

Integrating Technology, Empowering Teachers: A Roadmap to Continuous Professional Advancement

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Abstract: This study investigates the impact of digital transformation on a teacher's professional self-development in the educational environment. The objective is to examine how the potential for professional development in the digitally integrated educational environment influences teacher self-development. The study involved forty-three teachers from Uzbekistan, and research methods included surveys and correlation analysis. The results show that 85.6% of a teacher's self-development depends on the professional-developing potential of the digitally integrated educational environment, which includes microenvironments, meso-environments, and macroenvironments. Factors such as accessibility, openness, availability of resources, and interactivity play crucial roles in a teacher's self-development. The study concludes that the digital integrated educational environment has significant potential for enhancing professional and pedagogical self-development.

1. INTRODUCTION

The digital transformation has fundamentally altered educational systems, redirecting the primary vectors of development and self-improvement for teachers within the context of integrating environmental resources that define the effectiveness of their activities. The contours and focal points of a self-developing teacher are shifting towards continuous professional development, aimed at acquiring digital competencies and fostering adaptability in the evolving conditions of the digital integrative educational environment. These priorities in teacher self-development have gained international recognition within the professional-educational community and are enshrined at the regulatory level in guidelines for the social and pedagogical support of teachers, developed and implemented until 2030. This document gives primary attention to issues related to the replenishment of teaching personnel, their career prospects, and development and self-improvement in alignment with professional standards [1].

Like many other nations, Uzbekistan acknowledges the urgent need for digitalization

across various economic and educational sectors. To expedite progress in the digital industry, enhance national economic competitiveness, and achieve the objectives outlined in the State Program for the implementation of the Action Strategy in the Republic of Uzbekistan's five priority areas of development for 2017-2021, particularly during the "Year of Science, Education, and Digital Economy Development," the "Digital Uzbekistan - 2030" strategy was officially endorsed. Uzbekistan aims to join the ranks of developed nations by implementing rapid reforms centered around science, education, and innovation. A key focus is placed on educating a new generation of personnel with strategic vision, extensive knowledge, and high qualifications who will drive the reform initiatives. Consequently, comprehensive educational reforms are underway at all levels, from preschool to higher education, to support this objective.

The analytical report "Trends in the Development of Higher Education Worldwide and in Russia" states that modern education is undergoing the integration of digital educational environments into a unified system, significantly influencing the professional self-development of teachers. Such an integrative

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digital educational environment is characterized primarily by the constant updating of telecommunications tools and information and communication technologies, which significantly influence the pace and specifics of self-development for educators at all levels of education [2].

2. LITERATURE REVIEW

Researchers have discovered that the majority of participants in the educational process hold a positive and motivated attitude towards the use of digital products in education [8]. Furthermore, information and communication competence is included in the list of meta-subject outcomes for graduates of general educational institutions [9]. It is evident and axiomatic that a teacher cannot effectively teach something if they themselves lack the relevant knowledge, skills, and competencies. Therefore, the education system needs to enhance the digital competence of self-developing teachers, addressing this requirement at all levels, from regulatory foundations to technological implementation [10].

According to H. Morgan, a crucial aspect of digital transformation in education is the development of digital literacy among teachers and their information capabilities to facilitate successful interaction in the educational process [11]. Digital literacy, broadly defined, refers to a system of skills and abilities enabling effective work with media resources and their processing [12]. A. Emejulu and C. McGregor define digital literacy as the confident use of information and communication technologies necessary for successful learning and career development in various life spheres [13]. Creating a profile of a teacher's digital competence ensures a coherent correlation between their professional self-development and the effectiveness of their pedagogical activities [14].

Several new scientific works by researchers delve into the factors and conditions of professional development and self-development of teachers in the context of educational digitization. For instance, A.I. Klieba and colleagues assert that in the modern digital educational environment, teachers need to systematically adjust their level of professional skills and address areas of the "unknown" [15]. In the study by R. Sancar, D. Atal, and D. Deryakulu, emphasis is placed on the self-development of teachers throughout their professional careers under the influence of current changes and reforms in the field of education [16]. T.M. Gunn and colleagues' article indicates that mentoring and external socio-

pedagogical support play a significant role in the professional self-development of teachers [17]. A self-developing teacher should prioritize the formation of key and digital competencies to ensure their own success [18]. Professional self-development should be accompanied by changes in the job functions of teachers due to the digitization of the educational process [19].

The research of these authors also addresses the risks of educational digitization and proposes new models for educational development. A.V. Noskova and colleagues argue that an ambiguous attitude toward educational system transformation can be a barrier to teachers' own development and innovative activities [20]. The digitization of education itself can pose psychological risks for teachers and their self-development process [21], and the strategy of digital transformation in educational systems has significant shortcomings, such as inadequate development of information infrastructure and a lack of quality digital resources and content [22]. In light of these issues, progressive educational models for future digital transformation are justified based on values and meanings, taking into account current trends, and the school of the future is associated with the development of active agency among participants in the educational process. Furthermore, a factor model has been developed based on teachers' aspirations for self-development as an internal factor of innovative readiness for changes in the external digital environment.

2.1 Objectives and Goals

The analysis of current literature on the digital transformation of education and the professional self-development of teachers in new environmental conditions has brought to light a contradiction between the increasing influence of the digital integrative educational environment on teachers' professional self-development and the insufficient level of research on this process. The search for ways to address this issue identifies the research problem:

- What are the specific impacts of the digital integrative educational environment on the process of teachers' professional self-development?

The objective of the research is to determine the significance of the professional development potential of the digital integrative educational environment, including its structural components, on the process of teachers' self-development. The stated research objective was achieved in two stages:

- In the first stage, the structural components of the digital integrative educational environment for

teachers were identified, and criteria for evaluating its professional development potential were developed.

- In the second stage, an empirical study was conducted to identify the specific impacts of the professional development potential of the digital integrative educational environment on the process of teachers' self-development.

3. MATERIALS AND METHODS

The study involved 43 teachers from higher education institutions in Tashkent and Namangan, including Tashkent State University of Law and Turan International University in Namangan, Uzbekistan. The pedagogical staff of the experimental base comprised teachers with varying levels of teaching experience, ranging from novices (1-3 years) to experts (11-20 years) and mentors (over 20 years). The surveyed teachers taught different subjects, such as English, History, Law, Russian, and Math. Regardless of gender or teaching experience, all participating teachers demonstrated a high level of readiness for professional self-development.

The research employed various methods, including teacher surveys, result comparisons, ranking evaluation criteria, and correlation analysis. The surveys were conducted in a face-to-face format, where teachers assessed the significance of the professional development potential of the modern digital integrative educational environment on a 10-point scale, according to identified criteria and indicators. Data analysis utilized Excel program features, including determining the statistical significance of the obtained data.

To assess the professional development potential of the digital integrative educational environment for teachers, the survey identified the following evaluation criteria:

Criterion A: Accessibility and openness of the environment.

Criterion B: Richness of the environment in professional development resources.

Criterion C: Interactivity of the environment, including the presence of feedback.

Each criterion involved teachers assessing the professional development potential based on indicators corresponding to the structural components of the digital integrative educational environment, namely:

Microenvironment of educational organizations.

Meso-environment of professional communities.

Macroenvironment as a global system.

The study aimed to establish correlation relationships between the identified values for each evaluation criterion. The t-Student test was utilized to assess the significance of the obtained coefficients.

4. RESULTS

In a generalized form, the results of assessing the professional development potential of the digital integrative educational environment for teachers, considering its structural components, are presented in Figure 1.

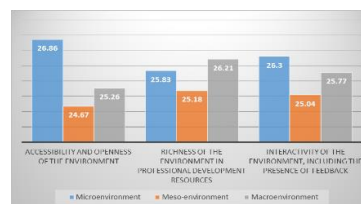


Figure 1: Analyzing Environmental Factors: A Comprehensive Examination of Micro, Meso, and Macro Environments in Professional Development.

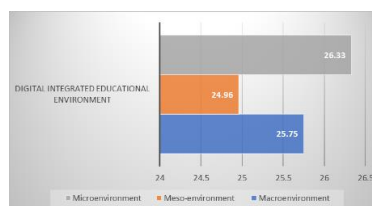


Figure 2: Navigating the Digital Educational Landscape: Assessing Micro, Meso, and Macro Environments for Integrated Learning.

The results suggest that the structural components of the studied environment hold equal importance. However, the microenvironments within educational organizations and the macroenvironment on a global scale exert the most significant influence on the teacher's self-development process (refer to Figure 2).

Table 1: Ranking the degree of importance of criteria for assessing professional development potential.

No	Assessment Criteria	Average scores
1	B - Environment's richness in professional development resources	77.22

2	C - Interactivity of the environment, including the presence of feedback	77.11
3	A - Accessibility and openness of the environment	76.79

The values obtained for specific indicators within each criterion for assessing professional development potential illustrate the nuances of the impact of the digital integrative educational environment on the teacher's self-development process (refer to Table 2).

Table 2: Values of criteria and indicators for assessing the professional development potential of the teacher in the digital integrative educational environment.

No	Criteria and indicators for assessing the digital integrative educational environment	Average scores
A	Accessibility and openness of the environment	76.79
A1	Microenvironments of educational organizations	26.86
A1.1.	Presence and quality of work of professional subject-based educational and methodological associations	9.0
A1.2	Creating an atmosphere of creative interaction within the educational organization	8.91
A1.3	Openness of the educational organization to the community	8.95
A2	Mesoenvironments of professional communities	24.67
A2.1	Activity of regional associations and other professional communities	8.51
A2.2	Organizing collaborative partnerships with other schools in the district and region, professional communities	8.3
A2.3.	A wide representation of the advanced experience of teachers in the city, district, and region	7.86
A3	Macro environment as a global system	25.26
A3.1	Engaging in pedagogical interaction within networked professional communities	8.21
A3.2	Ensuring unrestricted access to digital educational resources	8.21
A3.3	Receiving timely information about events conducted in a distance format.	8.84

B	The availability and quality of professional development resources	77.22
B1	Microenvironments of educational organizations	25.83
B1.1.	Conducting professional development events at the organizational level	8.88
B1.2	Level of material and technical resources in educational organizations, equipped classrooms	8.3
B1.3	Work of the pedagogical excellence school and other forms of methodological work in the educational organization	8.65
B2	Meso-environments of professional communities	25.18
B2.1	Conducting professional development events at the district and regional levels	8.67
B2.2	Transmission of pedagogical activity results at the district and regional levels	7.84
B2.3.	Availability and quality of functioning of professional development centers in the city and region	8.67
B3	Macrosystem as a global system	26.21
B3.1.	Conducting professional development events at a level beyond the regional level in a remote format	8.14
B3.2.	Opportunity for professional development in a remote format	9.19
B3.3.	Quality of digital professional development resources for personal growth	8.88
C	Interactivity of the environment as the presence of feedback	77.11
C1	Microenvironments of educational organizations	26.3
C1.1.	Creating conditions for open dialogue in the educational organization	9.04
C1.2	Familiarization with the results of educational monitoring and teacher rankings	8.49
C1.3	Conducting and discussing the analysis of educational performance results	8.77

C2	Meso-environments of professional communities	25.04
C2.1	Discussing the quality of education and ways to improve it in regional subject communities	7.88
C2.2	Analyzing teachers' activities at the district and regional levels in achieving educational quality	8.44
C2.3.	Wide-ranging discussions on priority education issues at the district and regional levels	8.72
C3	Macrosystem as a global system	25.77
C3.1	Integrating teachers into the broader community, participating in discussions on education issues in online communities	8.3
C3.2	Opportunity for interactive distance learning considering individual achievements	8.98
C3.3	Availability and quality of feedback in professional development educational portals.	8.49

The study results reveal the identification of significant correlation relationships between the evaluation criteria for the professional development potential of the digitally integrated educational environment for teachers.

5. DISCUSSION OF THE RESULTS

The analysis of the collected data reveals that the digitally integrated educational environment is a complex system comprising interacting co-subordinate environments, all equally crucial for the self-development of teachers. This process is 85.6% dependent on the influence of the professional-developing potential of the studied environment, encompassing microenvironments of educational organizations, meso-environments of professional communities, and the macrosystem as a globally unified system. This affirms the integrative and emergent properties of the digital educational environment. This environment is not merely a simple sum of its components but manifests its professional-developing properties through a unified new effect as a system (in this context, "emergent" refers to the systemic effect of the digital integrated

educational environment for teachers, influencing professional self-development).

The obtained data align with the perspectives of various researchers on the global digitization of the education system [3], the communicative role of digital platforms [4], and the necessity to elevate the significance of digital competencies for self-developing teachers [10]. It is the digital environment as an open system that ensures the development of teachers themselves and their informational capabilities [11]. Strengthening digital literacy through self-development guarantees success in working with information and communication technologies and the supporting resources [12]. As rightly posited by the authors, constructing a profile of a teacher's digital competence ensures the interconnection of professional self-development and success [14], and in modern conditions, teachers need to systematically enhance their level of digital competencies [15]. This perspective undoubtedly aligns with the idea of teachers' continuous self-development throughout their professional careers under the influence of environmental conditions [16].

Simultaneously, the conducted research has yielded new results, evident in the clear identification of criteria for assessing the professional-developing potential within the structural components of the digitally integrated educational environment for teachers. Such an approach allows for the determination of the specific influence of the studied environment on the process of teachers' professional self-development and a comprehensive examination of the environment's formative impact on self-developing educators. The presence and quality of work within professional subject-specific educational and methodological communities and associations, the creation of an atmosphere of creative interaction, openness to society, the opportunity for continuous professional development and learning in a distance interactive mode considering individual achievements, and participation in professional-developing activities (forums, scientific-practical conferences, webinars, master classes, and other forms of active interaction) emerge as the most important factors for the process of teachers' self-development.

6. CONCLUSION

The conducted research substantiates the significance of the professional-developing potential of the digitally integrated educational environment as a whole, encompassing its structural components and

forming a unified macrosystem that systematically influences self-developing teachers. The microenvironments of educational organizations, meso-environments of professional communities, and the macrosystem as a global system are equally important for teachers' self-development. The self-development of teachers as professionals depends on both the accessibility and openness of this environment and the richness of professional-developing resources and interactivity, including the presence of feedback.

The research results pave the way for increased effectiveness in the process of teachers' professional self-development in the dynamic conditions of the digitally integrated educational environment.

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