METHODOLOGY FOR DEVELOPING STUDENTS' PROFESSIONAL COMPETENCIES THROUGH THE DUAL EDUCATION SYSTEM IN TECHNICAL SCHOOLS

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Abstract
This article examines the methodology for developing students' professional competencies in technical schools through the dual education system. The dual education model integrates theoretical instruction, workplace practice, employer participation and competency-based assessment. The paper uses official statistical data on Uzbekistan's professional education system, the normative basis of dual education, a methodological cooperation model, assessment criteria and sample pilot monitoring results to substantiate the relevance and practical value of this approach.

Keywords: Technical school, dual education, professional competence, vocational education, workplace practice, employer, assessment criteria, modular teaching.

Introduction

The main task of the professional education system is to train specialists who meet labour-market requirements, adapt quickly to production processes and make independent decisions in practical activity. Technical schools are one of the central links in this process because they provide students with theoretical knowledge and must also develop the practical skills required in real working conditions.

The professional education network of Uzbekistan is undergoing structural renewal. According to official statistical data, at the beginning of the 2025/2026 academic year the number of technical schools reached 712. This figure increased by 440 compared with the 2024/2025 academic year, which reflects the optimization of professional education institutions and the expansion of a unified network of technical schools [1].

Improving education quality in technical schools cannot be limited to updating curricula and textbooks. It requires a clear mechanism of cooperation among teachers, students, enterprises and employers. Dual education is an effective form of such cooperation: theoretical preparation is carried out at the technical school, while practical training is organized at enterprises. As a result, students master not only professional knowledge but also workplace discipline, technological responsibility, safety culture and teamwork.

The purpose of this article is to develop a methodological model for forming students' professional competencies through the dual education system and to justify it using statistical and pedagogical indicators. The research tasks include analysing statistical trends in professional education, explaining the methodological essence of dual education, identifying stages of competency development, proposing assessment criteria based on teacher-employer cooperation and presenting a sample monitoring framework for technical school students.

1. Relevance of dual education in the professional education system

The organization of dual education in professional education is supported by normative legal documents. The Resolution of the Cabinet of Ministers No. 163 of March 29, 2021 defined the tasks, rights and obligations of professional education institutions, organizations and students in the dual education process [2]. This approach helps form the student not only as a learner of theory, but also as an active participant in real production activities.

The Presidential Decree No. PF-158 dated October 16, 2024 emphasizes the digitalization of professional education institutions, the provision of methodological materials and digital content, the modernization of laboratories and workshops, and the improvement of skills and competency assessment with the participation of employers [3]. These requirements demand that technical school teachers move from a purely explanatory lesson model toward practice-oriented, competency-based and cooperative teaching methods.

The advantage of dual education is that it connects professional knowledge with real production tasks. In construction, electrical engineering, geodesy, automotive services, information technology, agriculture and service fields, students do not merely learn the names and principles of tools and equipment. They also learn to use them at the workplace, perform technical assignments, comply with quality standards and evaluate the final result.

Table 1. Dynamics of technical schools, admission and students in Uzbekistan

Indicator	2021/22	2022/23	2023/24	2024/25	2025/26
Number of technical schools, units	215	207	237	272	712
Admission to technical schools, thousand persons	49.5	37.9	48.9	52.9	266.6
Students enrolled in technical schools, thousand persons	105.0	119.0	122.6	127.1	463.3

Source: National Statistics Committee of the Republic of Uzbekistan, press release dated 30.04.2026 [1].

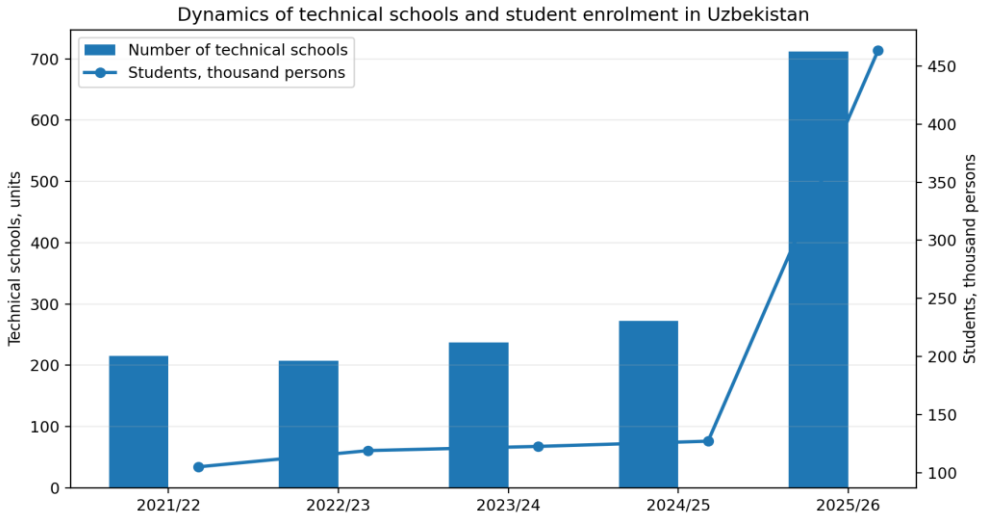

Figure 1. Dynamics of technical schools and student enrolment

Source: prepared by the authors based on the official statistical data in Table 1.

2. The concept and structure of professional competence

Professional competence is an integrated quality that includes knowledge, skills, practical abilities, work culture, compliance with safety rules, independent decision-making and responsible behaviour in production situations. In technical schools, competence should not be understood only as the ability to reproduce theoretical information. It must be measured by the student's ability to perform a professional task correctly, safely and effectively.

In dual education, professional competence develops gradually. At the first stage, the student receives basic theoretical knowledge and safety instructions. At the second stage, the student performs training exercises under teacher supervision. At the third stage, the student works in a real enterprise environment under mentor guidance. At the fourth stage, learning outcomes are assessed jointly by the teacher and the workplace mentor.

The methodological content of dual education can be described as a system of coordinated actions. The technical school prepares theoretical and methodological foundations, the enterprise provides real practice, the teacher organizes learning and evaluation, the mentor guides the student at the workplace, and the employer defines the professional requirements expected from graduates.

Table 2. Main components of professional competence in technical school students

Competence component	Content	Recommended assessment method
Theoretical knowledge	Understanding concepts, processes, equipment and safety rules	Test, oral questioning, written task
Practical skill	Ability to perform professional operations in laboratory and workplace conditions	Practical assignment, observation checklist
Problem solving	Selection of an appropriate solution in non-standard production situations	Case task, situational analysis
Production discipline	Compliance with time, safety and quality requirements	Mentor observation and practice diary
Communication and teamwork	Cooperation with group members, mentor and employer representatives	Portfolio and peer/mentor feedback

Source: developed by the authors as a methodological classification.

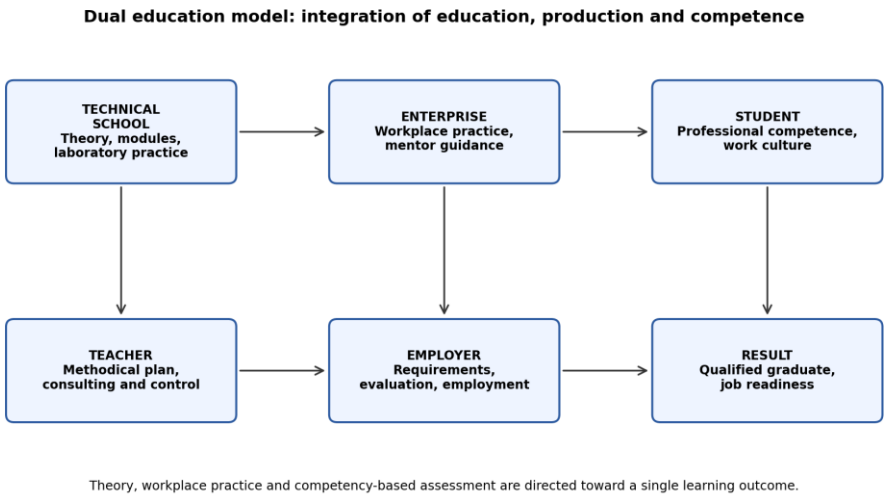

Figure 2. Methodological model of dual education in technical schools

3. Methodological model of competency formation

The proposed model is based on the principle of integration between education and production. Each professional module must have a clearly defined competency result. This result is then linked with theoretical lessons, laboratory work, workplace practice and final assessment. The model prevents the separation of theory from practice and helps students understand why each topic is necessary for their future profession.

At the planning stage, the teacher and enterprise representative agree on the professional operation to be mastered, the required tools and equipment, the safety requirements, the expected result and the assessment criteria. At the teaching stage, the teacher explains the theoretical basis and demonstrates the initial practical algorithm. At the practice stage, the student performs the task in a real or simulated workplace. At the assessment stage, the teacher and mentor evaluate the result using common indicators.

The effectiveness of the model depends on the quality of communication between the technical school and enterprise. Practice assignments should not be formal. They must correspond to real technological processes, contain measurable outcomes and be recorded in the student's portfolio. Such a portfolio can include photographs of work stages, completed forms, mentor comments, safety checklists and self-reflection notes.

Table 3. Teacher-employer cooperation mechanism in dual education

Stage	Teacher activity	Employer / mentor activity	Expected result
Planning	Develops module objectives, theoretical content and assessment criteria	Defines workplace tasks and equipment requirements	Module and practice plan are coordinated
Teaching	Organizes theoretical instruction, safety briefing and initial practical exercises	Demonstrates real work process and standards	Student understands the technological process
Practice	Monitors practice diary and learning progress	Supervises student activity at the workplace	Practical skill is strengthened
Assessment	Analyses tests, portfolio and final criteria	Evaluates work quality and discipline	Integrated competence assessment is formed

4. Statistical analysis and regional context

Statistical data show that the role of technical schools in professional education is increasing rapidly. At the beginning of the 2025/2026 academic year, 266.6 thousand students were admitted to technical schools. This is 213.7 thousand more than in the 2024/2025 academic year [1]. Therefore, the methodological preparation of teachers, their ability to cooperate with enterprises and their culture of competency-based assessment directly influence the quality of professional education.

Fergana region is particularly important in the territorial analysis. At the beginning of the 2025/2026 academic year, 66 technical schools were recorded in Fergana region, with 34.1 thousand admitted

students and 59.6 thousand students enrolled [1]. According to national statistical data, Fergana is among the leading regions in terms of the number of students studying in technical schools.

Table 4. Technical schools and students in selected regions at the beginning of 2025/2026

Region	Technical schools, units	Admission, thousand persons	Students, thousand persons
Fergana	66	34.1	59.6
Samarkand	70	26.8	52.4
Kashkadarya	71	29.7	49.0
Andijan	69	26.4	46.0
Namangan	53	23.3	38.6
Tashkent region	57	18.7	32.4

Source: prepared based on the press release of the National Statistics Committee [1].

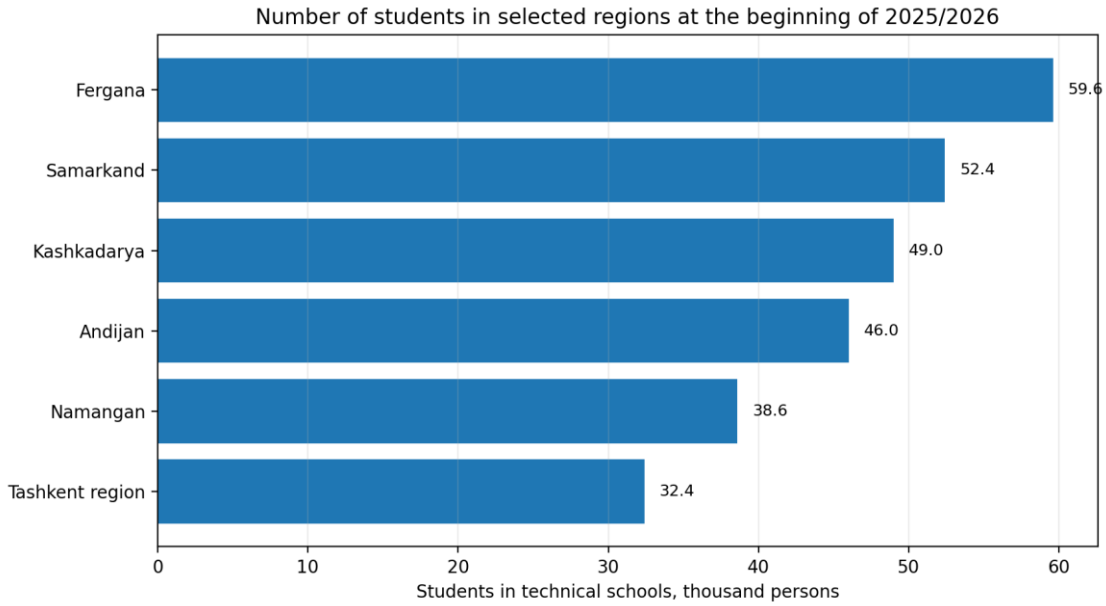

Figure 3. Comparative diagram of students in technical schools by selected regions

5. Assessment of professional competencies in dual education

Competency-based assessment should not be limited to a final examination. In professional training, it is essential to know how the student acts in real working conditions, whether he or she follows safety requirements, completes tasks on time and takes responsibility for quality. Therefore, assessment in dual education should be multi-source: teacher assessment, mentor assessment, student portfolio, practical assignment result and employer feedback.

A four-level system can be used to evaluate competency: low, satisfactory, good and high. A low level indicates serious gaps in theoretical knowledge and practical skills. A satisfactory level means that the student can perform basic operations with assistance. At a good level, the student completes tasks independently but may need consultation in complex situations. At a high level, the student organizes the work process independently, analyses mistakes and achieves a result that meets production requirements.

The following table provides a sample monitoring result that can be used when testing the proposed methodology. It is not official statistics; it is a methodological example that can be replaced by real survey and assessment results obtained at a specific technical school.

Table 5. Sample monitoring results for professional competencies after applying dual education elements

Competence indicator	Initial state, %	After dual education elements, %	Growth, percentage points
Theoretical knowledge	58	76	+18
Practical skills	52	79	+27
Problem solving	49	72	+23
Production discipline	55	81	+26
Teamwork	57	78	+21
Average indicator	54.2	77.2	+23.0

Note: the table is a methodological sample and may be replaced with actual pilot results from a specific technical school.

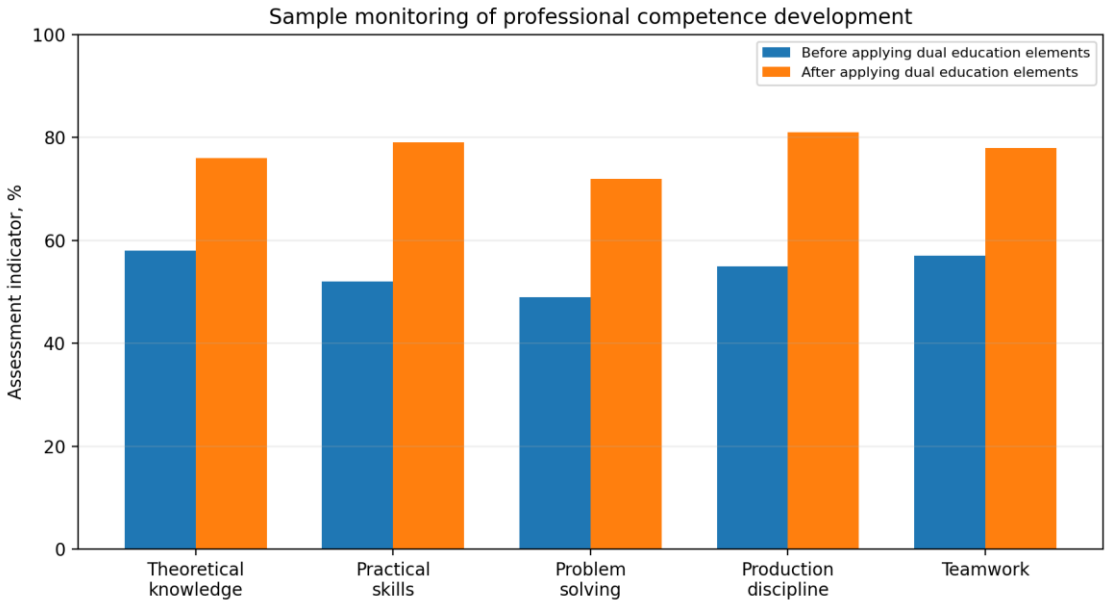

Figure 4. Sample monitoring diagram of professional competence development

6. Discussion

The analysis shows that the increasing number of students in technical schools requires renewal of teaching methodology. If a teacher limits the lesson to theoretical explanation, note-taking and simple testing, students may not be ready for the situations they will face at the workplace. Dual education introduces students to production discipline, quality control, professional responsibility and labour relations at an early stage.

Three problems often occur when dual education is organized. The first is insufficient coordination of practice content between the technical school and enterprise. The second is the use of general and vague assessment criteria. The third is the lack of regular information exchange between the workplace

mentor and the technical school teacher. To address these problems, a 'competency passport' should be developed for each practice module.

A competency passport should include the module name, practical operation to be performed, required tools and equipment, safety requirements, evaluation criteria, mentor signature, teacher conclusion and evidence for the student's portfolio. Such a passport makes assessment transparent, strengthens cooperation between teacher and employer and documents the graduate's professional readiness.

International practice also supports the modernization of technical and vocational education through stronger links with the labour market. UNESCO-supported TVET projects emphasize dual education, employer participation and the renewal of training content as important directions for professional education development [4]. Thus, the development of dual education in technical schools corresponds not only to national priorities but also to international experience.

Conclusion and recommendations

Developing students' professional competencies through the dual education system is an important condition for improving the quality of professional education in technical schools. Official statistical data show that the number of technical schools and the student contingent have grown significantly. This situation requires teachers to use practice-oriented, competency-based and employer-connected methodologies.

In the proposed model, the technical school, enterprise, teacher, mentor and student are considered as participants in a single educational process. Each module is connected with a final professional competence, practical assignments are brought closer to real workplace conditions, and assessment is conducted with the participation of both teacher and employer.

The following practical recommendations can be offered: develop a competency passport for each professional module; agree on practice assignments with enterprises in advance; introduce student portfolios; include mentor assessment in final evaluation; monitor the dual education process through a digital tracking table; assess students' professional competencies at least twice, at the initial and final stages.

Thus, dual education develops not only practical skills but also professional responsibility, work culture, communication, teamwork and independent decision-making. These qualities increase the competitiveness of technical school graduates in the labour market and help align professional education with the needs of employers.

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