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System of Digital Didactic Tools for Developing the Professional Competence of Future Primary School Teachers in A Dual Education Environment

Umurov Zarif Latifboyevich

Professor, Bukhara State Pedagogical Institute, Doctor of Philosophy (PhD) in Pedagogical Sciences, Uzbekistan

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Abstract: The article analyzes the didactic foundations for effectively organizing the process of developing the professional competence of future primary school teachers in the context of dual education. The study highlights the role of digital didactic tools in the educational process and their significance in ensuring the integration of theory and practice. In addition, the mechanism of symmetric cooperation between higher education institutions, general secondary schools, and practice supervisors within the dual education system organized on the basis of the "4+2" model is substantiated, as well as its pedagogical effectiveness. The article also describes the criteria and levels for assessing the professional competence of future teachers through such tools as electronic portfolios, reflective diaries, observation sheets, and monitoring instruments. The results of the research show that the use of digital didactic tools in dual education conditions contributes to improving the effectiveness of the educational process, ensuring the integration of theory and practice, and enhancing the monitoring system based on a competency-based approach.

Keywords: Dual education, professional competence, primary education, digital didactic tools, electronic portfolio, reflective diary, monitoring, "4+2" model.

Introduction: Today, the modernization of the education system, improvement of the quality of teacher training, and strengthening the connection between education and practice are among the most urgent issues. In particular, the development of the professional competence of teachers working in the primary education system is considered one of the key tasks of pedagogical education. In the modern educational process, it is important to ensure the harmony between theory and practice in the preparation of future teachers, strengthen their readiness for real pedagogical activity, and develop their professional skills.

In recent years, a new model of training future teachers has been emerging through the introduction of the dual education system in higher pedagogical education. The dual education system serves to integrate students' theoretical knowledge with practical pedagogical activities and enables the development of their professional competence in a real educational environment. The essence of this system lies in organizing the student's learning process simultaneously in two environments: theoretical preparation at a higher education institution and practical activity at a general education school.

In the education system of the Republic of Uzbekistan, a number of normative legal documents have been adopted to develop dual education and improve the quality of teacher training. Within this framework, the organization of the educational process based on the "4+2" model has been defined as an important task. This model integrates weekly theoretical classes with practical activities at schools and creates opportunities for the gradual development of professional

competence. Under such conditions, the need to effectively organize the educational process, systematically monitor the outcomes of practical training, and ensure a close connection between theory and practice is increasing.

In this regard, the use of digital didactic tools plays an important role in developing the professional competence of future primary school teachers within a dual education environment. Digital educational resources, electronic portfolios, reflective journals, monitoring systems, and learning management platforms provide opportunities to systematically observe students' professional development, document their practical activities, and evaluate their results. Consequently, this contributes to increasing the effectiveness of the educational process, forming professional competencies, and organizing education on the basis of modern pedagogical technologies.

This article analyzes the didactic foundations of developing the professional competence of future primary school teachers in a dual education environment, the role of digital didactic tools in the educational process, and the pedagogical significance of a monitoring and assessment system organized on the basis of cooperation between the higher education institution, school, and practice supervisor.

METHOD

The effective organization of the process of developing the professional competence of future primary school teachers in a dual education environment is directly related to the digitalization of the educational process, the electronicization of educational resources, and the implementation of monitoring systems based on modern technologies. In contemporary pedagogical education, digital tools serve not only as a convenient means of delivering educational content, but also as a didactic mechanism for developing professional competence, strengthening practical skills, conducting reflection, and systematically organizing diagnostic and assessment processes. Therefore, improving the system of didactic tools in dual education based on digital capabilities contributes to increasing the quality indicators of future teacher training.

The distinctive feature of dual education is that a future primary school teacher carries out the learning process simultaneously in two environments: theoretical and methodological training at the higher education institution and real pedagogical practice at a general education school. When this process is implemented on the basis of the "4+2" mechanism, the need for continuous information exchange, documentation, monitoring, and systematic reflection between educational stages becomes even more significant [1].

Thus, digital didactic tools are considered an important functional instrument that ensures the integration of theory and practice in dual education.

Here is the table in English presenting the didactic functions of digital didactic tools in a dual education environment.

Didactic Functions of Digital Didactic Tools in a Dual Education Environment

No.	Didactic Function	Description	Implementation Tools
1	Information-educational function	Ensures the systematic acquisition of theoretical knowledge by providing structured educational materials in digital form.	Theoretical materials, methodological guidelines, presentations, video lessons, electronic textbooks, LMS platforms
2	Activity-practical function	Develops students' professional skills through practice-oriented activities and interactive tasks that simulate real pedagogical situations.	Bank of practical assignments, interactive exercises, methodological developments, simulations, virtual laboratories
3	Reflective function	Promotes students' self-analysis, self-assessment, and professional	Reflective journals, electronic portfolios, lesson

		development through reflection on their learning and teaching practice.	analysis forms, self-assessment questionnaires
4	Monitoring and diagnostic function	Determines the level of competence formation and learning outcomes through systematic assessment and diagnostic tools.	Observation sheets, tests, evaluation criteria, rubrics, assessment tables
5	Integrative function	Provides systematic coordination of cooperation between the higher education institution, school, and practice supervisor, ensuring the integration of theory and practice.	Digital collaboration platforms, shared databases, practice monitoring systems, electronic reports

These functions demonstrate that digital tools in dual education are not merely additional resources, but rather a didactic mechanism that ensures the development of professional competence.

In a dual education environment, the system of digital didactic tools used to develop the professional competence of future primary school teachers is manifested in the following main directions:

1) Electronic resources and multimedia materials. Electronic resources (PDF materials, electronic textbooks, methodological manuals, presentations, infographics, video lessons, and animations) play a significant role in strengthening the theoretical and methodological preparation of future teachers. In particular, since the principles of visualization, systematicity, and consistency are essential in primary education methodology, multimedia materials increase the effectiveness of the educational process. These resources also help connect theoretical classes at higher education institutions with school practice, allowing students to directly apply the methodological knowledge they have learned during real classroom teaching.

2) Digital platforms and Learning Management Systems (LMS). In modern education, the use of Learning Management Systems (LMS) plays a particularly important role in a dual education environment. Through LMS platforms, learning materials are uploaded, assignments are distributed, student activities are monitored, assessment results are recorded, and overall monitoring is conducted. This accelerates the exchange of information within the "higher education institution – school – practice supervisor" collaboration and enables the systematic management of practical training processes.

Platforms such as the "Dual Education Management System" further expand the opportunities to organize planning, monitoring, and management mechanisms of dual education in a digital environment. Such information systems have practical significance in improving the organizational and didactic effectiveness of dual education and help ensure the implementation of monitoring and management requirements established in regulatory documents.

3) Electronic portfolio (e-portfolio). In a dual education environment, one of the most effective tools for assessing and monitoring the development of the professional competence of future primary school teachers is the electronic portfolio. The portfolio enables the systematic documentation of students' pedagogical activities, accumulation of methodological experiences, storage of lesson plans, recording of reflective analyses, and evaluation by practice supervisors.

An electronic portfolio usually includes the following materials: lesson plans (lesson outlines and technological maps); results of work with students (assignments and analyses); observation sheets and assessment results; plans for educational and extracurricular activities; recommendations and

conclusions of the practice supervisor; reflective journal entries.

This tool has important didactic value in monitoring the dynamics of professional development, determining the level of competence formation, and defining the student's individual professional development trajectory.

4) Observation sheets and monitoring documents. In a dual education environment, the monitoring of students' practical activities should be organized systematically. For this purpose, observation sheets, assessment tables, diagnostic cards, and evaluation rubrics are widely used. Observation sheets help practice supervisors analyze students' abilities in lesson delivery, classroom management, methodological approaches, communicative interaction, and reflection. The advantage of these tools is that they shift the dual education process from subjective evaluation to criteria-based assessment, thereby ensuring scientifically grounded monitoring of competence development.

5) Reflective journal. A reflective journal is an important tool for developing the reflective competence of future primary school teachers. In the journal, students record the lessons they conducted, the challenges encountered, strengths and weaknesses in their activities, conclusions based on the recommendations of the practice supervisor, and plans for further improvement. A digital journal systematizes this process, strengthens communication with the practice supervisor, and enables continuous reflection. Foreign studies also emphasize the importance of reflection and monitoring mechanisms in ensuring the effectiveness of dual education [4].

The use of digital didactic tools in a dual education environment ensures the following outcomes in the development of the professional competence of future primary school teachers: a continuous connection between theoretical and practical training is established; the educational process becomes individualized and a learner-centered approach is strengthened; the results of practical training are documented and opportunities for analysis increase; a monitoring system based on assessment criteria is formed; mechanisms for professional feedback are systematized under the guidance of practice supervisors; the didactic effectiveness of the educational process increases through digital management tools.

The process of developing the professional competence of future primary school teachers in a dual education environment is directly related not only to the integration of educational content and the use of modern forms and methods, but also to the systematic organization of cooperation among all subjects of the educational process. In this context, the cooperation model formed between the higher education institution, general education school, and practice supervisor acts as a key mechanism in the organization of dual education. The essence of dual education lies in ensuring the integration of theory and practice, developing professional competence through real pedagogical activity, and scientifically and methodologically evaluating and improving the outcomes of practice. These tasks can be fully implemented only when effective cooperation among the higher education institution, school, and practice supervisor is established.

Cooperation in dual education is not merely a simple partnership; rather, it is a systematic collaboration organized on the basis of didactic goals, integration, and symmetric functions. The concept of "symmetric cooperation" indicates that the roles of the higher education institution, the school, and the practice supervisor are equally important in this process, and each of them performs specific didactic tasks aimed at developing professional competence. Within this approach, the effectiveness of the educational process depends not on the activity of a single participant but on the harmonious collaboration of all subjects involved.

In Uzbekistan, the widespread introduction of dual education in pedagogical higher education institutions and the organization of the educational process according to the "4+2" model further increases the relevance of the role of practice supervisors and the cooperation model. The "4+2" mechanism forms the didactic basis of dual education, where a student's academic week is organized in parallel between theoretical and methodological classes at the higher education institution and practical activities at school [1]. For such a system to function effectively, cooperation between the higher education institution,

school, and practice supervisor must ensure the integrated implementation of planning, coordination, monitoring, and assessment processes.

In a dual education environment, the higher education institution participates in the process of developing the professional competence of future primary school teachers as a didactic leader, determining methodological and theoretical foundations and guiding the formation of competence-based learning outcomes. The main functions of higher education institutions within this collaborative framework include: providing a scientific basis and integrating the content of professional competence development in a dual education environment; designing educational activities based on competence-oriented forms, methods, and tools; ensuring the methodological preparation of students for pedagogical practice; developing assessment criteria and monitoring mechanisms; ensuring the continuity of the educational process through cooperation with schools and practice supervisors.

Therefore, the higher education institution creates the theoretical and methodological foundation of dual education and performs the function of scientifically substantiating and guiding practical activities carried out in schools.

In a dual education environment, the general education school serves as the real pedagogical activity field for a future primary school teacher. In other words, the school acts as the main practice base in dual education and performs the function of a natural pedagogical environment for developing the student's professional competence. The didactic functions of the school within this cooperation are manifested in the following aspects: providing opportunities for students to observe and analyze the teaching process in a real classroom environment; organizing students' practical activities such as teaching lessons, classroom management, and conducting educational activities; creating conditions for studying the age and individual characteristics of pupils within the practical process; enabling the development of students' pedagogical communication and communicative competence; ensuring an environment for cooperation and exchange of experience through the school's methodological community.

At the same time, the requirements specified in normative documents related to the organization of teaching practice (planning practical activities, conducting monitoring, and documenting results) also define the school's responsibility within this collaborative framework.

The practice supervisor is an important subject in the dual education process, providing practical guidance, methodological support, observation, and evaluation in the development of the future teacher's professional competence. The mentorship institution (practice supervision) is one of the key mechanisms ensuring the effective functioning of dual education. The didactic functions of the practice supervisor are manifested in the following: observing the student's practical activities (teaching, educational work, classroom management); organizing lesson analysis and reflective discussions; providing methodological recommendations and assisting in correcting professional mistakes; conducting evaluation and monitoring based on competence criteria; determining an individual professional development trajectory for the student.

The strength of the practice supervisor lies in the fact that they improve the student's practical activities not merely as an experience, but through didactic supervision and methodological guidance. International experience also shows that mentorship and practice supervision play a crucial role in ensuring the effectiveness of dual education [5].

In a dual education environment, the mechanism of symmetric cooperation is implemented through the following didactic stages:

1. Planning stage – the higher education institution, school, and practice supervisor agree on the practice program, integration of topics, and assessment criteria;

2. Organization stage – the student's activities based on the "4+2" model, including lesson observations, micro-teaching, and independent work, are organized;

3. Methodological guidance stage – the practice supervisor guides the student's lesson process, provides professional feedback, and organizes methodological analysis;

4. Monitoring stage – competence development is assessed through observation sheets, electronic portfolios, reflective journals, and evaluation tables;

5. Result analysis stage – the results obtained are discussed jointly by the higher education institution and the school, and measures for further improvement are determined.

These stages ensure the systematic functioning of the dual education process, the continuity of the integration of theory and practice, and the effectiveness of competence development.

The symmetric cooperation of the higher education institution – school – practice supervisor in a dual education environment contributes to the development of the professional competence of future primary school teachers in the following directions: continuous application of theoretical knowledge in practice is strengthened; methodological skills are reinforced in a real classroom environment; experience in pedagogical communication and teamwork is developed; mechanisms of reflection and professional growth are systematically established; and the dynamics of competence development are identified through monitoring and criteria-based assessment.

Thus, in a dual education environment, the mentorship and symmetric cooperation model serves as an important didactic mechanism for developing the professional competence of future primary school teachers. It enables the organization of the educational process as an integrated system, the effective implementation of the "4+2" mechanism with a results-oriented approach, the formation of professional competencies within a real pedagogical environment, and the establishment of reflective monitoring processes.

The effective management of the process of developing the professional competence of future primary school teachers in a dual education environment is primarily associated with creating a scientifically grounded system for diagnosing, assessing, and monitoring the results of this process. Competence is a dynamic pedagogical phenomenon, manifested through the gradual development of professional knowledge, skills, abilities, motivation, communicative culture, and reflective capacities of future teachers. Therefore, in a dual education environment, the development of professional competence is determined not only by the integration of educational content but also by the management of the process through a criteria-based system of assessment and monitoring. In this context, the system of assessment and monitoring in dual education should be developed on the basis of a competence-based approach and oriented toward real pedagogical activity.

The main objective of the assessment and monitoring system for the professional competence of future primary school teachers in a dual education environment is to determine the dynamics of students' professional development, evaluate the level of formation of competence components, and make scientific and methodological decisions aimed at improving the educational process. Within this framework, the monitoring system performs the following tasks: identifying and analyzing the stages of competence development; evaluating the correspondence between learning outcomes and practical skills; identifying problematic aspects of student activities and determining mechanisms for improvement; systematically organizing professional feedback and reflective processes under the guidance of practice supervisors; determining the didactic effectiveness of professional competence development.

From this perspective, the assessment and monitoring system acts as an important management mechanism within the didactic support of dual education.

In a dual education environment, the system of criteria used to assess the professional competence of future primary school teachers is based on the component structure of competence. Within the framework of the research, the following criteria have been identified for evaluating professional competence:

1) Motivational–value criterion. This criterion reflects the future teacher's positive attitude toward professional activity, the level of awareness of professional values, and motivation for adapting to the teaching profession. Its indicators include: the presence of professional goals and aspirations; pedagogical responsibility and commitment to the profession; active participation in practical training; aspiration for professional growth.

2) Cognitive criterion. The cognitive criterion reflects the level of professional and pedagogical knowledge of the future teacher, mastery of primary education methodology, and readiness to apply theoretical

knowledge in practice. Its indicators include: knowledge of the fundamentals of pedagogy and didactics; theoretical knowledge of primary education methodology; knowledge related to lesson design and planning; understanding of assessment criteria.

3) Activity–practical criterion. This criterion reflects the student's practical skills and abilities in performing real pedagogical tasks such as teaching lessons, managing the classroom, and organizing the educational process. Its indicators include: developing and conducting lesson plans; selecting and applying appropriate teaching methods; classroom management and time distribution; use of didactic materials; planning educational and extracurricular activities.

4) Communicative criterion. The communicative criterion determines the future teacher's ability to effectively communicate with students, parents, practice supervisors, and the pedagogical team. Its indicators include: culture of pedagogical communication; methods of influencing students' personal development; cooperation and teamwork skills; educational communication and conflict resolution.

5) Reflective criterion. The reflective criterion reflects the student's ability to evaluate and analyze their own pedagogical activity and draw conclusions aimed at improvement. Its indicators include: post-lesson analysis and self-assessment; maintaining a reflective journal; identifying and correcting methodological mistakes; developing a professional growth plan. Thus, the system of criteria enables a comprehensive assessment of the professional competence of future primary school teachers and serves as a methodological basis for monitoring the effectiveness of the dual education process.

In a dual education environment, the monitoring of the professional competence of future primary school teachers involves determining the levels of competence development. The characteristics of these levels are described as follows:

- Low level – the student does not sufficiently understand theoretical knowledge, shows low activity in practical tasks, experiences difficulties in making methodological decisions, and lacks developed reflection and analytical skills.

- Intermediate level – the student has acquired theoretical knowledge and possesses some practical skills; however, assistance from the practice supervisor is required in organizing lessons, and elements of reflective analysis are present.

- High level – the student independently applies theoretical knowledge, effectively organizes the teaching process, quickly finds methodological solutions in professional situations, and demonstrates well-developed reflection and self-assessment skills.

The system of levels makes it possible to clearly classify monitoring results and to improve the educational process through differentiated approaches.

In a dual education environment, various didactic tools are systematically used to assess and monitor professional competence. These include: diagnostic tests (for the cognitive criterion); questionnaires and interviews (for the motivational and reflective criteria); observation sheets (for practical activity and communicative criteria); portfolios (for documenting competence outcomes); reflective journals (for reflective analysis and professional development); assessment criteria and evaluation tables (for monitoring and general evaluation).

In particular, the implementation of observation sheets and reflective analysis based on practice supervision increases the effectiveness of monitoring in dual education. The practice supervisor evaluates the student's real pedagogical activity during practice and provides conclusions based on competence criteria. This process also corresponds to the monitoring and control requirements established in normative documents regulating the organization of dual education [3].

The scientifically grounded implementation of the assessment and monitoring system in a dual education environment ensures the following didactic outcomes: the real state of professional competence development is identified; the strengths and weaknesses of the educational process are analyzed; methodological measures are determined to address problems arising in practice; control and coordination are strengthened through cooperation among the higher education institution, school, and practice supervisor; a foundation is created for the mathematical and statistical processing of results obtained in experimental studies.

Thus, the system for assessing and monitoring the professional competence of future primary school teachers in a dual education environment is organized on the basis of competence-based criteria and levels, and it serves as an important didactic mechanism for improving the effectiveness of the educational process, managing the development of professional competence, and scientifically substantiating experimental research results.

CONCLUSION

The results of the study show that the process of developing the professional competence of future primary school teachers in a dual education environment becomes more effective when it is organized on the basis of the integration of theory and practice. The dual education model provides students with opportunities to study pedagogical activity in a real educational environment, integrate theoretical knowledge with practical experience, and gradually develop professional skills.

The research findings also indicate that the use of digital didactic tools plays an important role in improving the didactic effectiveness of dual education. Electronic resources, educational platforms, electronic portfolios, reflective journals, and monitoring tools expand the opportunities for systematically observing the professional development of future teachers, documenting the results of practical activities, and evaluating their performance. This contributes to the scientific management and analysis of the process of developing students' professional competence.

Furthermore, the system of symmetric cooperation between higher education institutions, general education schools, and practice supervisors is an important factor in the formation of professional competence among future primary school teachers in a dual education environment. This cooperation model ensures close collaboration in the stages of planning, organization, methodological guidance, monitoring, and analysis of results within the educational process.

As a result, the integrated approach based on digital didactic tools, a monitoring system, and cooperation between higher education institutions, schools, and practice supervisors contributes to the effective development of the professional competence of future primary school teachers in a dual education environment. This approach has significant didactic importance in improving the quality of pedagogical education, ensuring the integration of theory and practice, and enhancing the educational process based on modern pedagogical technologies.

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