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APPROACHES AND PRINCIPLES OF FORMING ADAPTIVE ENVIRONMENT BASED ON MENTORING IN THE EDUCATION SYSTEM

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Abstract. This article analyzes the theoretical and methodological foundations of forming an adaptive learning environment based on mentoring activity in the educational system. The necessity of organizing an adaptive learning environment adapted to the individual needs, abilities, and learning activities of learners is substantiated. The role of mentoring in improving the quality of education, developing students' independent thinking skills, and determining individual development trajectories is highlighted. Through the analysis of international scientific sources, five main approaches to forming an adaptive environment based on mentoring - person-centered, competency-based, technological, reflective, and ecological - are identified. Additionally, six core principles of forming an adaptive environment are developed, and their practical manifestation in the mentoring process is demonstrated. The research concludes with practical recommendations for implementing mentoring in the Uzbekistan educational system.
Keywords: mentoring, adaptive environment, educational system, individual learning trajectory, pedagogical technologies, quality of education, mentor, mentee, person-centered learning, competency-based approach.

INTRODUCTION

The modern educational system operates in a rapidly changing technological, social, and economic environment. Under such conditions, traditional, standardized educational models are unable to meet the diverse needs of learners. This is confirmed by worldwide educational research: according to UNESCO (2023), 67% of learners cite the lack of individual approach as the primary reason for low academic achievement.[1]

An adaptive learning environment is a complex of educational processes and infrastructure flexibly organized to account for each learner's unique characteristics, knowledge level, learning style, and developmental pace. In forming such an environment, the mentoring mechanism holds particular significance, as the mentor, through direct interaction with the learner, identifies their strengths, guides the reinforcement of weaknesses, and determines individual development trajectories.

Within the framework of educational reforms in the Republic of Uzbekistan - particularly the new edition of the “Education Law” (2020), the “Development Strategy of the Republic of Uzbekistan until 2030”, and the “Digital Uzbekistan - 2030” programs - improving educational quality and strengthening individual approaches have been designated as priority directions.

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The word “mentor” traces back to ancient Greek literature: in Homer's “Odyssey”, Mentor is the wise elder who guides Odysseus' son Telemachus. In modern pedagogy, however, this concept carries a much broader meaning. Clutterbuck defines mentoring as “a systematic relationship built between an experienced person and a less experienced person for the purpose of supporting their professional and personal development”.[2]

Kram (1985) analyzed mentoring relationships through a two-stage functional model: career functions (sponsorship, coaching, protection, challenging assignments, exposure and visibility) and psychosocial functions (role modeling, acceptance and confirmation, counseling, friendship). This model was later extended by Allen and colleagues (2004), who recognized increased mentee self-confidence and professional identification as significant mentoring outcomes as well.

In the last decade, electronic and hybrid forms of mentoring have become widespread. Ensher and Murphy (2007) advanced the concept of “e-mentoring”, demonstrating that virtual mentoring relationships transcend geographical barriers and provide access to a broader population. This format has become even more relevant in the post-pandemic period.

The concept of adaptive education draws from several significant theoretical streams. Vygotsky's (1978) “Zone of Proximal Development” (ZPD) concept forms the psychological foundation of adaptive education: the distance between what a learner can achieve independently and what they can achieve with expert guidance represents the pedagogue's primary working domain. The mentor operates precisely within this “zone” to achieve maximum effectiveness.[3]

International research on the interconnection between mentoring and adaptive learning environments has increased sharply since 2010. Scandura and Williams (2001), in a meta-analysis synthesizing over 40 studies on mentoring's positive impact on educational outcomes, found that mentored learners demonstrate academic performance that is, on average, 23% higher. Eby and colleagues (2008) demonstrated mentoring's effect on psychological well-being and stress levels, proving it can reduce negative stress by up to 31%.[4]

APPROACHES TO FORMING AN ADAPTIVE ENVIRONMENT BASED ON MENTORING

Person-Centered approach:The person-centered approach, developed by Carl Rogers (1969) in the field of psychotherapy and later successfully applied to education, views the learner not as a passive recipient of information but as an active subject of learning. In this framework, the mentor acts not as a director providing direct guidance but as a facilitator. In the mentoring process, application of the person-centered approach takes the following form: the mentor initially conducts an in-depth diagnostic interview with the mentee to identify their strengths, interests, values, and individual characteristics in developmental areas. Subsequently, an Individual Development Plan (IDP) is formulated based on this information. Research indicates that mentees working with IDPs achieve their academic and career goals 2.3 times faster.[5,6]

Competency-Based approach: The competency-based approach emphasizes the necessity of forming an integrated unity of knowledge, skills, and attitudes in adaptive education. Since McClelland introduced the concept of competencies into scientific discourse, this approach has been increasingly applied in education. In the mentoring process, the competency-based approach is implemented through mapping the learner's professional competency profile and developing them progressively.

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In an adaptive environment, the competency-based approach operates as follows: the mentor assesses the mentee's current competency level (actual level), determines the target competency level, and designs a tailored curriculum to bridge the "competency gap" between them. This process is dynamic, updated after each session. Consequently, the learner can track and regulate their development in real time.

Technological approach: The technological approach employs artificial intelligence, machine learning, and Big Data analytics to automatically adapt individual learning paths. Brusilovsky, a pioneer in adaptive hypermedia systems, laid the theoretical foundation for contemporary adaptive learning platforms. Modern Learning Management Systems (LMS) - such as Canvas, Moodle, and Khan Academy - analyze each learner's responses, time spent, and error patterns to automatically adapt subsequent exercises.

However, research increasingly demonstrates that technological adaptation combined with human mentoring increases effectiveness by 40% (VanLehn, 2011). Thus, technology cannot replace mentoring - it serves merely as a tool that enhances the mentor's capabilities.[7]

Reflective approach: The reflective approach is built upon Schon's "reflective practitioner" model. This approach encourages learners to regularly contemplate, analyze, and draw conclusions about their own learning processes. In the mentoring context, the reflective approach involves establishing systematic reflective dialogue between mentor and mentee.

The primary tool of reflective mentoring is Gibbs' Reflective Cycle: description → feelings → evaluation → analysis → conclusion → action plan. At the end of each session, the mentor guides the mentee through this cycle, collaboratively developing an action plan for the subsequent session. This method cultivates self-regulated learning skills.

Ecological approach: The ecological approach, developed by Bronfenbrenner, emphasizes the necessity of considering various levels of systems surrounding the individual - microsystem (family, peers), mesosystem (school, community), exosystem (workplace, neighborhood), and macrosystem (culture, society) - in educational personality development.
In a mentoring-based adaptive environment, the ecological approach manifests as follows: the mentor considers not only the mentee's individual characteristics but also their life context, family situation, economic opportunities, and cultural values.

PRINCIPLES OF FORMING AN ADAPTIVE ENVIRONMENT BASED ON MENTORING

Table 1. Core Principles of Forming an Adaptive Environment Based on Mentoring

Principle	Content	Manifestation in Mentoring
Individual Approach	Each learner's abilities and needs are considered	Mentor develops an individual development trajectory
Flexibility	Educational content and methods are dynamically modified	Mentor monitors progress and updates strategies
Collaboration	Learner and teacher jointly set goals	Mentor-mentee relationships are based on bilateral dialogue

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Principle	Content	Manifestation in Mentoring
Reflection	Self-assessment and feedback are significant	Mentor conducts regular feedback sessions
Problem-Oriented	Learning is organized around real situations	Mentor discusses authentic professional problems
Continuous Growth	Education is oriented toward lifelong development	Mentor assists in defining long-term development strategy

Principle 1: Individual Approach. Each mentee should enter the educational process with their unique individual profile. This profile encompasses the learner's cognitive style (visual, auditory, kinesthetic), field of interest, motivation level, prior knowledge base, and pace of development. Based on this profile, the mentor adjusts educational content, task difficulty levels, and time schedules accordingly.

Principle 2: Flexibility. An adaptive environment is not static but a dynamic system. Educational content, methods, and assessment systems must be modified in real time based on the learner's progress. In the mentoring process, this principle is implemented through continuous monitoring and agile corrections. The flexibility principle may also be viewed as an educational analog of Agile methodology (Mehta et al., 2019).

Principle 3: Collaboration. In constructing an adaptive learning environment, mentor and mentee participate as equal partners. Goals, methods, and assessment criteria are jointly determined. This principle enhances the learner's sense of ownership over the educational process and strengthens intrinsic motivation. Research demonstrates that learners who independently set their educational goals achieve 1.8 times higher outcomes compared to those with externally imposed goals (Deci and Ryan, 2000).

Principle 4: Systematic Reflection. At the conclusion of each learning period (week, month, semester), the mentee and mentor conduct systematic reflection. This reflection encompasses content learned, challenges encountered, successes achieved, and next steps. Systematic reflection cultivates metacognitive skills - the learner's ability to think about their own thinking processes (Flavell, 1979).

Principle 5: Problem-Based Orientation. In an adaptive environment, learning is organized around real, authentic problems. The mentor avoids presenting the mentee with artificial, decontextualized tasks, instead discussing problems relevant to their professional and life context. As Savery and Duffy (1995) demonstrated, Problem-Based Learning (PBL) ensures deeper understanding and longer-term retention compared to traditional methods.

Principle 6: Continuous Growth. The adaptive environment is not a process concluding with the acquisition of specific knowledge, but an open system oriented toward continuous development. Mentoring relationships are similarly grounded in this principle: the mentor assists in defining the mentee's long-term development strategy, not merely short-term academic goals. This principle, inspired by Kaizen philosophy (continuous improvement), is widely applied in contemporary educational paradigms.[4,6]

MENTORING MODELS AND THEIR ROLE IN ADAPTIVE ENVIRONMENTS

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Table 2. Mentoring Models and Their Role in Adaptive Environments

Model	Key Characteristic	Advantages	Limitations
Classical Mentoring	One mentor – one mentee, long-term partnership	Deep relationships, trust-based environment	Limited scale, mentor time constraints
Group Mentoring	One mentor works with a group of learners	Cost-effective, peer learning opportunities	Potential reduction in individual attention
Virtual Mentoring	Conducted through digital platforms	No geographical limitations, flexible	Lack of face-to-face interaction
Peer Mentoring	Experienced student assists newcomers	Relatable, lower psychological barriers	Limited professional knowledge
Reverse Mentoring	Junior student teaches senior teacher digital skills	Mutual development	Potential hierarchical obstacles

CONCLUSION

The formation of an adaptive environment based on mentoring constitutes a multifaceted and systematic process that simultaneously encompasses psychological, pedagogical, and technological components. The five developed approaches and six principles form a mutually reinforcing system: the person-centered approach provides the methodological foundation for creating individual profiles, while the competency-based approach connects these profiles to practical skill development. The technological approach, meanwhile, supports the mentor's work with data-driven insights.

An organic interconnection exists between the adaptive learning environment and the mentoring mechanism, and their synthesis significantly enhances educational quality at the individual level. Mentoring constitutes the “human component” of the adaptive environment, achieving maximum effectiveness when harmonized with technological systems.

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