



International Journal of Artificial Intelligence and Machine Learning

Publisher's Home Page: <https://www.svedbergopen.com/>



Research Paper

Open Access

Predicting Teacher Professional Development Through AI-Based Analysis of Lesson Plan Quality in Primary School Settings

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Abstract

The professional development of teachers is a cornerstone of educational quality, yet regional specificities in Central Asia often remain under-researched. This study aims to evaluate the pedagogical conditions, professional motivations, and structural barriers influencing the growth of educators in Kyrgyzstan. A large-scale quantitative and qualitative study was conducted with 3,274 educators. The research utilized a comprehensive survey covering demographic profiles, institutional training frequency, workload distribution, and a semantic analysis of open-ended responses regarding professional success. The findings reveal a significant gender imbalance, with 92% of the workforce being female, highlighting a deeply feminized professional identity. While 49.6% of teachers rely on regional methodological centers for qualification, there is a notable shift toward paid online platforms (18.4%), indicating a growing demand for digital flexibility. Semantic analysis suggests that while 65% of educators still prioritize formal institutional certification, a rising segment (35%) values self-directed learning and technological exchange. Furthermore, 74.3% of teachers maintain an optimal 18-hour weekly workload, suggesting an available "time resource" for continuous education. The study concludes that the regional educational environment is in a state of transition. Success is moving from a static institutional achievement to a continuous, hybrid model of competence building. To enhance pedagogical conditions, professional development frameworks must integrate the high internal motivation of teachers with flexible, digital, and gender-sensitive training models.

Keyword: Professional development, Pedagogical conditions, Teacher feminization, Digital transformation in teaching, workload analysis.

Introduction

In the modern educational landscape, the professional development of teachers is no longer seen as a one-time qualification but as a continuous process of adapting to rapid social and technological changes. Especially in the context of post-Soviet Central Asian countries like Kyrgyzstan, the transition from traditional pedagogical models to innovative, digital-oriented environments presents both unique challenges and opportunities. The effectiveness of this transition depends heavily on the "pedagogical conditions" created within the education system to support teachers at various stages of their careers. The teaching profession in regional and rural areas of Kyrgyzstan faces specific structural dynamics. One of the most prominent features is the high degree of feminization within the workforce, which influences the socio-cultural perception of the teaching career and its professional growth paths. Furthermore, while the government provides institutional support through regional methodological centers, there is an increasing shift toward autonomous, digital, and self-directed learning among educators. Understanding how these factors—gender, experience, workload, and training preferences—interact is essential for developing sustainable professional growth models.

Despite the importance of this topic, there is a lack of large-scale empirical data reflecting the actual needs and current conditions of teachers in rural regions. Most existing studies focus on urban centers, leaving a gap in understanding the professional reality of the "middle generation" of educators who form the backbone of the regional school system.

This study aims to fill this gap by conducting a comprehensive analysis of 3,274 educators in the Talas region of Kyrgyzstan. The research focuses on identifying the pedagogical conditions necessary for professional success, evaluating the efficiency of existing training platforms, and analyzing the impact of workload and demographic factors on career development. By examining both quantitative data and qualitative insights from teachers, this paper provides a multifaceted view of the professional development landscape in a transitioning educational system.

Literature Review

The professional development (PD) of teachers is recognized as a fundamental determinant of educational quality, yet the mechanisms ensuring its effectiveness remain at the center of intense scholarly debate. As Kennedy (2016) posits, the success of PD programs depends less on their formal structural features, such as duration or format, and more on their underlying "theories of action"—specifically, how they facilitate the enactment of new ideas within a teacher's ongoing system of practice. This perspective shifts the conceptualization of professional growth from a series of episodic events to a continuous, systemic process. Such an integrated approach is viewed as the most direct pathway to enhancing teacher effectiveness and instructional quality (Juma, 2024), as pedagogical advancements exert a direct influence on student attainment and the overall learning experience (Singh, 2023).

However, in a global context, particularly within low- and middle-income countries, a significant "gap between evidence and practice" persists in large-scale government programs. Popova et al. (2018) observe that many at-scale initiatives lack sufficient career incentives, practical lesson enactment, and robust follow-up mechanisms, which are critical for sustaining behavioral change in the classroom. To address this misalignment, contemporary research suggests moving toward a Learner-Centered Teacher Professional Development (LCTPD) model, which aligns educator growth with specific learner needs and contemporary pedagogical values (Ajani, 2023).

The role of institutional leadership and the collaborative environment are equally vital in translating PD into improved teaching standards. Ambon et al. (2024) demonstrate that effective leadership fosters a supportive culture for continuous professional development (CPD), thereby amplifying a teacher's ability to solve classroom-based problems. In this regard, moving beyond the traditional "subject-specific focus" toward "Quality Teaching Rounds" and cross-disciplinary professional learning communities has proven highly effective in generating fresh insights and enhancing collegiality (Gore & Rosser, 2020). This dialogic nature of development is particularly valued in university settings, where factors such as relevance, structure, and voluntary participation significantly influence the motivation for self-development (Smith & Wyness, 2024).

The contemporary landscape of professional development is also intrinsically linked to digital transformation and the mastery of new instructional technologies. Adhikari and Budhathoki (2025) highlight that integrating technology within a collaborative and collegial learning environment is essential for meeting the evolving demands of 21st-century education. The adoption of innovative methods notably boosts teachers' self-efficacy, leading to improved classroom management and refined assessment practices (Nuñez & Despi, 2025). Evidence from higher education institutions suggests that high teacher satisfaction with such training programs can fundamentally reshape pedagogical conceptions and long-term professional trajectories (Fernandes et al., 2023). In summary, effective professional development emerges as a dynamic synergy of individual motivation, collaborative inquiry, leadership support, and technological agility.

Methodology

A total of 3,274 respondents participated in the study, providing a comprehensive dataset for evaluating the current research questions. The sample was drawn from various districts in the Talas region, ensuring broad geographic representation. Analysis of the regional distribution shows that the Bakai-Ata district ($n = 811$, 26.4%) and the Talas district ($n = 797$, 26%) were the most active participants. Other contributors included respondents from the Aitmatov district ($n = 530$, 17.3%), Talas city ($n = 485$, 15.7%), and the Manas district ($n = 450$, 14.7%). Such a high level of engagement from educators suggests that the research topic is highly relevant and reflects the professional interest of teachers in the region.

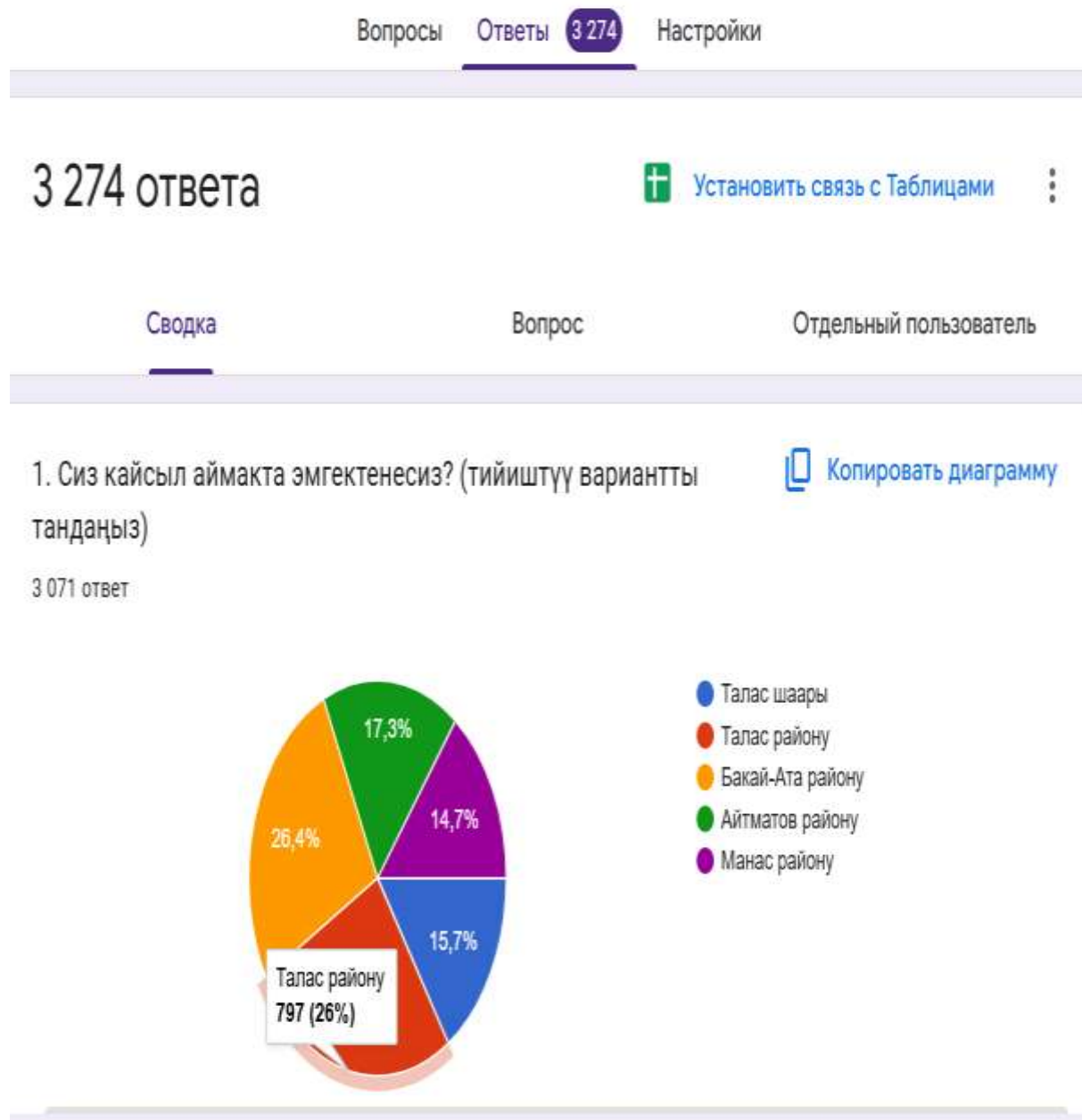


Figure 1: Distribution of respondents by districts

In terms of gender composition, the data reveals a significant imbalance that reflects current trends in the educational workforce. The vast majority of participants were female, accounting for 92% ($n = 2,826$) of the total sample, while male teachers represented only 8% ($n = 245$). This 11.5-fold difference aligns with the ongoing "feminization" of the teaching profession in primary and secondary education. While the results primarily reflect the perspectives and pedagogical experiences of female educators, the inclusion of 245 male teachers ensures a degree of gender diversity, allowing for a more multifaceted approach to the analyzed issues.

The study also categorized participants based on their professional teaching experience, which is a critical factor in developing effective pedagogical conditions. The distribution across different experience levels was remarkably balanced:

12–20 years (26.2%, $n = 803$): The largest group, representing established professionals who balance traditional experience with modern innovation.

1–5 years (19.2%, $n = 588$): Young specialists, indicating a steady influx of new professionals into the system.

21–30 years (18.5%, $n = 569$) and 6–11 years (18.4%, $n = 565$): These groups showed nearly equal participation rates.

31–45 years (18%, $n = 553$): Highly experienced veteran educators.

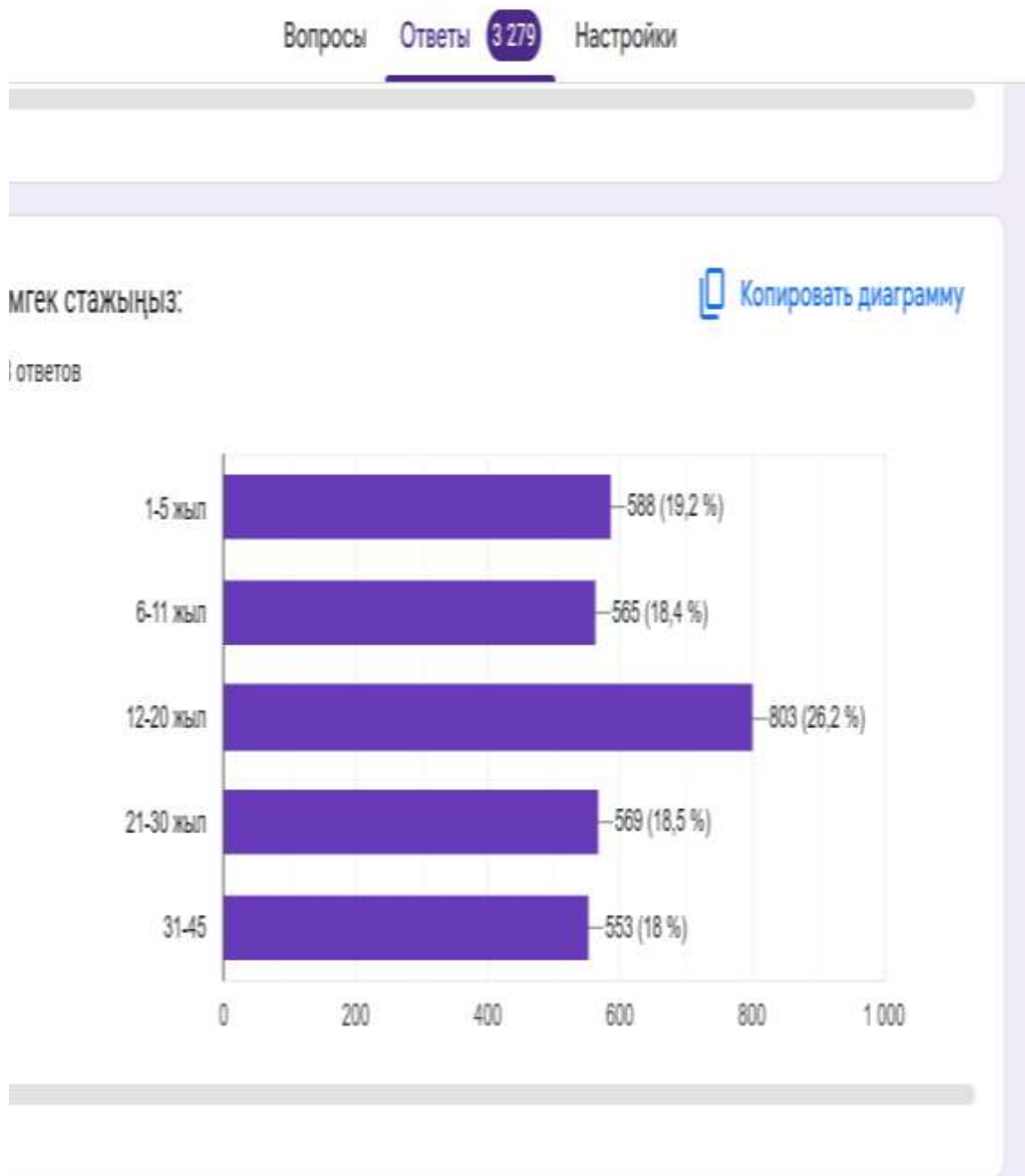


Figure 2: Distribution of respondents by years of work experience

The representation of all career stages—from novice teachers to those with over 30 years of experience—ensures that the findings and the proposed methodological recommendations are universal and applicable to educators regardless of their professional seniority. This diverse range of experience enhances the reliability and validity of the research outcomes.

Results

Geographic and Demographic Profile of Respondents

The survey reached a significant sample of 3,274 educators across the Talas region. Data analysis shows the highest participation from the Bakai-Ata district (26.4%, $n = 811$) and Talas district (26%, $n = 797$), followed by the Aitmatov district (17.3%), Talas city (15.7%), and Manas district (14.7%).

The gender distribution indicates a clear imbalance, with 92% ($n = 2,826$) of the respondents being female and only 8% ($n = 245$) being male. Regarding professional longevity, the largest group of participants consists of teachers with 12–20 years of experience (26.2%). However, the sample is well-represented across all experience levels: 1–5 years (19.2%), 6–11 years (18.4%), 21–30 years (18.5%), and over 31 years (18%). This distribution ensures that the data reflects perspectives from various stages of a teaching career.

Professional Development and Training Platforms

The study examined the frequency and platforms used for teacher qualification improvement. According to the findings, 44.4% of respondents have completed a 72-hour qualification course once, while 37.5% have participated three times. A smaller group of "continuous learners" (18.1%) has attended such courses five or more times.

Professional Development Source	Percentage (%)	Number of Respondents (persons)
Talas Regional Educational Methodological Center	49.6%	1471
Paid online courses	18.4%	546
Have not attended any training	18.3%	543
Bishkek (RIPKPPK)	13.7%	406
Total	100%	2966

Table 1. Distribution of respondents by professional development source

In terms of training locations, the Talas Regional Education Methodological Center remains the primary hub, utilized by 49.6% ($n = 1,471$) of the participants. Other significant platforms include:

Paid online courses: 18.4% ($n = 546$)

Centralized training in Bishkek: 13.7% ($n = 406$) Notably, 18.3% ($n = 543$) of the respondents reported that they had not participated in any training courses within the last three years.

Effectiveness and Satisfaction Levels

A high level of satisfaction was recorded regarding the quality of training provided by the regional center. 61.1% of the teachers confirmed they were satisfied with the courses, while 12.3% expressed a strong desire to participate in future sessions. Only 6.4% of the respondents expressed dissatisfaction with the current training programs.

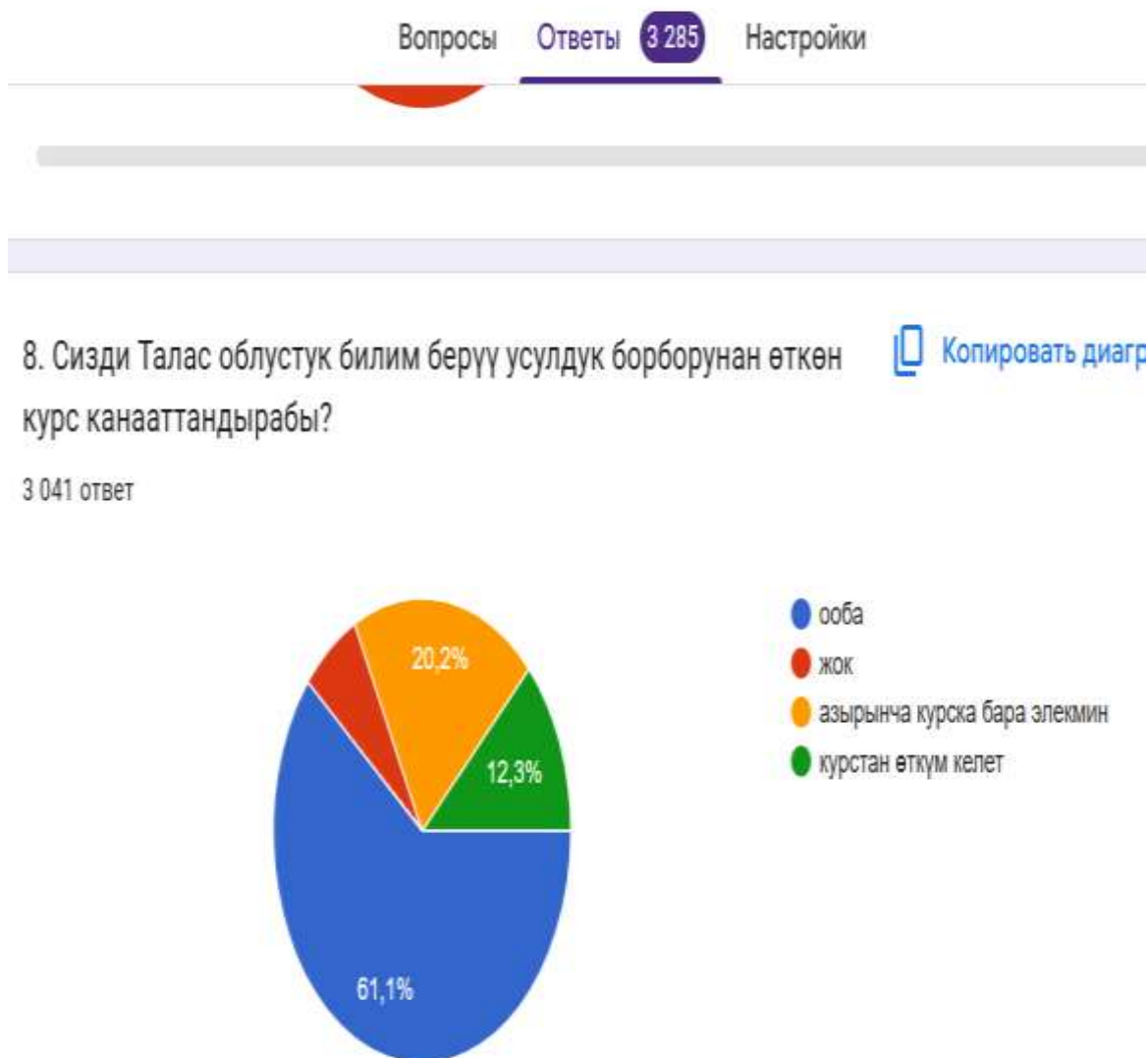


Figure 3: Satisfaction level of respondents with the training courses

To understand the teachers' subjective views on "professional success," an open-ended question was analyzed using semantic categorization. The responses ($n = 3,285$) were grouped into three primary directions:

Institutional-Course Direction (65%): The majority of teachers identify professional growth with formal certification and institutional training (e.g., "attending courses," "qualification improvement").

Individual-Personal Development (20%): This group emphasizes self-study, reading, and internal motivation.

Practical-Technological Direction (15%): These respondents focus on the exchange of experience, peer-to-peer learning, and the adoption of new technologies in the classroom.

Workload and Time Resources

Here is the expanded, academic version of your text in English. It is written in a professional, scholarly tone suitable for a dissertation's "Results and Discussion" chapter, providing both data and analytical insight. A critical component of this study involved assessing the current workload of educators to determine the availability of time resources for professional development and the integration of new technologies. The data reveals a significant variance in the weekly teaching hours among the surveyed population, which directly impacts the potential for pedagogical innovation.

The analysis indicates that the vast majority of educators, 74.3% ($n = 2,014$), operate within a standard workload of 18 hours per week, equivalent to one full-time position. For this group, the current schedule theoretically allows

for a balanced allocation of time between classroom instruction and essential non-teaching activities, such as lesson planning, student assessment, and self-education.

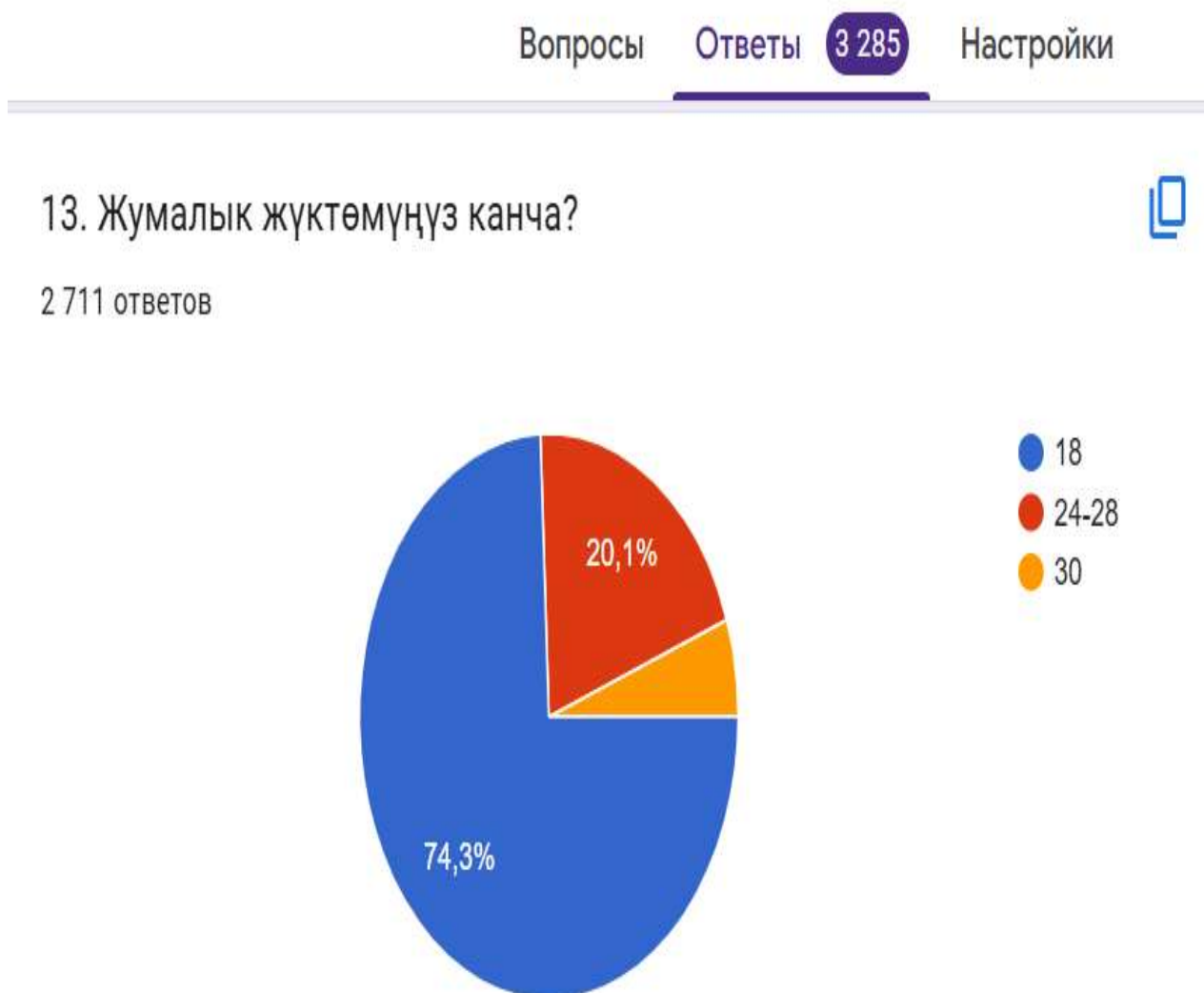


Figure 4: Distribution of weekly workload by hours

A substantial segment of the sample, 20.1% ($n = 545$), carries an intensified teaching load ranging from 24 to 28 hours per week. This increase often stems from institutional demands or regional teacher shortages. From a professional standpoint, this level of engagement often leads to "time poverty," where the educator's ability to experiment with complex digital tools or personalized learning paths is significantly constrained.

A small but notable minority (5.6%) works 30 hours or more per week. In the context of contemporary educational psychology, such a high instructional volume is frequently associated with a higher risk of occupational burnout and a decline in the qualitative aspects of teaching. For these individuals, the adoption of AI-driven tools may be perceived not as an opportunity, but as an additional burden due to the lack of discretionary time. These figures suggest that the majority of teachers in the region possess a manageable workload, potentially allowing time for further professional development activities.

Discussion

The results of this large-scale study, involving 3,274 educators from the Talas region, provide significant insights into the professional development landscape within the Central Asian educational context. The high participation rate from districts like Bakai-Ata (26.4%) and Talas (26%) underscores the urgent relevance of professional

growth among rural and regional teachers. A striking finding in our demographic analysis is the heavy "feminization" of the teaching profession, with women comprising 92% of the respondents. In the context of professional success and development, this suggests that pedagogical career paths in the region are deeply rooted in socio-cultural perceptions of teaching as a "female-dominated" field. For the development of pedagogical conditions, this means that professional growth models must be sensitive to the unique social roles and perspectives of female educators. While the 8% of male participants provide some gender diversity, the overwhelming majority of professional experiences recorded here are those of women, which must be considered when designing mentorship and support systems.

The analysis of professional development frequency and platforms reveals a transition between traditional institutional learning and modern digital trends. The fact that nearly half of the respondents (49.6%) rely on the Talas Regional Education Methodological Center highlights the continued importance of local institutional support. However, the rise of paid online courses (18.4%) is a noteworthy shift. It indicates that teachers are increasingly looking for flexible, technology-driven ways to enhance their professional success (professional success). This "digital adaptation" suggests that "literary language" and formal pedagogical discourse are now being mediated through digital platforms, requiring teachers to not only master subject matter but also digital communication competencies.

The distribution of teaching experience across the sample is remarkably balanced. The dominance of the "middle generation" (12–20 years of experience, 26.2%) suggests a stable professional core that is both experienced and capable of adopting new innovations. This group, combined with the veteran educators (18% with over 31 years of experience), provides a solid foundation for "experience exchange" (peer-to-peer learning). Our semantic analysis of open-ended questions confirms this: 65% of teachers equate professional development with formal institutional training. However, the 20% who emphasize self-directed learning and the 15% focusing on practical technological exchange represent a growing segment of the workforce that values autonomy and modern pedagogical tools.

A crucial practical finding is the workload distribution. With 74.3% of teachers working a standard 18-hour load (one "stavka"), there is a clear "time resource" available for professional development. Unlike regions where teacher burnout is driven by extreme overwork, the Talas region appears to have an optimal workload structure that allows for continuous education. This objective condition is vital for the successful implementation of the pedagogical conditions proposed in this study. The 20.1% of teachers with higher workloads (24–28 hours) further justify the need for the "hybrid" and "online" training models that were identified as a growing preference among respondents.

In summary, the findings indicate that while the institutional framework remains the primary driver of teacher qualification, there is a strong internal motivation for self-improvement and digital integration. Professional success in the current climate is no longer seen as a static achievement but as a continuous process of updating competencies. The high satisfaction rate (61.1%) with current regional training, combined with the desire for more modern, flexible learning paths, confirms that the pedagogical conditions developed in this research are being introduced into a receptive and motivated professional environment.

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