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Pedagogical Mastery: Theoretical Foundations, Official Statistical Indicators and Contemporary Development Pathways

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Abstract : Official statistics show a rapid expansion of the teaching workforce in Uzbekistan, but it remains unclear how this quantitative growth relates to the quality of pedagogical mastery, and Uzbek, Russian and international conceptions of mastery are rarely compared within a single framework. This study aims to compare the theoretical foundations of pedagogical mastery, to systematise official indicators of the teaching workforce for 2019/2020–2025/2026, and to substantiate an integrative model for developing mastery. The article offers a comparative analysis of the concept of pedagogical mastery in Uzbek, Russian and international scholarship and systematises official statistical data on the teaching workforce in Uzbekistan's general secondary education. The study uses a documentary-analytical review, comparative analysis and descriptive statistics; no experimental component was conducted. data were collected from documentary sources (official statistics of the National Statistics Committee, normative-legal documents, reports of UNESCO and OECD, and peer-reviewed publications) selected by three criteria: official or peer-reviewed character, verifiability and relevance; no questionnaires, interviews, observations or tests were used. According to the National Statistics Committee, the number of teachers in general secondary schools grew from 486.6 thousand in 2019/2020 to 577.7 thousand in 2025/2026 (+18.7%), women account for 72.5% of the workforce, and regional differences reach a factor of 4.6. International evidence (Shulman; Hattie; Kunter et al.; Darling-Hammond et al.) indicates that teaching quality depends less on workforce expansion than on the integration of knowledge, practice, personal-value, reflective and digital-methodological components. Because these indicators are only proxy measures, they describe workforce capacity rather than the quality of mastery. The author proposes a five-component integrative conceptual model and formulates recommendations for qualitative monitoring of teacher capacity and for the design of professional development. The model is not yet empirically tested; future quasi-experimental or mixed-methods studies and the development of locally validated measurement instruments are recommended.

Keywords: pedagogical mastery; professional competence; teacher qualification; pedagogical content knowledge; TPACK; professional development; Uzbekistan education statistics

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INTRODUCTION

The quality of education is increasingly shown to depend on the professional capacity of the teacher. Synthesising more than 800 meta-analyses, Hattie (2009) demonstrated that among the factors influencing student achievement, teachers' instructional practice, including feedback, clarity of content and the organisation of learning, occupies a prominent place. From an economic perspective, Chetty et al. (2014) estimated that replacing a teacher in the bottom 5% of the value-added distribution with an average teacher would raise the present value of students' lifetime income by about USD 250,000 per classroom of average size. Such findings call for treating pedagogical mastery not only as a professional attribute but also as a resource for socio-economic development.

The global shortage of teachers is also acute. According to the report of UNESCO and the International Task Force on Teachers for Education 2030 (2024), an additional 44 million teachers will be needed by 2030 to ensure universal primary and secondary education. The report stresses that the issue concerns not only numbers but also the preparation, motivation and support of teachers, professional collaboration and lifelong professional development. Developing pedagogical mastery should therefore be regarded as a quality guarantee both under conditions of shortage and in systems where the workforce is expanding.

In Uzbekistan this issue has been set as one of the priorities of state policy. The Concept for the Development of the Public Education System until 2030, approved by Presidential Decree No. PF-5712 of 29 April 2019, identifies the training of qualified personnel as a systemic priority and sets the goal of bringing the country into the group of the world's 30 leading countries in the PISA ranking by 2030 (President of the Republic of Uzbekistan, 2019). According to the National Statistics Committee, 577.7 thousand teachers (excluding part-time staff) worked in general secondary education institutions at the beginning of the 2025/2026 academic year (National Statistics Committee, 2025b). This figure confirms a quantitative expansion of workforce capacity, but it does not by itself allow conclusions about the quality of mastery.

The concept of pedagogical mastery is interpreted in various ways in the scholarly literature. In Uzbek and Russian pedagogy it is usually described as an integral combination of personal qualities, knowledge, abilities and pedagogical technique (Slastenin et al., 2002; Yo'ldoshev & Usmonov, 2004), whereas in the international Scopus-indexed literature the leading constructs are teacher expertise, professional competence, pedagogical content knowledge (PCK) and technological pedagogical content knowledge (TPACK) (Shulman, 1986; Mishra & Koehler, 2006; Blömeke et al., 2015). This terminological diversity complicates the communication of national research findings to an international audience and the substantive interpretation of statistical indicators.

Three previous studies are particularly relevant to this work. First, Yo'ldoshev and Usmonov (2004) interpreted mastery through pedagogical technology, that is, the design of the educational process, its division into stages and the diagnosis of outcomes this approach is practical, but it offers limited external, verifiable criteria for the level of mastery. Second, Slastenin et al. (2002) described mastery as a complex of personality properties with four structural components (humanistic orientation, professional competence, pedagogical abilities and pedagogical technique) their model is conceptually coherent, but it is theoretical-descriptive and is not linked to student outcomes or workforce data. Third, Kunter et al. (2013), within the COACTIV research programme, measured professional competence empirically (knowledge, beliefs, motivation and self-regulation) and linked it to instructional quality and student development however, this evidence comes from the German context and does not engage with the Uzbek or Russian traditions or with national workforce statistics.

Novelty this study differs from these works in three respects it places the Uzbek technological, Russian personal-professional and international empirical approaches in a single comparative framework it complements them with official statistics on the teaching workforce in Uzbekistan for 2019/2020–2025/2026, which have not previously been systematised in relation to mastery and it derives from this comparison a five-component integrative model that links the national value and technology dimensions with international measurement logic.

The aim of the study is to compare the theoretical foundations of pedagogical mastery on the basis of Uzbek, Russian and international sources, to systematise official statistical data on the teaching workforce in Uzbekistan's general secondary education, and, by juxtaposing these with international empirical evidence, to substantiate an integrative model for developing mastery. Three objectives were set: (1) to identify and compare the principal scholarly approaches to the concept; (2) to analyse indicators of workforce capacity for the 2019/2020–2025/2026 academic years; and (3) to formulate criteria and directions for developing mastery on the basis of international evidence. The novelty of the article lies in combining national official statistics, classical Russian-language pedagogical theory and international empirical research within a single analytical framework.

The article is structured as follows. Section 2 compares Uzbek, Russian and international interpretations of mastery; Section 3 describes the methodology and limitations; Section 4 analyses official statistics, the regulatory framework and international empirical evidence and proposes an integrative model; Section 5 discusses the findings; and the final section summarises the conclusions. This structure follows the general expectations of Scopus-indexed journals (relevance, theoretical background, methodology, results, discussion and conclusion), although an experimental section has deliberately not been included.

Theoretical Foundations and Literature Review

1. The concept of Mastery in the Uzbek Pedagogical Tradition

In Uzbek pedagogical thought, the personality and mastery of the teacher have long been linked to the unity of knowledge, morality and practice. The anthology compiled by Hoshimov and Ochil (1995) brings together pedagogical views from Eastern thinkers to the Jadids, in which the teacher's erudition, exemplary conduct and responsibility for the upbringing of the learner occupy a central place. The Jadid enlightener Abdulla Avloniy (1913) regarded upbringing as a matter bound up with the fate of the nation and set high standards for the teacher's moral and methodological preparation. These views show the national roots of the value-based component of contemporary interpretations of pedagogical mastery.

In the period of independence, the question of mastery in Uzbek pedagogy developed in close connection with the concept of pedagogical technology. Yo'ldoshev and Usmonov (2004), Sayidahmedov (2003), and Tolipov and Usmonboyeva (2006) substantiate the design of the educational process, its division into stages, the specification of learning objectives and the diagnosis of outcomes as the practical foundation of mastery. In this approach, the teacher's expertise is interpreted less as personal talent than as a technological process that can be reproduced, analysed and learned. In this respect, the Uzbek technological approach is close in substance to the ideas of evidence-based practice abroad.

In Uzbek literature, pedagogical mastery is often described through components such as pedagogical technique, pedagogical communication, speech culture and the professional orientation of the teacher's personality. The strength of this approach is its practical orientation: a student or novice teacher can master mastery as a set of concrete skills and develop it through practice and analysis. Its weakness is the limited possibility of linking the level of mastery to external, verifiable criteria. International research pays particular attention to exactly this aspect, namely measuring knowledge and instructional quality with dedicated instruments (Kunter et al., 2013). Aligning the value and technology dimensions of Uzbek theory with the measurement logic of international research is therefore a promising scholarly direction.

2. Pedagogical Mastery in the Russian Scholarly School

In Russian pedagogy, pedagogical mastery is among the most consistently theorised concepts. Slastenin et al. (2002) interpret it as a complex of personality properties that ensures a high level of self-organisation of professional activity. The authors distinguish the structural components of mastery as humanistic orientation, professional competence, pedagogical abilities and pedagogical technique. Slastenin and Podymova (1997) show innovative pedagogical activity to be a mechanism through which mastery develops. Because this model has been widely used in Uzbek

higher pedagogical education, it offers a practical convenience for describing mastery as a system of components.

Kan-Kalik (1987) considered pedagogical communication central to mastery and worked on communication style, interpersonal relations with the learner and the management of the communicative process. Markova (1993), studying the psychology of the teacher's work, analysed professional mastery as professional activity, professional communication and a process of personal development. Mitina (1994) examined the teacher as both a personality and a professional and described the psychological problems of professional growth. Within the competence-based approach, Zimnyaya (2003) and Khutorskoy (2003) substantiated key competences and the distinction between competence and competency. At the normative level, the professional standard "Teacher" approved by Order No. 544n of the Russian Ministry of Labour of 18 October 2013 formally defines the teacher's work functions and the required knowledge and skills (Ministry of Labour of Russia, 2013).

The influence of the Russian school on Uzbek pedagogical education is felt especially through textbooks and manuals used in higher pedagogical institutions. The scholarly value of this heritage lies in describing mastery as a system, with components, stages and a development mechanism. In the author's view, theoretical-conceptual description predominates in the Russian literature, whereas large-sample quantitative studies linked to student outcomes lead in the international literature. Combining the two traditions, that is, enriching the conceptual integrity of the Russian school with the measurement logic of international research, is therefore a substantively meaningful direction.

3. International Approaches

In international research, the analysis of teacher knowledge rests on the concept of pedagogical content knowledge (PCK) advanced by Shulman (1986, 1987). According to it, teacher preparation is not limited to knowing subject matter; what matters is the ability to render that content comprehensible to particular learners and to anticipate their typical errors and misconceptions. Mishra and Koehler (2006) added technological knowledge to this model to develop the TPACK framework, making it possible to analyse mastery in digital environments at the intersection of subject, pedagogy and technology.

The most rigorous empirical evidence comes from the German COACTIV study. Baumert et al. (2010) established links between mathematics teachers' subject knowledge and pedagogical content knowledge, cognitive activation in the classroom and student progress; Kunter et al. (2013) included beliefs, motivation and self-regulation alongside knowledge in professional competence and showed their effect on instructional quality and student development. Blömeke et al. (2015) proposed interpreting competence not as a dichotomy but as a continuum from dispositions to

observable performance. Bandura (1997) and Tschannen-Moran and Hoy (2001) substantiated teachers' self-efficacy as an important determinant of motivation and instructional behaviour.

The reflective-practice strand regards mastery as a process that develops through thinking about experience. Schön (1983), with the concept of the "reflective practitioner", showed that professional knowledge is formed in the course of practice, while Korthagen (2004) explained the essence of a good teacher through a layered, holistic model that includes the levels of environment, behaviour, competencies, beliefs, identity and mission. Hattie and Timperley (2007) identified feedback as one of the most powerful influences on teaching and learning, estimating its average effect size at 0.79. These results indicate that mastery should be measured not only by knowledge but also by the effectiveness of concrete pedagogical actions.

Differences in teacher effectiveness have also been studied seriously in economics. Hanushek and Rivkin (2012) summarised studies showing large differences in teacher quality and a marked reflection of these differences in student achievement; Chetty et al. (2014) found that the effect does not end with achievement but extends to students' later educational and labour-market outcomes. These results make it possible to view pedagogical mastery not as a one-off benefit within an academic year but as a long-term investment. At the same time, such studies rely mainly on US data, and their transfer to other education systems requires caution.

Table 1. Principal Scholarly Approaches to Interpreting Pedagogical Mastery

Approach	Representative authors	Interpretation of mastery	Emphasis
Uzbek technological school	Yo'ldoshev & Usmonov (2004); Sayidahmedov (2003); Tolipov & Usmonboyeva (2006)	Designing the educational process, dividing it into stages and guaranteeing results	Technological, practical
Russian personal-professional school	Slastenin et al. (2002); Markova (1993); Kan-Kalik (1987); Mitina (1994)	A complex of personal qualities, knowledge, abilities and pedagogical technique	Personal, communicative
Russian competence-based approach	Zimnyaya (2003); Khutorskoy (2003); Ministry of Labour of Russia (2013)	Key competences and professional standard	Normative, competence-based
International knowledge-based approach	Shulman (1986, 1987); Mishra & Koehler (2006); Baumert et al. (2010)	Intersection of subject, pedagogical and technological knowledge	Knowledge structure

Competence and self-efficacy	Kunter et al. (2013); Blömeke et al. (2015); Bandura (1997); Tschannen-Moran & Hoy (2001)	Continuum of knowledge, beliefs, motivation and self-regulation	Motivational, empirical
Reflective approach	Schön (1983); Korthagen (2004); Hattie & Timperley (2007)	Growth through reflection on experience and feedback	Reflective, practical

The approaches presented in Table 1 do not negate one another but illuminate different facets of mastery. The Uzbek technological school emphasises design and diagnostics, the Russian school the personal-professional structure and communication, and international research the structure of knowledge, empirical validation and self-regulation. An integrative approach is therefore required for a contemporary understanding of mastery.

METHODOLOGY

The research design is documentary-analytical (desk research) and does not include empirical trial-and-experiment work. This decision follows from the aim of the article: the study does not test the effectiveness of a new pedagogical model but systematically analyses existing theoretical concepts and official observational data and synthesises them conceptually. Accordingly, causal statements (for example, that professional development programme X leads to outcome Y) are made not on the basis of primary data but with reference to the evidence of international research.

The sources were divided into four groups: (a) official data of the National Statistics Committee of the Republic of Uzbekistan and the media outlets that published them; (b) normative-legal documents, including presidential decrees and ministry data; (c) reports of international organisations (UNESCO, OECD); and (d) scholarly monographs and peer-reviewed journal articles in Uzbek, Russian and English. Three criteria guided source selection: official or peer-reviewed character, verifiability (URL, volume, page numbers) and direct relevance to the topic.

Content analysis (for theoretical concepts), comparative analysis (for comparing approaches) and descriptive statistics (for growth rates, shares and ratios) were used as analytical methods. Where statistical indicators were published in several sources, they were cross-checked. For example, the number of teachers in 2020/2021 is given as 508.0 and 508.2 thousand in different publications; the analysis uses 508.2 thousand, and it was verified that the difference does not affect the results. The growth rates and shares reported in the article were calculated by the author from official figures; such calculations are indicated separately in table notes.

A four-group system of indicators was used to structure the statistical analysis: (1) volume indicators (number of teachers, annual change); (2) composition indicators (gender, region); (3) indicators of formal recognition (qualification categories); and (4) context indicators (numbers of students and schools, student–teacher ratio). These groups are indirect (proxy) rather than direct measures of mastery. For example, volume and composition indicators reflect staffing levels, while categories reflect the formal recognition of professional growth. Measuring mastery itself, that is, the quality of teaching and its effect on student outcomes, would require other types of data, such as lesson observations and assessment results.

The study used only generalised data from public and official sources; no personal data, respondents or closed archives were involved, so special ethical approval was not required. All figures are given with their sources and can be verified independently by the reader.

The limitations of the study are as follows. First, official statistics mainly cover quantitative indicators and do not directly measure the quality of pedagogical mastery. Second, regional data are not normalised by the number of students. Third, the results of international studies were obtained in other education systems and cannot be transferred directly to Uzbekistan. As a result, the international evidence is used in the analysis as descriptive evidence and is interpreted as a source of hypotheses for future local empirical research.

RESULTS AND DISCUSSION

Quantitative Dynamics of Teaching Workforce Capacity

According to the National Statistics Committee, the number of teachers working in general secondary education institutions (excluding part-time staff) was 486.6 thousand at the beginning of the 2019/2020 academic year, rose to 564.9 thousand in 2024/2025 (Kun.uz, 2025) and reached 577.7 thousand at the beginning of 2025/2026 (National Statistics Committee, 2025b). Over the last year the increase was 12.8 thousand, or 2.3%.

Table 2.

Number of Teachers in General Secondary Education Institutions (at the Beginning of the Academic Year, Thousand Persons)

Academic year	Teachers, thousand	Annual change, thousand	Annual growth, %	Relative to 2019/2020, %
2019/2020	486.6	—	—	—
2020/2021	508.2	+21.6	+4.4%	+4.4%
2021/2022	510.0	+1.8	+0.4%	+4.8%
2022/2023	521.6	+11.6	+2.3%	+7.2%
2023/2024	547.7	+26.1	+5.0%	+12.6%
2024/2025	564.9	+17.2	+3.1%	+16.1%

2025/2026	577.7	+12.8	+2.3%	+18.7%

Note: at the beginning of the academic year, excluding part-time staff.
Source: National Statistics Committee (2025a, 2025b); Kun.uz (2025);

The table shows that over six academic years the total growth was 91.1 thousand, or 18.7%. The growth was uneven: +21.6 thousand in 2020/2021, only +1.8 thousand in 2021/2022, and the highest annual increase of +26.1 thousand in 2023/2024. Figure 1 presents this dynamic graphically.

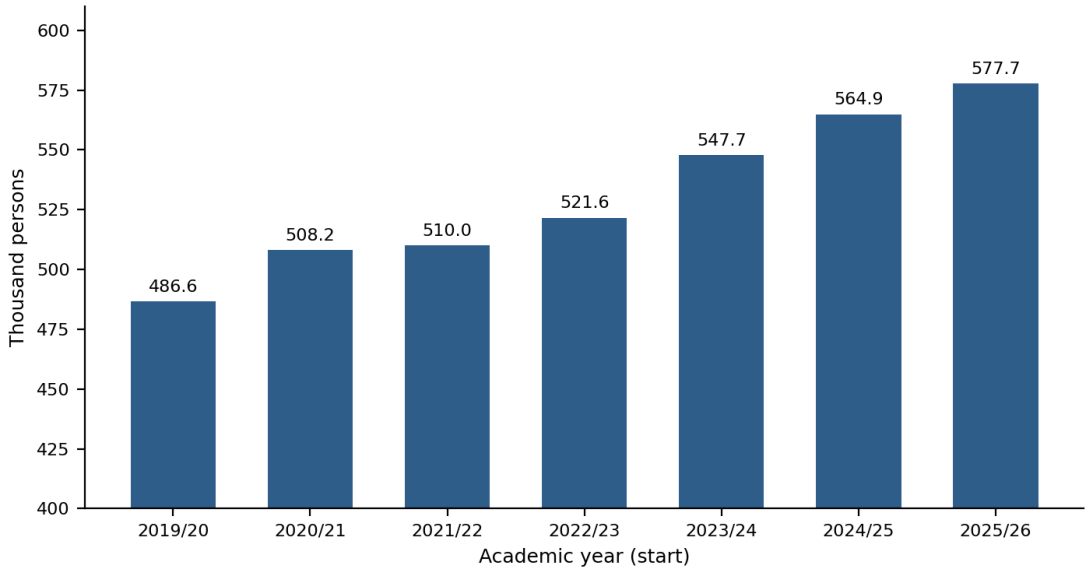


Figure 1. Dynamics of the Number of Teachers in General Secondary Education Institutions, Thousand Persons
Source: National Statistics Committee (2025a, 2025b) and Kun.uz (2025).

The growth should be interpreted with the expansion of the school network in mind. According to a source based on National Statistics Committee data, 11,118 general secondary education institutions, including 551 non-state institutions, were operating at the beginning of the 2025/2026 academic year (Yep.uz, 2025). On this basis there are about 52 teachers per school on average (author's calculation: 577.7 thousand / 11,118). The number of schools rose by 175 from 10,943 in 2024/2025 while the number of teachers rose by 12.8 thousand; that is, workforce growth has been broadly consistent with the expansion of the school network. However, this consistency does not prove that the existing workforce meets quality requirements.

It is also useful to consider the ratio to student numbers. At the beginning of the 2024/2025 academic year, about 6.776 million students were enrolled in 10,943 general secondary education institutions (Yep.uz, 2025, citing National Statistics Committee data); relative to 564.9 thousand teachers this gives roughly 12 students

per teacher (author's calculation). This average, however, does not reflect actual class sizes, second and third shifts, or subject-specific shortages, and therefore cannot be interpreted as a quality indicator.

By gender, the profession is markedly feminised: at the beginning of 2025/2026, women accounted for 72.5% (418.8 thousand) and men for 27.5% (158.9 thousand) of teachers (National Statistics Committee, 2025b). This implies that, in designing programmes for developing pedagogical mastery, women's professional and family workload should be taken into account and flexible, distance and modular formats prioritised. The number of staff in higher education, which trains teachers, has also grown: the number of teaching staff in higher education institutions rose from 23,021 in 2010 to 45,210 in 2023, an increase of about 96.4% (47.9% relative to 30,559 in 2019) (National Statistics Committee, 2024).

Regional Distribution and Inequality

Teaching staff are unevenly distributed across regions. At the beginning of 2025/2026, the largest numbers of teachers were recorded in Samarkand and Kashkadarya regions (65.1 thousand each) and the smallest in Syrdarya region (14.2 thousand) (National Statistics Committee, 2025b). Table 3 presents data for the 14 administrative-territorial units and their shares in the national total (author's calculation).

Table 3.

Distribution of Teachers by Region at the Beginning of the 2025/2026 Academic Year

No.	Region	Teachers, thousand	Share, %
1	Samarkand region	65.1	11.3%
2	Kashkadarya region	65.1	11.3%
3	Fergana region	60.6	10.5%
4	Surkhandarya region	52.3	9.1%
5	Andijan region	46.3	8.0%
6	Namangan region	42.6	7.4%
7	Republic of Karakalpakstan	40.7	7.0%
8	Tashkent region	40.2	7.0%
9	Khorezm region	35.1	6.1%
10	Tashkent city	34.1	5.9%
11	Bukhara region	33.4	5.8%
12	Jizzakh region	25.7	4.4%
13	Navoi region	22.3	3.9%
14	Syrdarya region	14.2	2.5%
	Total (national)	577.7	100.0%

Note: Shares calculated by the author relative to the national total of 577.7 thousand.

Source: National Statistics Committee (2025b).

The first four regions (Samarkand, Kashkadarya, Fergana and Surkhandarya) together account for about 42.1% of all teachers (243.1 thousand). The gap between the largest and smallest regions is a factor of 4.6. These figures also reflect natural differences in population and school networks, so conclusions about inequality in mastery between regions cannot be drawn from them. However, to ensure that professional development resources (methodological centres, mentors, digital platforms) are distributed proportionately across regions, the concentration of the workforce should be taken into account.

The capital, Tashkent city, has 34.1 thousand teachers (5.9%), Tashkent region 40.2 thousand (7.0%) and the Republic of Karakalpakstan 40.7 thousand (7.0%). Differences between regions arise from the number of schools, the age structure of the population and the number of students. In future research, therefore, the student–teacher ratio should be calculated separately by region, and professional development resources planned in line with that ratio.

Regulatory Basis and Qualification Categories

In regulatory-legal terms, the issue of pedagogical mastery was systematically advanced by Decree No. PF-5712 of 2019 and the concept annexed to it; the document also reflected the existing problems of the sector, including those in staffing. In particular, in July 2019 the Minister of Public Education stated that about 60 thousand teachers in the system did not have a higher education degree (Kun.uz, 2019). Compared with the 486.6 thousand teachers of the 2019/2020 academic year, this suggests a share of staff without higher education of about 12% (the author's approximate calculation; the sources refer to different dates, so the result should be taken as an order of magnitude rather than an exact indicator).

The concept also envisages a gradual increase in teachers' remuneration and material incentives and a strengthening of the profession's attractiveness (President of the Republic of Uzbekistan, 2019). In practice this is reflected in differentiated incentives through qualification categories and attestation. According to the Ministry of Preschool and School Education, in the first five months of 2026 more than 5,000 teachers were awarded qualification categories through a direct mechanism, without attestation examinations: 1,933 the highest category, 2,014 the first category and 1,216 the second category (Daryo, 2026). Among the total of 5,163 teachers, the highest category accounts for 37.4%, the first for 39.0% and the second for 23.6% (author's calculation). This distribution is shown in Figure 2.

Under the direct mechanism, qualification categories are granted without test procedures to teachers who meet criteria established in national regulations, and certificates for approved categories are issued through the teacher's personal online account (Daryo, 2026). Such digital formalisation may reduce the administrative burden, but the long-term effect of the mechanism on teachers' professional growth

has not yet been assessed in independent studies and requires separate empirical investigation.

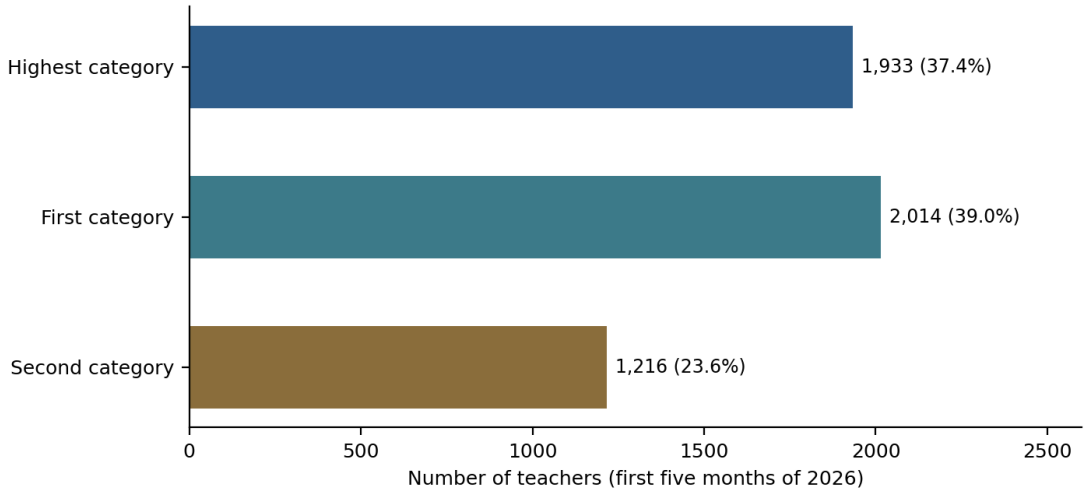


Figure 2. Qualification Categories Awarded Through the Direct Mechanism in the First Five Months of 2026, Persons (%).

Source: calculated by the author from Daryo (2026).

It should be noted that a qualification category signifies formal recognition of mastery but does not by itself guarantee its effectiveness in actual classroom practice. International experience shows that the link between formal certification and instructional quality is robust only when certification criteria cover practice itself (lesson observation, student achievement, portfolio, reflection). It would therefore be appropriate to enrich the categorisation system in the future with criteria that separately assess content knowledge, pedagogical content knowledge and digital-methodological competence.

International Empirical Evidence: What Develops Mastery?

One of the most influential syntheses of international evidence on developing pedagogical mastery was published by Darling-Hammond et al. (2017): analysing 35 methodologically rigorous studies that showed a positive link between teacher professional development, teaching practices and student outcomes, they identified seven common features of effective programmes. Desimone (2009) likewise identified five core features of effective professional development (content focus, active learning, coherence, duration and collective participation). Kennedy (2016) showed that what matters is not only the structural features of programmes but also which practical problem of the teacher they address, and proposed a critical reading of existing research. Table 4 summarises these features.

Table 4. Core Features of Effective Professional Development Programmes (According to A Synthesis of International Research)

No.	Feature	Content	Source
1	Content focus	The programme addresses the specific content of the subject and its teaching methodology	Darling-Hammond et al. (2017); Desimone (2009)
2	Active learning	Teachers analyse lesson materials, practise, and take the learner's role themselves	Darling-Hammond et al. (2017); Desimone (2009)
3	Collaboration	Teachers work in teams and share experience	Darling-Hammond et al. (2017); Desimone (2009)
4	Models of effective practice	Lesson exemplars, plans and video analyses are provided	Darling-Hammond et al. (2017)
5	Coaching and expert support	Working together with a mentor or expert teacher	Darling-Hammond et al. (2017)
6	Feedback and reflection	The teacher receives and analyses grounded feedback on own practice	Darling-Hammond et al. (2017); Hattie & Timperley (2007)
7	Sustained duration	The programme continues over an extended period and is not limited to a one-off event	Darling-Hammond et al. (2017); Desimone (2009)

Source: Darling-Hammond et al. (2017) and Desimone (2009).

According to the OECD (2019) TALIS 2018 study, the majority of teachers in OECD countries (on average 94%) participated in some form of professional development in the 12 months before the survey; among the areas in which teachers report the greatest need are the use of digital technologies in teaching and work with students with special needs. This indicates that it is not participation as such but the content and quality of professional development that is decisive. Because Uzbekistan did not take part in TALIS 2018, these indicators are used as a benchmark rather than for direct comparison.

Hattie and Timperley (2007) estimated the average effect size of feedback at 0.79, as noted above; in Hattie's (2009) synthesis, an effect size of 0.40 is used as a conventional threshold for evaluating "promising practice". These results should not be transferred mechanically; rather, they should be viewed as a tool through which Uzbek teachers can measure their own practice: a system for evaluating the effectiveness of pedagogical actions could be built on lesson observation, peer analysis and students' interim results. Moreover, the findings of Baumert et al. (2010) and Kunter et al. (2013) confirm that developing deep subject knowledge and pedagogical content knowledge together is a necessary condition of teacher mastery.

The UNESCO and International Task Force on Teachers (2024) report identifies several directions for strengthening the teaching profession: reimagining it as a

collaborative profession, lifelong professional development, professional autonomy and involving teachers in decision-making. The report estimates that about USD 120 billion per year would be needed to pay the salaries of the additional teachers. These views interpret mastery not only as a personal quality but as a systemic phenomenon linked to the organisational environment, governance and resources. For Uzbekistan this means that professional development should be designed not as an individual teacher's initiative but as a collective system at the school and regional level.

An Integrative Conceptual Model of Pedagogical Mastery

Synthesising the theoretical and statistical analyses above, the author proposes a five-component integrative model of pedagogical mastery (Figure 3). The model presents mastery as an interrelated system of knowledge, practical-technological, personal-value, communicative-reflective and digital-methodological components. The knowledge component covers subject content, PCK and TPACK elements (Shulman, 1986; Mishra & Koehler, 2006); the practical-technological component covers lesson design, selection of methods and assessment (Yo'ldoshev & Usmonov, 2004); the personal-value component covers humanistic orientation, motivation and self-efficacy (Slastenin et al., 2002; Bandura, 1997); and the communicative-reflective component covers pedagogical communication and analysis of experience (Kan-Kalik, 1987; Schön, 1983).

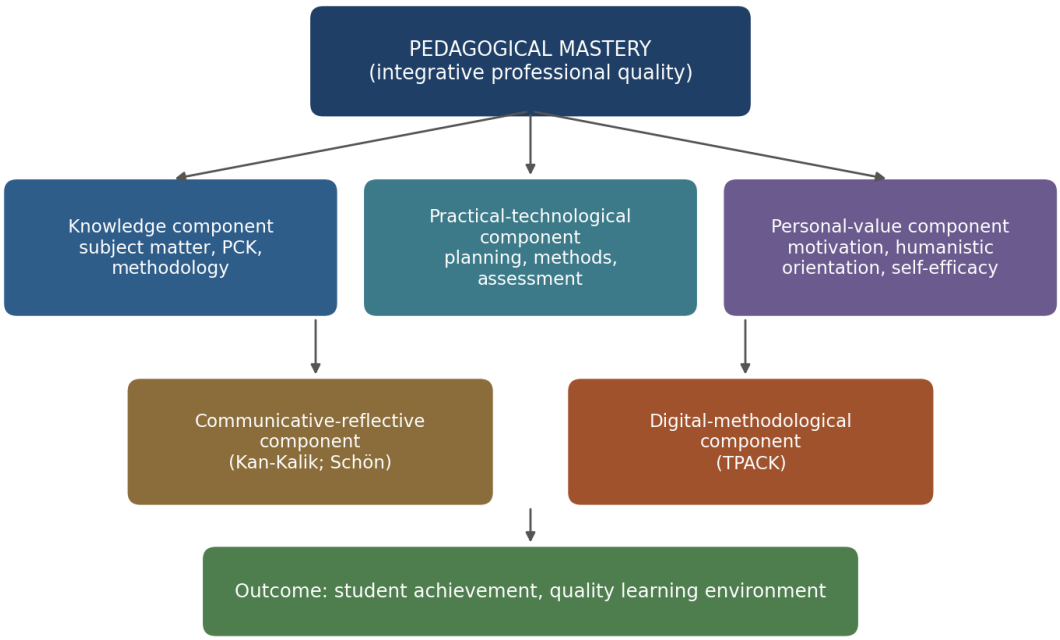


Figure 3. Integrative Conceptual Model of Pedagogical Mastery (Author's Synthesis).

Source: Shulman (1986); Slastenin et al. (2002); Kan-Kalik (1987); Schön (1983); Mishra and Koehler (2006); Yo'ldoshev and Usmonov (2004).

The core idea of the model is that the dominance of one component does not guarantee mastery: for example, high motivation does not compensate for a lack of pedagogical content knowledge, and knowing digital tools does not change the didactic logic of a lesson. The model has not been tested empirically and is therefore hypothetical; it is offered as a research framework that can be tested in the future through observation, surveys and quasi-experimental designs.

To link the model to observable indicators, approximate monitoring instruments are proposed for each component: standardised tests of subject knowledge and PCK for the knowledge component; lesson-observation rubrics for the practical-technological component; self-efficacy scales (Tschannen-Moran & Hoy, 2001) for the personal-value component; reflective portfolios and peer observation for the communicative-reflective component; and TPACK questionnaires for the digital-methodological component. Such indicators do not currently exist in official statistics, so they are offered for pilot monitoring and future research.

Discussion

The analysis reveals three important tensions. The first concerns the gap between quantity and quality. Since 2019/2020 the number of teachers has grown by 18.7% and the inflow of staff has stabilised, yet official statistics do not openly publish indicators that measure mastery (for example, lesson quality, level of pedagogical content knowledge or student growth). As a result, workforce capacity is assessed mainly by number, gender, region and category, while quality is judged only through indirect inferences. This is close to a problem noted in international reports: UNESCO (2024) requires teacher shortages to be considered together with qualifications, motivation and support, not only numbers.

The second tension lies between formal recognition and practical mastery. Qualification categories and certificates are a powerful mechanism for professional growth, but they may not fully express practical effectiveness. According to the analyses of Kennedy (2016) and Darling-Hammond et al. (2017), the effectiveness of professional development is associated with programme duration, content focus, practice models, coaching and reflection. It is therefore expected that if categorisation-oriented attestation were complemented by mentoring and lesson observation within the professional community, its effect on pedagogical mastery would be strengthened.

The third tension is between digital transformation and didactic foundations. As digital tools expand in schools, competences within the TPACK framework are becoming increasingly relevant (Mishra & Koehler, 2006). However, OECD (2019) data identify the need to use digital technologies in teaching as one of the areas most frequently emphasised by teachers; this suggests that access to technology and the ability to use it in a pedagogically grounded way are not the same thing. For Uzbekistan too, the important task is to develop digital literacy not merely as a

technical skill but as a component of mastery integrated with subject content and didactics.

Motivation and professional prestige are also an important condition for developing mastery. Kunter et al. (2013) included motivational characteristics in professional competence, and Bandura (1997) showed that self-efficacy helps teachers act consistently even in difficult situations. The fact that the concept for developing the public education system envisages a gradual increase in pay, material incentives and social protection (President of the Republic of Uzbekistan, 2019) creates a normative basis for strengthening the attractiveness of the profession. However, material incentives can contribute to growth in mastery only when combined with the substantive side of professional development.

The following practical and scholarly recommendations arise from the findings. First, it would be appropriate to define mastery criteria by components such as PCK, TPACK, reflection and communication, and to incorporate them into lesson-observation rubrics and the portfolio system. Second, professional development programmes should be aligned with the international features in Table 4 (content focus, active learning, mentoring, feedback, duration). Third, taking regional differences into account, methodological resources and digital platforms should be distributed in proportion to the concentration of staff. Fourth, it would be valuable for researchers if qualitative indicators of workforce capacity (the share of teachers with higher education, the level of participation in professional development, the composition of categories) were included in annual monitoring and published as open data.

Terminological compatibility is important when presenting local research to Scopus-indexed journals. Table 5 gives approximate equivalents, in international scholarly language, of the main concepts in Uzbek and Russian pedagogical literature. Such equivalents are not fully equivalent: for example, whereas "pedagogical mastery" in the Uzbek-Russian tradition denotes personal-professional integrity, "teacher expertise" is studied mainly through differences in knowledge and decision-making between experienced and novice teachers, so the context should be explained in translation.

Table 5. Approximate Equivalents of Pedagogical Concepts in International Scholarly Language.

Uzbek/Russian term	International equivalent	Note
Pedagogik mahorat (pedagogicheskoe masterstvo)	Teacher expertise; pedagogical mastery	Personal-professional integrity; in international literature linked to experience and knowledge structure

Kasbiy kompetentlik	Professional competence	Knowledge, skills and motivational characteristics (Kunter et al., 2013)
Pedagogik texnika	Instructional / classroom practices	Concrete classroom actions and methods
Pedagogik muloqot	Teacher–student interaction; classroom communication	Close to the concept of Kan-Kalik (1987)
Malaka oshirish	In-service training; professional development	Continuous professional development (Darling-Hammond et al., 2017)
Malaka toifasi	Teacher qualification category / career grade	Formal recognition specific to the national system
Pedagogik texnologiya	Instructional design; evidence-based teaching	Design and diagnosis of outcomes

These findings are also of practical importance for pedagogical higher education institutions: enriching bachelor's and master's programmes with modules that include PCK, TPACK, reflection and mentoring, and assessing graduates' practical mastery through lesson observation and portfolios, serves to link the knowledge and practical components of the model. Theoretically, the article builds a bridge between national and international terminology; practically, it provides an analytical basis that education governance bodies, methodological centres and pedagogical universities can use in designing professional development.

The limitations of the study also define the directions of future research. Because no empirical experiment was conducted in this article, the proposed model remains untested. In the future, longitudinal studies using quasi-experimental or mixed methods are needed to validate the model's components, together with analyses of the link between mastery and student outcomes across regions. Linking Uzbekistan's experience to international comparative studies such as TALIS would further expand the possibilities for interpreting national results to an international audience.

CONCLUSION

The article compared the concept of pedagogical mastery on the basis of Uzbek, Russian and international scholarly approaches and systematised official statistical indicators on the capacity of the teaching workforce in Uzbekistan's general secondary education. The analysis led to the following main conclusions. First, pedagogical mastery is not a one-dimensional concept: the Uzbek technological school foregrounds design and diagnostics, the Russian school the personal-professional

structure and communication, and international research the structure of knowledge, self-efficacy and reflection.

Second, official statistics confirm a considerable quantitative growth of workforce capacity: from 486.6 thousand in 2019/2020 to 577.7 thousand in 2025/2026 (+18.7%), a 72.5% share of women, a 4.6-fold regional difference, and qualification categories awarded to 5,163 teachers through the direct mechanism in the first five months of 2026. However, these indicators do not directly measure the quality level of mastery.

Third, international evidence shows that professional development programmes are effective when they are content-focused, sustained, collaborative and enriched with practice models, coaching and feedback. Fourth, the proposed five-component integrative model (knowledge, practical-technological, personal-value, communicative-reflective and digital-methodological) can serve as a conceptual basis for developing assessment criteria for mastery and for designing professional development. The effectiveness of the model should be tested in future empirical research.

Fifth, the study defines clear directions for future research: (a) developing and validating, in the local language, instruments that measure the components of the proposed model; (b) evaluating the effectiveness of professional development programmes using quasi-experimental or mixed methods; (c) analysing the student–teacher ratio by region and subject; and (d) linking Uzbekistan to international comparative studies such as TALIS so that national results can be interpreted in an international context. These directions serve to ensure that policy for the qualitative development of pedagogical mastery is evidence-based. In this way the article can serve as a theoretical-analytical foundation that brings national research on pedagogical mastery closer to international scholarly dialogue.

The study has the following limitations. First, it is based on documentary and official statistical sources, which mainly capture quantitative indicators and do not directly measure the quality of pedagogical mastery. Second, regional data were not normalised by the number of students, so regional comparisons are indicative only. Third, international findings come from other education systems and cannot be transferred directly to Uzbekistan, and the proposed five-component model has not been tested empirically. Accordingly, the follow-up actions based on these results are: (1) to develop and validate local-language instruments for each component of the model and pilot them in a sample of schools; (2) to supplement official statistics with lesson-observation, assessment and student-outcome data in order to measure mastery directly; (3) to normalise regional indicators by student numbers and subject; and (4) for education authorities and pedagogical universities to use the model to design and monitor professional development programmes, evaluating their effect with quasi-experimental or mixed-methods designs.

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