and validity of language proficiency evaluations.

KEYWORDS

Interdisciplinary approach; English and Kazakh languages;
educational environment; technology.

INTRODUCTION

When designing a technology for creating a language educational environment for teaching English, we first grounded our work in the key concept of "environment," which we define as a set of conditions, influences, and opportunities. In the context of our research, conditions refer to a complex of natural and social factors that directly or indirectly affect an individual's life activities. Through an interdisciplinary lens, we draw on the sociological concept of human-environment metabolism (Drídze, 1995), which emphasizes that the core of influence lies in human-environment relationships, shaped by the exchange of matter, energy, and information. Additionally, Gibson's "Theory of Affordances" (1988) provides a methodologically promising framework, as affordances are based on the subjective relationship, actively involving individuals in creating and developing their own environment.

Gibson's Theory of Affordances (1988) shifts the focus from how people think about their environment to how they directly perceive and interact with it based on the opportunities for action the environment provides. The theory suggests that environments should be structured in ways that make action possibilities clear and natural for learners, enhancing engagement and exploration. A person is simultaneously a product and a creator of their environment, which provides the physical foundation for life and makes possible intellectual, moral, social, and spiritual development. If we consider the educational environment from the perspective of the educational opportunities it provides, then the criterion for the quality of the educational environment is its ability to offer all participants in the educational process a system of opportunities for effective self-development.

These views align with the findings of foreign researchers examining the relationship between teacher-student models and language learning outcomes in TESOL classes (Alshuraiaan, 2023). Ramzan et al. (2023) emphasize how enhancing classroom enjoyment positively affects students' attitudes toward learning, particularly among English as a Second Language (ESL) learners. Their findings reveal that creating an engaging and enjoyable classroom environment considerably increases students' motivation, participation, and overall learning outcomes. By incorporating interactive, student-centered teaching methods, teachers can improve language proficiency and foster a lasting interest in learning (Makena & Feni, 2023; Mdodana-Zide & Mafugu, 2023; Makeleni et al., 2023). Additionally, a study by Kiziltepe (2022) emphasizes the role of gamification in enhancing student engagement in language learning. The incorporation of game elements into lesson plans not only increases participation but also fosters a sense of achievement among students, making learning more interactive and enjoyable.

Broadley et al. (2013) explored the impact of technological platforms on the creation of online learning communities, emphasizing that these tools can enhance collaboration and connection among students. This is particularly relevant in the post-pandemic educational context, where many institutions have transitioned to hybrid or fully online learning environments (Johnson & Sdunzik, 2023; Nyika & Motalenyane, 2023). A recent study by Zheng

et al. (2024) found that technology-mediated communication fosters a sense of community that is crucial for language acquisition, especially in remote learning scenarios. In addition, studies by Huang et al. (2023) highlight the effectiveness of using mobile-assisted language learning (MALL) applications. These applications provide students with immediate feedback and interactive activities, which can be more engaging than traditional methods. The findings suggest that such technologies can significantly improve students' language skills and overall satisfaction with the learning process.

The importance of maintaining positive teacher-student relationships has been reaffirmed in the context of challenges posed by the COVID-19 pandemic. Sharplin and Sharplin (2021) emphasize that fostering these relationships is essential for sustaining student engagement during disruptions. Vyortkina et al. (2020) further support this notion, demonstrating that students who maintained positive attitudes toward learning were more resilient during the rapid shift to remote education. A more recent study by Makarova et al. (2023) underscores the necessity of social-emotional learning (SEL) in enhancing teacher-student interactions. The integration of SEL into the curriculum not only helps in building stronger relationships but also improves students' emotional well-being and academic performance.

The notion of the educational environment as a systemic complex is supported by various scholars. A comprehensive review by Kumar and Dutta (2023) outlines that a well-structured educational environment should encompass not only linguistic and methodological components but also consider socio-psychological factors that influence learning. Their research advocates for a more holistic approach that integrates these dimensions to foster a language personality conducive to effective communication and intercultural competence.

Furthermore, recent advancements in understanding intercultural education highlight the significance of incorporating cultural awareness into language teaching. A study by Lopez and Medina (2023) suggests that integrating cultural contexts into language instruction enhances students' global citizenship skills, thereby enriching their learning experience.

Thus, we define the educational language environment as a systemic complex comprising the conditions for shaping a language personality, the internal and external influences on the development of the individual's worldview, and the opportunities for their successful and holistic growth. Based on the methodology of psycho-pedagogical design, we identified the object field, which encompasses the goals, content, methods, forms, and the following components of pedagogical activity determined through theoretical analysis: linguistic, socio-psychological, methodological, information-communicative, intercultural, managerial components (Karimova et al., 2024; Yeleussiz, 2024).

Objectives

The aims of the research include the following scope:

- Develop a Comprehensive Model that integrates linguistic, socio-psychological, methodological, informational-communicative, intercultural, and managerial components.
- Assess Current Practices: Assess current practices by evaluating the methods and approaches used by teachers in urban and rural schools in Kazakhstan for teaching English, identifying the strengths and weaknesses of existing pedagogical practices.
- Enhance Functional Literacy: Enhance functional literacy in English by implementing innovative teaching methods and evaluating their effectiveness.
- Provide Practical Recommendations: Provide practical recommendations for school methodological associations and educators to create a more effective, technology-integrated language learning environment.

Table 1.

The Development of Technology For The Educational Language Environment According To The Methodology Of Psycho-Pedagogical Design Included Five Stages

Num.	Stages of Psycho-Pedagogical Design	Description
1	Assessment of Problems and Contradictions	The results of OECD studies assessing 15-year-old students through PISA (2009, 2012, 2015, 2018) and the international IEA study on school education quality through TIMSS in reading, science, and mathematics literacy (2007, 2011, 2015, 2019) revealed a substantial achievement gap across regions, urban-rural areas, language of instruction, and socio-economic status. In 2021, Kazakhstan fell to 96th place out of 112 in the global ranking of English proficiency, as reported in the 2023 English Proficiency Index. The analysis of language training results from these studies underscores significant disparities in educational outcomes across regions.
	Subject of Analysis	Educational Language Environment
	Development of the Design Concept	Establishment of Goals and Various Design Conditions
2	Analysis of the Organization of the School's Educational System and Its Elements	Strategic Directions for Its Development; Alignment with Social Demand; Assessment of the System's Current State and Potential Capabilities
3	Development of the Action Plan	Evaluation of Alternatives; Critical Analysis; Decision-making and Formulation; Discussion, Determination of Action Plan
4	Systemic Changes	Determination of Means of Change for the Designed Object; Modeling Changes; Development of Change Mechanisms; Testing Proposed Means on Models.
5	Commercialization of Design Results includes	Summarizing the Design Results; Development of a Set of Techniques for Project Implementers; Analysis of the Effectiveness of its Implementation

Thus, the study aimed to answer the following questions:

- What tools and methods are most effective for implementing innovations in the language education system, particularly in light of digital and technological

advancements?

- What practical steps can be recommended to school methodological associations and educators to improve the language educational environment and ensure its alignment with modern educational standards and technological developments?

METHODS AND THEORETICAL FRAMEWORK

In our research, we limit the scope to the components of the language educational environment: linguistic, socio-psychological, methodological, information-communicative, intercultural, and managerial components. The study employs a mixed-methods research design, integrating both quantitative and qualitative approaches. This allows for a comprehensive analysis of statistical data alongside in-depth qualitative insights.

Methodological structure

Quantitative research focuses on measuring and evaluating the effectiveness of various components of the language educational environment, while qualitative research delves into teachers' experiences, opinions, and practices related to language education. The following quantitative data analysis techniques were used in the research: data collected from the questionnaires were analyzed using statistical methods to identify trends, correlations, and differences between urban and rural schools, as well as between different teacher groups.

MS Excel was utilized for basic data organization and preliminary analysis, while Statistica/R was employed for advanced statistical analysis. Techniques such as t-tests, ANOVA, and chi-square tests were used to compare groups and test hypotheses. Qualitative data from interviews and focus groups were analyzed thematically to uncover key patterns, themes, and insights.

Participants and data collection tools

The study included 1,926 teachers from urban and rural (public and general education) schools in the Akmola, Zhambyl, Kostanay, Pavlodar, East Kazakhstan, and Abai regions. The majority of respondents were aged 31 to 40 years, with female teachers predominantly participating. Detailed information about the characteristics of the participants is provided in the "Findings" section below. Educators from all categories, as defined by the rules for the Attestation of Teachers in Kazakhstan, were represented.

Conducted during the 2021–2022 period, the study utilized a questionnaire with 15 questions to assess various aspects of creating a language educational environment. MS Excel was used for basic data organization and preliminary analysis, while Statistica/R was employed for advanced statistical analysis. The methodology was implemented on the Google Cloud Platform, with data collection performed through Google Forms. The data collection process included the development of a methodology for assessing the language educational environment, comprising a set of questions grouped by primary functions. Systematization and analysis involved data collection through the questionnaire. Statistical processing of the data was conducted using MS Excel and Statistica/R software.

Participants were provided with comprehensive information about the research purpose, scope, data usage, and potential risks and benefits. The questionnaire was accessed via Google Forms, which is compatible with multiple browsers such as Yandex Browser, Google Chrome, Mozilla Firefox, Opera, Microsoft Edge, Safari, and Sputnik. Quantitative data were analyzed using statistical methods such as t-tests, ANOVA, and chi-square tests, while qualitative data from interviews and focus groups were analyzed thematically to identify patterns and insights.

THEORETICAL FRAMEWORK

In this section, in line with the general purpose of the study, the model of the technology is examined. The model for developing the technology of the language educational environment, represented in IDEF0 notation, consists of a set of hierarchically ordered and interconnected diagrams. Each diagram represents a system unit and is presented on a separate sheet. The model includes two types of diagrams. In our view, the most effective approach to designing a technology for creating a language educational environment, which considers changes in the pedagogical sphere and the requirements associated with these changes, is the Integration Definition for Function Modeling (IDEF0) methodology.

IDEF0 is used to describe the functions, activities, or processes within a system, providing a graphical representation of the flow of inputs, outputs, controls, and mechanisms (resources) that govern each function (Shitarev et al., 2005). This allows users to visualize how different components of a system interact and work together. The method describes business processes using a structured approach, enabling subject matter experts to present situations as an ordered sequence of events while simultaneously detailing objects directly related to the process (Shitarev et al., 2005). IDEF0 is based on a sequence of actions represented graphically.

This program provides clarity in structuring the design of technology for creating a language educational environment, is suited to the current stage of the social and scientific-pedagogical process, reflects objective reality, and is productive due to its universal nature. Let's take a closer look at the algorithm for designing a language educational environment. The modeling domain focuses on the development of language education technology, consisting of two components: breadth and depth. Breadth involves defining the model's boundaries—what is considered part of the language educational environment and what lies outside it. Depth refers to the level of detail at which the model is deemed complete. Below is presented the description of context diagram (Figure 1), and decomposition diagram (Figure 2).

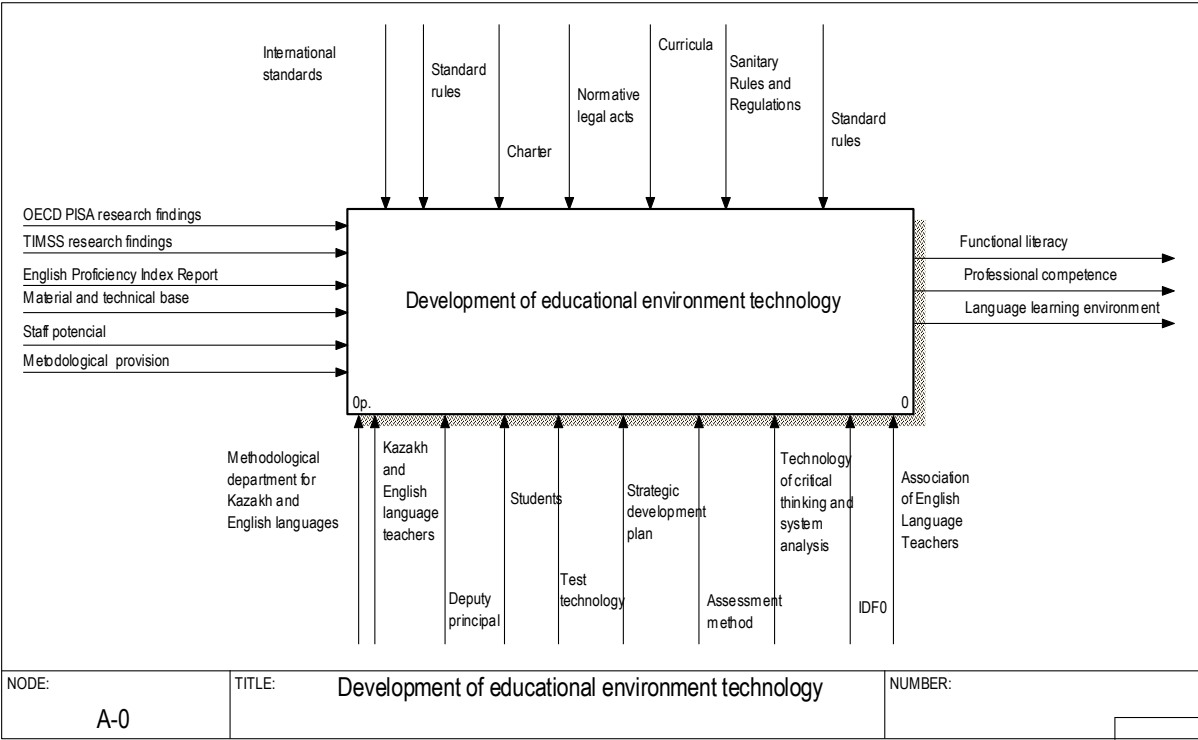
The context diagram provides an overall description of the development of the language educational environment and its interaction with the external environment. Input: Inputs consist of materials or information used or transformed by the work to produce outputs. In this research, these include OECD PISA and TIMSS results, English Proficiency Index reports, as well as the material-technical base, personnel potential, and methodological support.

Control: Control refers to rules, procedures, or standards that regulate the process of creating the language educational environment. It affects the work without being transformed by it. In our research, this includes regulatory legal acts in education, methodological instructions, and ministerial orders. **Output:** Outputs include the developed language educational environment, improved functional literacy among students, and enhanced professional competence of teachers. **Mechanism:** Mechanisms are resources essential for development, such as methodological associations, deputy principals, language teachers, testing technologies, expert assessment methods, criteria-based thinking technologies, and teacher associations. **Call:** Challenges refer to components of the language educational environment that are influenced by external conditions beyond the modeled system. The decomposition breaks down the general process of developing the language educational environment into key components. Through decomposition, we identify the following main functions:

- "Assessment of Problems and Contradictions;"
- "Analysis of the Organization of the School's Educational System;"
- "Development of the Action Plan;"
- "Implementation of Project Solutions Based on the Tutorial;"
- "Commercialization of Project Action Results."

This decomposition enabled the creation of a comprehensive model for developing technology to create a language educational environment, incorporating algorithms, resources, regulatory documents, and processes.

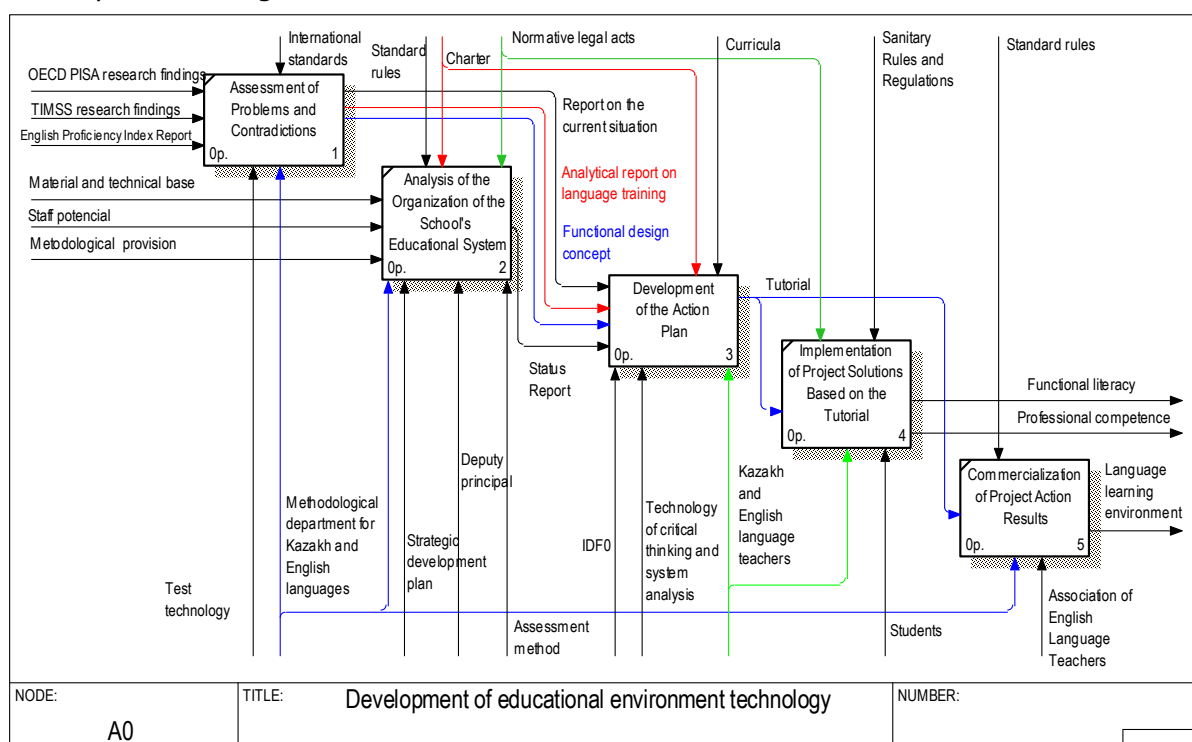
Figure 1.
Context Diagram



Operations and actions are organized with an emphasis on the logical subordination of the main functions in sequence. This structured decomposition yields several outcomes: the direct outcome is the creation of the language educational environment, while the indirect outcomes include the enhancement of students' functional literacy and the professional competence of educators. We believe that "Development of action plan" stage requires further decomposition into the following components: linguistic, socio-psychological, methodological, informational-communicative, intercultural, and managerial. This specific content of all these components should be tailored to the unique characteristics of each individual school.

Figure 2.

Decomposition Diagram



Based on the algorithms and content of the contextual and Decomposition diagrams, a methodology for assessing the language learning environment was developed. The questionnaire consists of 15 questions and enables the measurement of the effectiveness prominence of key functions essential for creating a language learning environment. The empirical data collected forms the basis for developing methodological recommendations for school-based methodological associations in the field of language education. Based on the specific weights of the variables mentioned above, the following scale is proposed:

- Low level of the main functions of creating the language educational environment - 3-4 points;
- Medium level of the main functions of creating the language educational environment - 5-7 points;
- High level of the main functions of creating the language educational environment - 8-9 points.

Below are the questions for the methodology, grouped according to the main functions (Table 2) (see appendix).

Analysis of the results was conducted using MS Excel and Statistica/R software. The proposed methodology was implemented on the Google Cloud Platform using the client-server application Google Forms.

FINDINGS

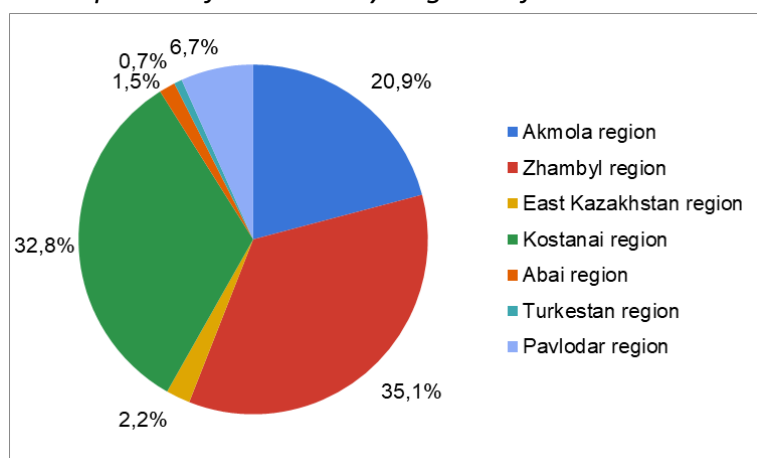
Analysis of the empirical research involved 1,926 teachers, categorized by region, seniority, qualification, and type of school, from 25 schools. Participants included teachers from the regions of Akmola, Zhambyl, Kostanay, Pavlodar, East Kazakhstan, and Abai, as well as from both urban and rural schools. The empirical part of the research was conducted according to the established tasks, following this algorithm:

- A methodology for assessing the language education environment was developed.
- The obtained empirical data were systematized for analysis.
- A database of results was created to exclude outliers from the representative sample, followed by statistical data processing.
- Statistical processing of all research data was conducted.
- Recommendations were provided for language teaching methodological associations.

The study participants received clear, understandable, and comprehensive information regarding the purpose and scope of the study, how the data would be used, the dissemination of results, as well as the potential risks and benefits. During the empirical stage, all collected data were processed, ranked, and systematized. The analysis of the results is visually represented in tables and figures. A thorough interpretation of the research findings, along with practical recommendations, is provided.

Figure 3.

Participation of Teachers by Regions of Kazakhstan

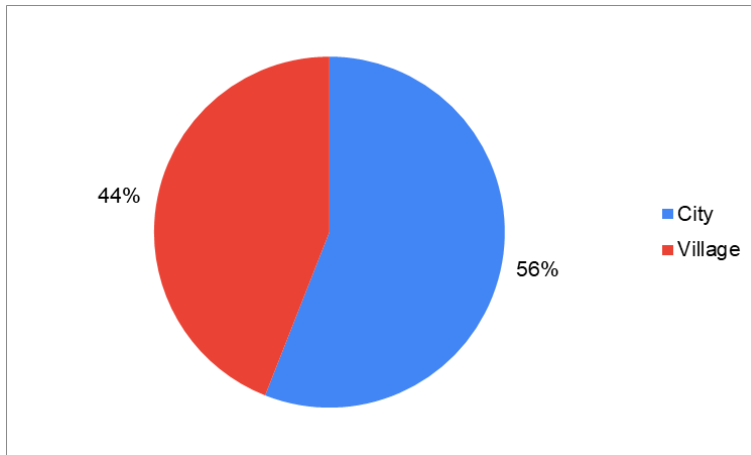


The Zhambyl region had the most active participation in the research, representing 35% of the total participants. In contrast, the Abai region was the least represented, with only 1.5%.

As illustrated in the Figure 3, the study covers the central, eastern, southern, and northern regions of Kazakhstan.

Figure 4.

Participation of Teachers in Urban Schools vs Rural Schools



Approximately equal numbers of urban and rural schools participated in the survey, with urban schools comprising 56% and rural schools 44%. This distribution is justified, as there are more urban schools in Kazakhstan than rural ones.

Figure 5.

Participation of Teachers by School Type

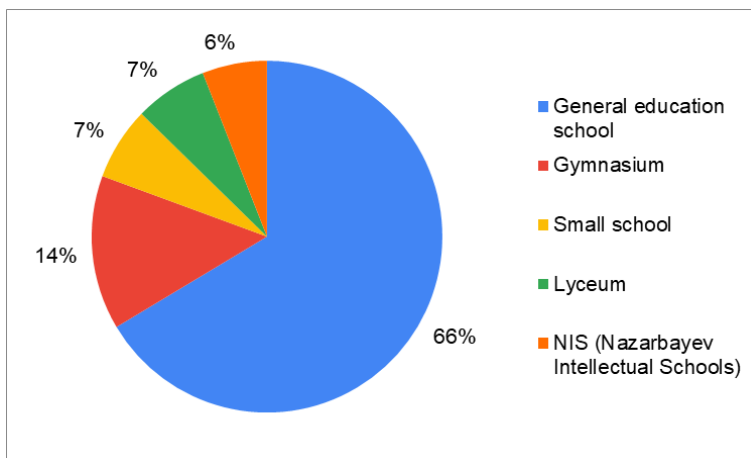
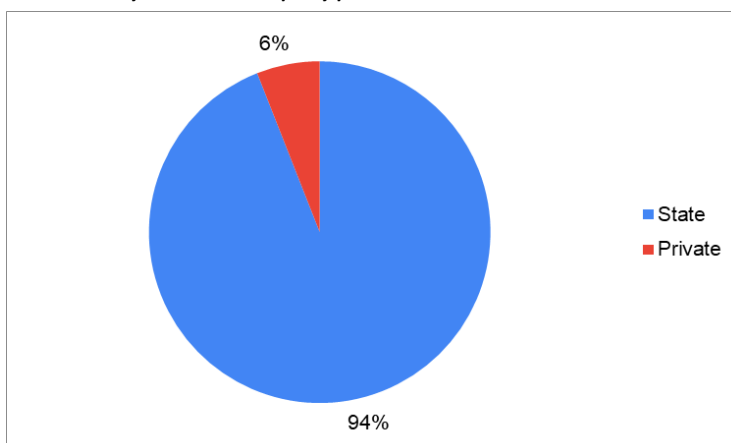


Figure 6.

Schools by Ownership Type



The study includes a broader representation of public general education schools, which set trends in the country's educational development and will serve as a benchmark for developing recommendations for creating a language education environment (Figures 5, 6).

Regarding respondents' age, the most widely represented group is those aged 31 to 40 years. The average age of respondents was 39.9 years (Figure 7).

Figure 7.

Respondents by Age Group

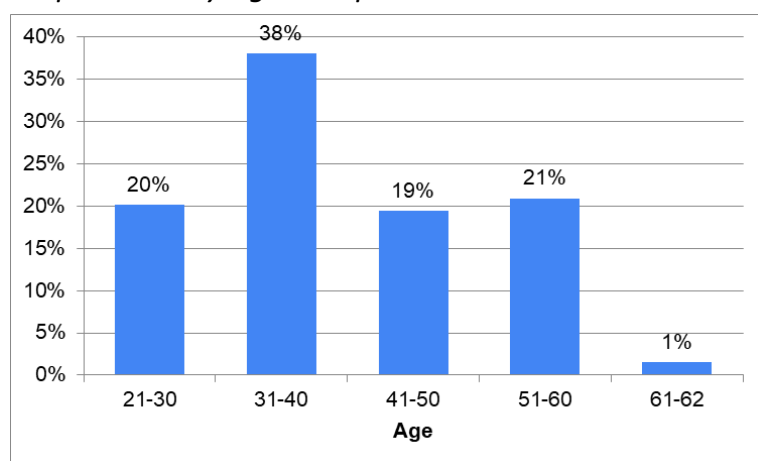
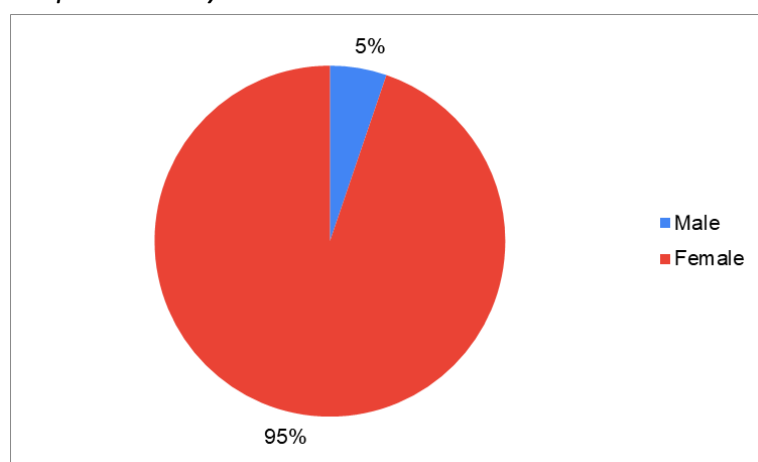


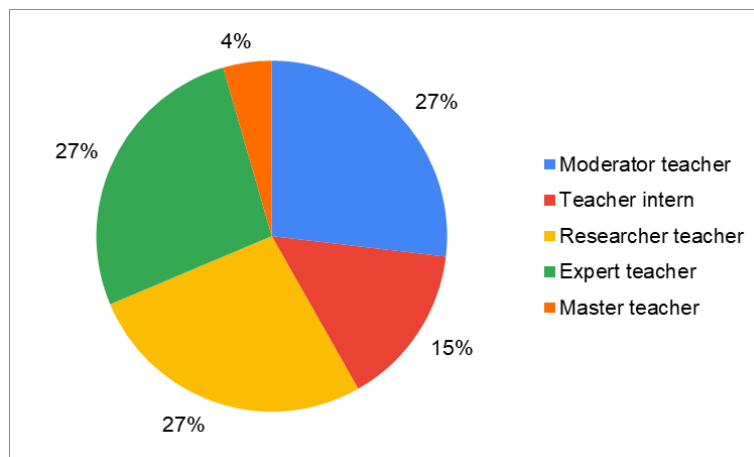
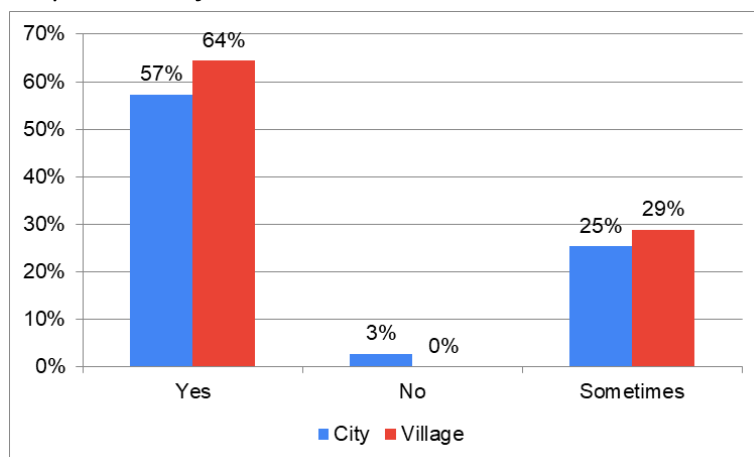
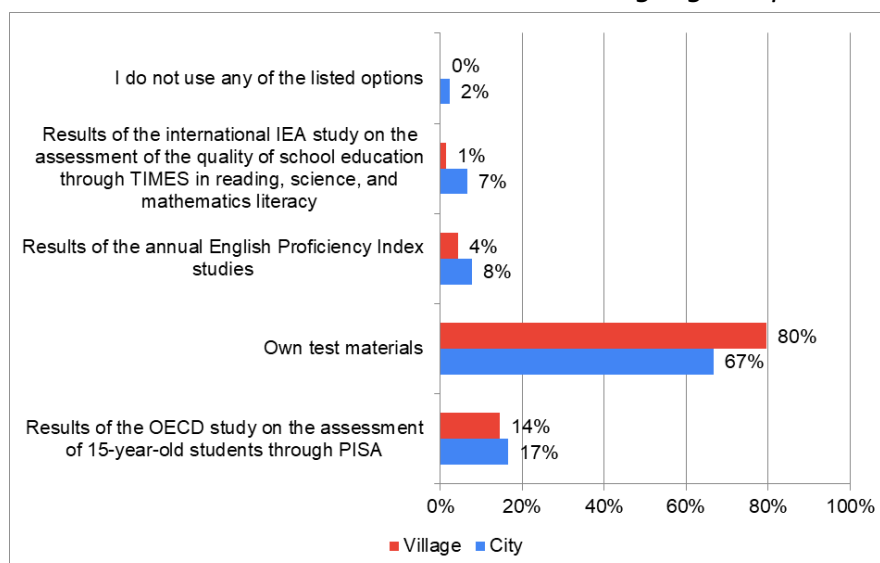
Figure 8.

Respondents by Gender



In terms of gender, the survey predominantly involved female teachers, highlighting the ongoing feminization of education (Figure 8). The study included all categories of educators, as defined by the Rules and Conditions for the Attestation of Teachers in the Republic of Kazakhstan (Figure 9).

Further, the empirical data on the main functions of creating a language educational environment in both urban and rural schools are examined: "Assessment of Problems and Contradictions"

Figure 9.*Respondents by Categories***Figure 10.***Question “Do You Systematically Assess The Problems And Contradictions In The Language Preparation Of Schoolchildren?”***Figure 11.***Question “What Do You Use To Assess The Language Preparation Of Schoolchildren?”*

According to the data obtained for the "Assessment of Problems and Contradictions" function, both rural and urban teachers involved in language training largely conduct systematic assessments of the issues in students' language preparation, with 64% of rural and 57% of urban teachers reporting regular assessments. However, the majority rely on their own test materials for these assessments, which may not always meet the criteria of objectivity and validity (80% and 67% respectively).

Figure 12.

Question "Do You Conduct An Assessment Of The State And Potential Opportunities Of The Language Educational Environment In The School?"

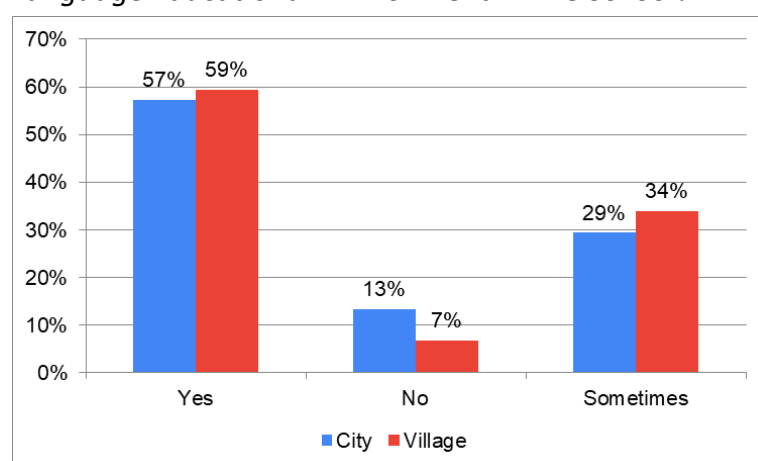
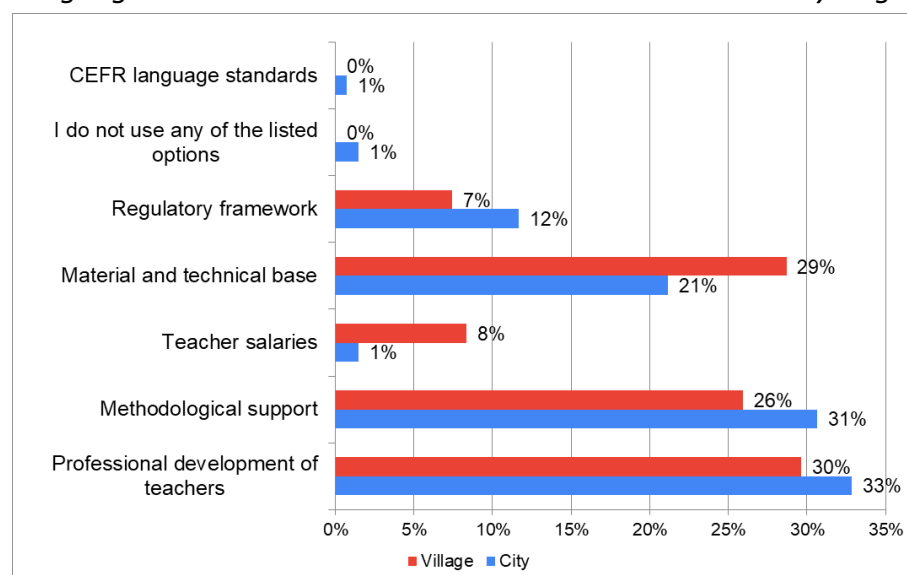


Figure 13.

Question "What Criteria Do You Use To Assess The State And Potential Opportunities Of The Language Educational Environment In The School: Choose By Degree Of Importance?"



The empirical data on the function "Analysis of the Organization of the Educational System of the School" reveal that half of the surveyed teachers from both urban and rural schools do not assess the possibilities or the current state of the language educational environment at their schools. Urban schoolteachers believe that professional development (33%) and methodological support (31%) significantly affect the language educational

environment. In contrast, rural teachers highlight the importance of the material and technical base (29%) alongside methodological support (26%). This suggests that one key factor contributing to the gap in language learning quality is the condition and adequacy of the material and technical base. Additionally, when a problem is identified, urban school teachers tend to follow a planned approach to resolving it (57%), whereas rural schools show a preference for a situational approach to addressing issues (53%).

Figure 14.

Question "If You Identify A Problem In Students' Language Preparation, Do You Develop A Short-Term/Long-Term Action Plan To Address The Issue?"

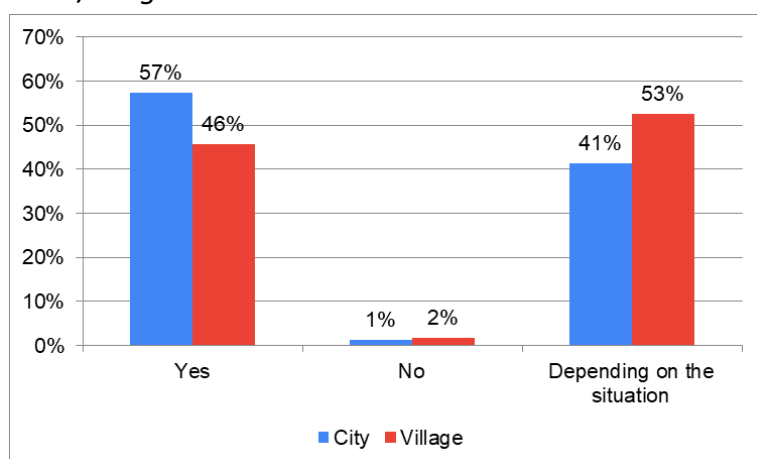
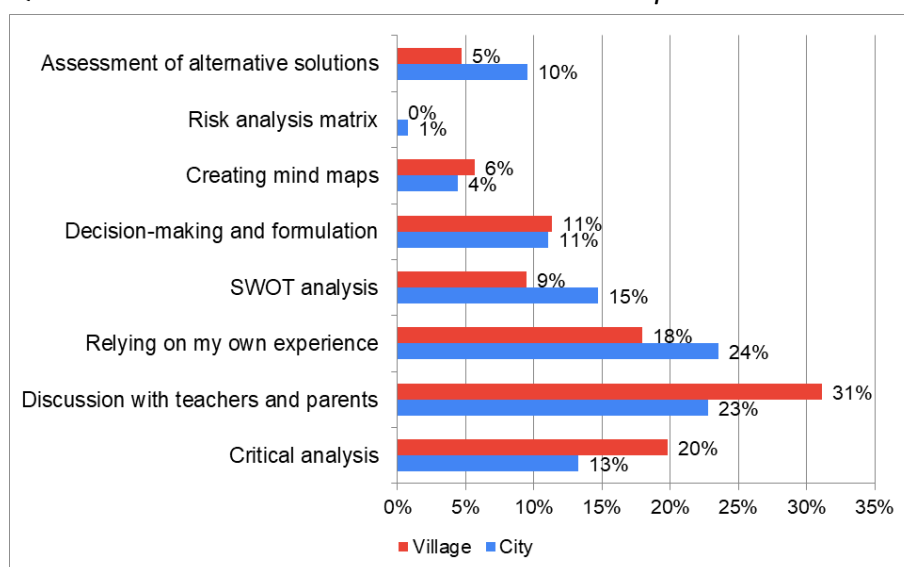


Figure 15.

Question "What Methods Do You Use To Develop An Action Plan To Solve The Problem?"



The results for the function "Development of Action Plan" show a preference among rural school teachers for discussing problem-solving plans with colleagues and parents of students (31%), while also using critical analysis (20%). Urban school teachers, on the other hand, tend to rely on their own experience (24%) and the opinions of colleagues and parents (23%) to solve problems. Fewer teachers utilize more structured planning methods, such as risk matrix analysis, mental development maps, evaluation of alternative solutions, or formal decision-

making processes. This suggests that many educators are unfamiliar with effective management and problem-solving techniques in the teaching process, which poses risks to the quality of language instruction.

Figure 16.

Question “Do You Implement Innovations To Improve The Language Education System?”

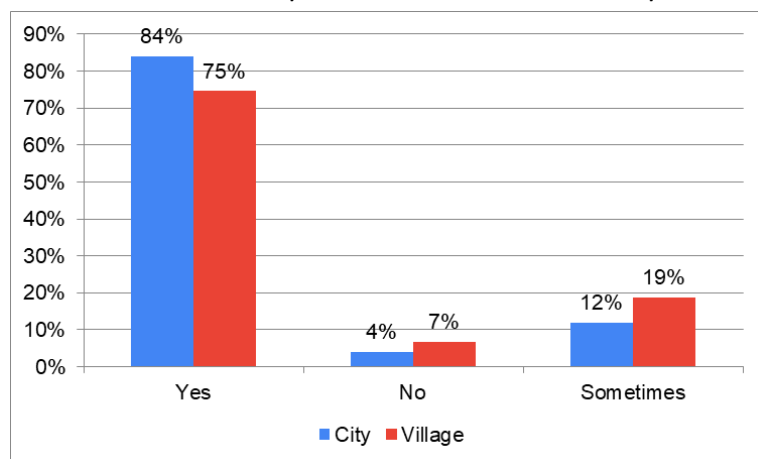
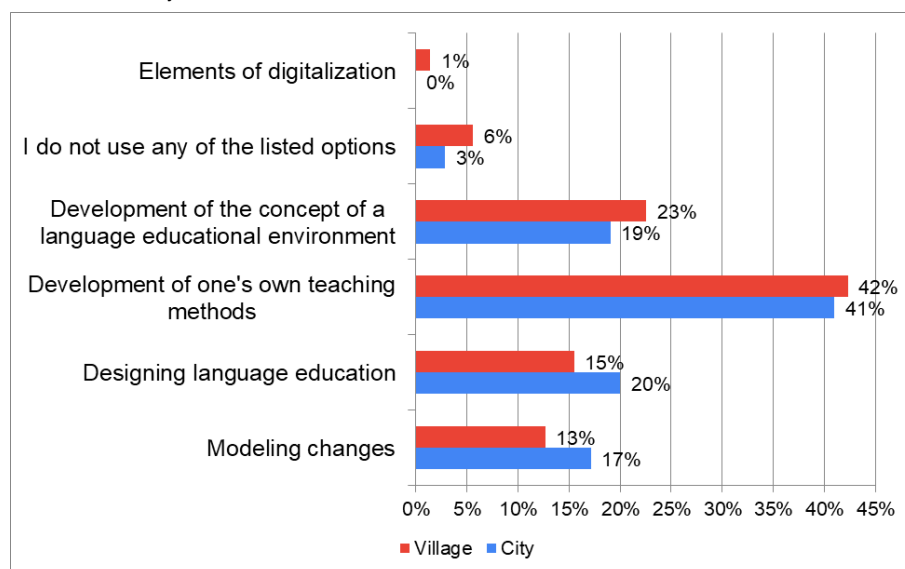


Figure 17.

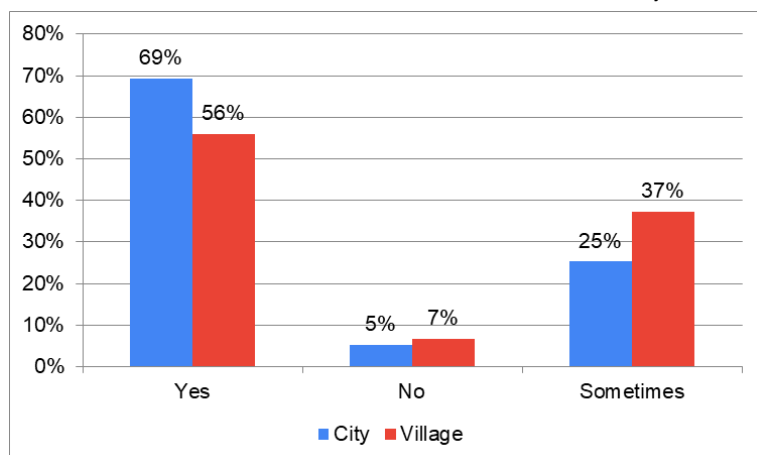
Question “What Tools Do You Use To Implement Innovations Aimed At Improving The Language Education System For Students?”



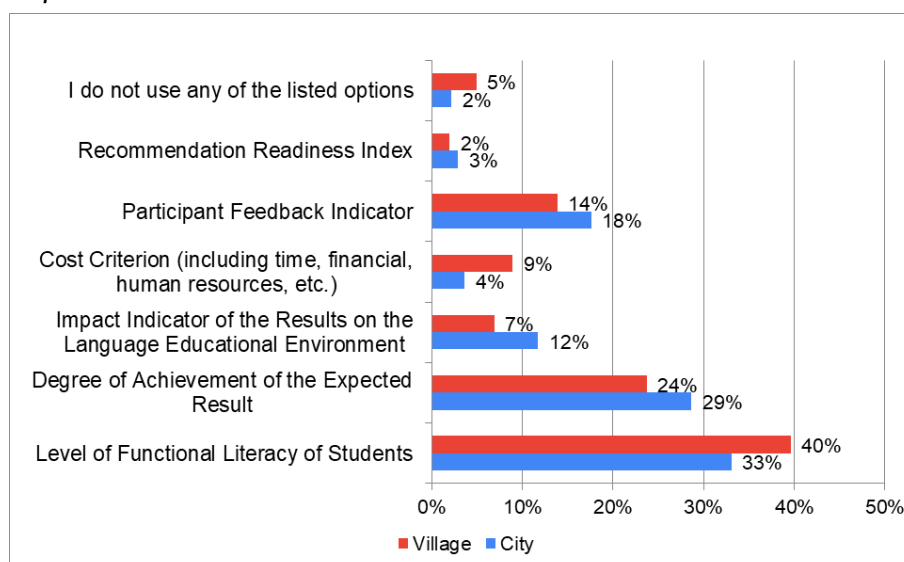
Empirical data on the function "Implementation of Project-Based Solutions Based on Tutorials" show that teachers in both urban and rural schools actively implement innovations in language education (84% and 75%, respectively). This is primarily done through the development of their own teaching methods (42% and 41%) and the adoption of the language educational environment concept (23% and 19%). However, the results lead to some concerns about the limited use of digital tools by teachers, suggesting a potentially low level of digital competencies, especially in the context of advancing neural networks and artificial intelligence in education.

Figure 18.

Question "Do You Conduct Generalization And Systematization Of Knowledge?"

**Figure 19.**

Question "What Indicators Do You Apply When Assessing The Effectiveness Of Innovation Implementation?"



Empirical data on the function "Marketing the Results of Project Actions" reveal a relatively high percentage of teachers who engage in summarizing and systematizing results after implementing innovations (69% in rural schools, 56% in urban schools). When evaluating the effectiveness of these innovations, both rural and urban teachers prioritize indicators such as the level of students' functional literacy (40% and 33%, respectively) and the degree to which the expected outcomes are achieved (24% and 29%). However, less emphasis is placed on assessing the effectiveness in terms of the readiness to recommend the innovation to the professional community (2% and 3%) and considering time or financial costs (9% and 4%).

DISCUSSION

The study aims to develop and assess a technology-driven approach for creating an effective language educational environment for teaching English. The results provide key insights into the

current state of language education and the effectiveness of the proposed methodologies and tools. It was found that both urban and rural teachers generally conduct systematic assessments of language preparation issues. However, most of the teachers rely on their own test materials rather than standardized and objective assessments (Figures 10 and 11). This reliance suggests a gap in the availability or use of standardized assessment tools. Teachers may prefer their own materials due to limited access to high-quality, objective resources or because they believe their methods are more effective. This reliance on personal test materials can lead to inconsistencies in evaluating students' language abilities, highlighting the need for standardized assessment tools that provide reliable and valid measures of language proficiency. Future efforts should focus on developing and distributing such tools to ensure that all teachers have access to high-quality assessment resources.

The study findings reveal that urban teachers more frequently assess the state and potential of the language educational environment compared to their rural counterparts (Figures 12 and 13). Urban teachers place greater emphasis on professional development and methodological support, while rural teachers focus more on the material-technical base. Furthermore, urban teachers tend to adopt a more structured approach to solving identified problems, whereas rural schools often take a more situational approach. This discrepancy suggests that rural schools may be at a disadvantage due to weaker material and technical resources, potentially affecting the quality of language education. There is a clear need for targeted support and resources for rural schools to bridge this gap. Policymakers should consider strategies to enhance the material and technical infrastructure in rural schools, while also providing professional development opportunities to improve language instruction quality across both urban and rural settings.

The study revealed that rural teachers are more likely to involve colleagues and parents in developing action plans, while urban teachers tend to rely more on their own experience and the opinions of colleagues (Figure 14). This suggests that rural teachers may adopt a more collaborative approach to problem-solving compared to their urban counterparts. The collaborative nature of rural teachers' problem-solving can be a strength, as it draws on diverse perspectives. However, the lower use of formal problem-solving methods, such as SWOT analysis and risk matrices, indicates a need for training in structured techniques. Professional development programs should incorporate training on strategic planning methods to enhance the effectiveness of action plans across both rural and urban settings.

Both urban and rural teachers actively implement innovations in language education, though there is a notable lack of digital tool usage (Figures 15 and 16). Teachers primarily focus on developing their own teaching methods and concepts, with limited engagement in advanced digital tools and technologies. This limited use may reflect a broader issue of insufficient digital competencies among teachers. As technology becomes increasingly integral to education, it is crucial to equip teachers with the skills and resources needed to integrate digital tools into their practices.

Future research should explore the barriers to adopting digital technologies and develop strategies to increase digital literacy among educators. The results show that teachers are relatively successful at summarizing and systematizing outcomes, but less effective at using indicators to measure the effectiveness of innovations (Figures 17 and 18). Teachers tend to prioritize students' functional literacy and the achievement of expected outcomes, rather than focusing on cost-effectiveness or readiness to recommend innovations. This focus on functional literacy and outcomes indicates that teachers place a higher value on student learning than on the administrative aspects of implementing innovations. However, adopting a more balanced approach that includes evaluating cost-effectiveness and gathering feedback for future recommendations could enhance the sustainability of these innovations. Future studies should emphasize the importance of comprehensive evaluation frameworks that integrate both educational and administrative metrics.

The study findings align with several aspects of existing literature on educational technology and language learning. The reliance on personal test materials reflects the observations of Nunan (1992) and Gibson (1988), who emphasize the importance of standardized assessments in ensuring educational quality. Similarly, the need for improved material and technical resources in rural schools mirrors the concerns raised by Ramzan et al. (2023) about disparities in educational opportunities. The observed gap in digital tool adoption supports Alshuraiaan's (2023) assertion that teachers' interaction patterns and technological proficiency significantly influence language learning outcomes. The emphasis on collaboration in rural schools aligns with Drídze's (1995) ecological approach to education, which views educational environments as dynamic, interconnected systems.

The study findings align with and extend the existing body of research on language educational environments, particularly in the areas of technology integration, teacher preparedness, and assessment methods. The reliance on personal test materials for assessing language proficiency, as observed in this study, aligns with the findings of Nunan (1992) and Vyortkina et al. (2021), who claimed that a lack of standardized assessment tools can result in inconsistent and subjective measures of student performance.

Similarly, Black and Wiliam (1998) and Brown (2007) emphasized the need for formative assessment tools that are both reliable and valid to improve learning outcomes. The study's finding that teachers predominantly use their own materials (Figures 10 and 11) supports this perspective, suggesting that, despite widespread recognition of the importance of standardized assessment, gaps remain in its practical implementation, particularly in rural settings.

Moreover, Stiggins (2005) highlighted the value of assessment for learning, which focuses on using assessment data to guide teaching practices. The study's indication that teachers are not fully utilizing standardized tools points to a missed opportunity for improving instruction and student outcomes through data-driven decisions, a gap similarly noted by Popham (2009). The results of this study further align with previous research highlighting disparities between urban and rural schools, particularly in resource allocation.

Ramzan et al. (2023) emphasized the challenges rural schools face in accessing modern educational resources, including technological tools. This study found that rural teachers place a greater emphasis on the material-technical base (Figure 13), supporting Ramzan's assertion that rural schools often contend with outdated or insufficient infrastructure. Conversely, urban schools prioritize professional development and methodological support, which echoes findings from Mishra and Koehler (2006), who argue that teacher development is essential for successfully integrating technology in education.

This suggests that while urban schools may have better access to resources, both urban and rural settings face unique challenges—urban schools may require more emphasis on infrastructure, whereas rural schools need greater support for teacher training and methodological development. The collaborative approach to problem-solving observed among rural teachers, who frequently involve parents and fellow teachers in action plan development (Figure 15), aligns with the findings of Gibson (1988), who advocates for an ecological approach to education. These authors suggest that educational environments operate as interconnected systems, and collaboration among various stakeholders can lead to more effective solutions.

However, the study also reveals a general lack of familiarity with structured problem-solving methods, such as SWOT analysis or risk matrices, among both urban and rural teachers. This finding is consistent with Nunan (1992), who argued that without formalized strategic approaches, teachers tend to rely on intuition or past experiences, which may not always be effective in addressing complex educational challenges.

The finding that both urban and rural teachers primarily focus on developing their own teaching methods rather than integrating advanced digital tools (Figures 17) aligns with earlier research by Alshuraiaan (2023), who emphasized that teachers' digital literacy significantly affects their ability to implement technology-driven innovations effectively. The limited use of digital tools observed in this study highlights a broader issue of insufficient technological competencies among teachers, a concern also raised by Mishra and Koehler (2006) in their Technological Pedagogical Content Knowledge (TPACK) framework.

Similarly, Koehler and Mishra (2009) claimed that successful technology integration in education requires a balance of technological, pedagogical, and content knowledge—areas where this study suggests both urban and rural teachers may require additional support. This gap in digital tool usage highlights the need for targeted professional development aimed at enhancing teachers' digital skills, as the current focus on personal teaching methods may not adequately prepare students for the growing role of technology in language education.

The findings regarding the evaluation of innovation effectiveness (Figures 19) align with existing literature on educational innovation. Popham (2009) and Stiggins (2005) both emphasized the need for a comprehensive set of metrics—beyond student achievement—when assessing the success of educational innovations. The limited focus on cost-effectiveness and recommendation readiness observed in this study reflects similar challenges identified by Black

and Wiliam (1998), who noted that educators often prioritize immediate learning outcomes over the long-term sustainability and scalability of innovations.

Moreover, the low use of recommendation readiness as a metric suggests a missed opportunity for teachers to share successful innovations with the broader educational community, a key aspect of sustainable educational reform, as highlighted by Ramzan et al. (2023). The trends observed in Kazakhstan's language education landscape, such as the reliance on individual teachers' methods and gaps in technological integration, mirror broader global challenges in education.

Similar findings have been reported in studies on educational technology in low-resource settings, where teacher competencies and access to technology are significant barriers to innovation (Gibson, 1988; Alshuraiaan, 2023). This study contributes to the global conversation by providing empirical data from Kazakhstan, a context often underrepresented in international research.

The conducted research on the design of technology for creating a language educational environment for teaching English and Kazakh languages revealed several key trends in language teaching disciplines in schools across Kazakhstan.

- Global reforms and updates in content, teaching methods, and assessment criteria are accompanied by ambiguity and unpredictability in learning outcomes, largely due to the low level of management competencies among teachers and methodological associations.
- There is a strong dependence on individual learner abilities and the characteristics of the teaching staff.
- The effectiveness of various teaching methods often depends on the skill level of the teacher, demonstrating success primarily in the hands of a master teacher.
- Teachers encounter weak technological and technical support, especially in the context of the growing role of artificial intelligence and neural networks in education.

As a solution, the authors propose the "5F" psycho-pedagogical technology to bridge the learning gap between rural and urban schools. This technology adapts to changes in the educational environment, meets the demands of modern education, and effectively identifies and solves real problems in language teaching and learning at the school level.

CONCLUSION

The presented study provides some insights into the language educational environment in Kazakhstan, highlighting significant disparities between urban and rural schools in assessing language preparation, resource availability, and the integration of technology. The reliance on personal test materials rather than standardized assessments raises concerns about the objectivity and validity of language proficiency evaluations. Additionally, the observed gaps in digital tool usage among teachers signal a pressing need for enhanced digital literacy to keep pace with evolving educational demands.

The following recommendations can be made in the framework of the study. Standardized assessment tools should be developed in order to ensure consistent and objective evaluations of language proficiency across all schools, especially in rural areas. Targeted professional development programs that focus on digital literacy and structured problem-solving techniques should be implemented. This training should empower teachers to integrate technology effectively and adopt evidence-based teaching methods. Resource allocation for rural schools should be prioritized, enhancing their material and technical infrastructure to support language education. Collaborative approaches in problem-solving should be fostered, encouraging teachers to involve parents and community members in the development of action plans for language education. Comprehensive evaluation frameworks that include both educational outcomes and administrative metrics to assess the long-term effectiveness and sustainability of implemented innovations should be established.

This study is subject to several limitations. First, the sample size, while substantial, may not fully represent the diversity of language educational environments across all regions of Kazakhstan. Additionally, the reliance on self-reported data could introduce bias, as teachers may overstate their use of best practices or innovative methods. Lastly, the study primarily focuses on English language education, which may limit the generalizability of findings to other language contexts. Future research should address these limitations by incorporating a more diverse sample and exploring additional languages and educational settings.

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APPENDIX

Table 2.*Questions of the Methodology for Assessing the Language Educational Environment*

Num	Primary Functions of Creating a Language Educational Environment	Questions and variants of answers
1	"Assessment of problems and contradictions"	Question: Do you systematically assess problems and contradictions in students' language preparation? Variants of answers: ✓ Yes ✓ No ✓ Sometimes Question: Question: Question: What do you use to assess students' language preparation? Variants of answers: ✓ Results of OECD assessments of 15-year-old students in PISA ✓ Results of the International Association for the Evaluation of Educational Achievement (IEA) study assessing the quality of school education in TIMSS for literacy, natural science, and mathematical literacy ✓ Results of the annual English Proficiency Index studies ✓ Own test materials ✓ Other
2	"Analysis of the organization of the school educational system"	Question: Do you conduct an assessment of the state and potential opportunities of the language educational environment in the school? Variants of answers: ✓ Yes ✓ No ✓ Unsure Question: What criteria do you use to assess the state and potential opportunities of the language educational environment in the school: Please select by importance. Variants of answers: ✓ Material-technical base ✓ Professional development of teachers ✓ Methodological support ✓ Regulatory framework ✓ Teachers' salaries ✓ Other (please specify) Question: If you have identified a problem in students' language preparation, do you develop a short-term/long-term action plan to address it? Variants of answers: ✓ Yes ✓ No ✓ Depending on the situation

3	"Development action plan"	of	Question: What methods do you use to develop an action plan for solving the problem? Variants of answers: ✓ SWOT analysis ✓ Assessment of alternative solutions ✓ Risk analysis matrix ✓ Creating mind maps for development ✓ Critical analysis ✓ Decision-making and formulation ✓ Discussion with teachers and parents ✓ Relying on my own experience
4	"Implementation project-based solutions based on tutorials"	of on	Question: Do you implement innovations to improve the language education system? Variants of answers: ✓ Yes ✓ No ✓ Unsure Question: What toolkit do you use to implement innovations to improve the language education system for students? Variants of answers: ✓ Modeling changes ✓ Designing language education ✓ Developing the concept of a language educational environment ✓ Developing your own teaching methods ✓ Other
5	"Marketing of project outcomes"		Question: Do you summarize and systematize the results obtained after implementing innovations to improve the language education system for students? Variants of answers: ✓ Yes ✓ No ✓ Sometimes Question: When assessing the effectiveness of implementing innovations to improve the language education system for students, what indicators do you use? Variants of answers: ✓ Degree of achievement of the expected result ✓ Level of functional literacy of students ✓ Criterion of costs (time, financial, human resources, etc.) ✓ Feedback indicator from participants ✓ Recommendation readiness index for the innovation ✓ Impact indicator of the obtained results on the language education environment in the school ✓ Other (please specify)