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ORCID: <https://orcid.org/0009-0006-2090-077X>**PEDAGOGICAL TECHNOLOGIES ENSURING STUDENTS' ADAPTATION
UNDER CONDITIONS OF VARIABILITY OF THE MODERN
EDUCATIONAL ENVIRONMENT****Abdullayev Siroj Abdurashidovich**

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Abstract: This article presents a scientific-theoretical substantiation of the pedagogical technologies that ensure students' successful adaptation under conditions of the growing variability of the modern educational environment. The relevance of the study is determined by the fact that today's educational environment is characterised not by a single, stable set of tools and requirements but by their continual variation — changing digital platforms, changing formats of instruction and assessment, and changing organisational conditions of study — which places a persistent adaptive demand on students that traditional pedagogy, oriented towards a stable environment, is not fully equipped to address. The aim of the research is to define the structure of student adaptation to a variable educational environment as a pedagogical category, to substantiate the technologies capable of purposefully supporting this adaptation, and to determine the pedagogical conditions and problems associated with their application. The study employed the methods of theoretical analysis and systematisation of scientific literature, comparative-pedagogical analysis, structural-functional modelling, and pedagogical observation. The analysis established that adaptation to a variable educational environment comprises three interrelated types — cognitive-informational, socio-communicative, and organisational-activity-based adaptation — and that their purposeful support is achieved most effectively through a coordinated complex of technologies: adaptive and blended-learning technologies, technologies of scaffolded autonomy, collaborative and peer-support technologies, and technologies of continuous formative feedback. The conclusion substantiates the necessity of the systematic application of these technologies throughout the period of study, of the corresponding preparation of academic staff, and of regular diagnostic monitoring of students' adaptation. Practical recommendations are proposed for the phased introduction of the described technologies into the educational process of higher education institutions.

Keywords: *educational environment, variability, student adaptation, pedagogical technology, adaptive learning, blended learning, scaffolding, formative feedback, collaborative learning.*

INTRODUCTION

The educational environment of the twenty-first century differs from that of previous decades not merely in its increased technological content but in a qualitative characteristic that pervades every aspect of study: variability. Digital platforms and applications used for instruction are replaced or updated within a single academic year; formats of teaching alternate between face-to-face, blended, and fully online modes according to circumstances; assessment procedures are periodically revised in line with evolving educational standards; and the organisational conditions of study — group composition, scheduling, and the balance between individual and collaborative work — are subject to more frequent change than in earlier, more stable models of higher education. Under these conditions, a student's ability to adapt continuously, rather than to adjust once to a fixed set of circumstances, becomes a decisive factor in academic success.

The strategic documents of the Republic of Uzbekistan concerning the modernisation of the education system — in particular, the Decree of the President No. PF-60 of 11 May 2022 and the normative acts regulating the introduction of digital and blended learning technologies in higher education institutions — presuppose the continuous updating of educational technologies and organisational forms of instruction [1; 2]. This normative context increases the relevance of a scientific elaboration of the pedagogical technologies that would allow students to adapt to such continuous updating productively, rather than experience it as a recurring source of academic difficulty.

Although the pedagogical literature contains extensive research on individual innovative technologies and on student adaptation to a new institution or programme at the point of enrolment, the specific question of how to support adaptation to the ongoing variability of the educational environment throughout the entire period of study remains insufficiently elaborated. The aim of the present article is therefore to define the structural components of student adaptation to a variable educational environment, to substantiate the technologies through which each component can be purposefully supported, and to identify the problems that arise in their implementation together with scientifically grounded solutions.

LITERATURE REVIEW AND METHODS

The theoretical foundation of the study draws on several complementary lines of research. J. Piaget's concept of cognitive adaptation, comprising the complementary processes of assimilation and accommodation, provides the general psychological framework for understanding how a student incorporates new educational demands into existing cognitive structures or, when this is insufficient, restructures those structures to meet genuinely new requirements.

L.S. Vygotsky's concept of scaffolding — structured support that is calibrated to the learner's current level of independence and gradually withdrawn as competence grows — was used as a methodological basis for substantiating technologies that support adaptation without either over-directing the student, which would inhibit the development of independence, or withdrawing support prematurely, which would leave the student unsupported precisely at the point of greatest uncertainty.

The theory of self-regulated learning, associated with B.J. Zimmerman, supplied the basis for treating adaptation to a variable environment as an ongoing cyclical process of goal-setting, monitoring, and adjustment, rather than as a single act of adjustment completed at the beginning of a course of study.

Research on blended and adaptive learning environments, in particular the work of C.R. Graham on models of blended instruction, provided the substantive basis for identifying which organisational and technological formats are most conducive to supporting continuous adaptation, since a well-designed blended environment itself models the flexible movement between modes of study that students are expected to master.

The following research methods were employed: theoretical analysis and systematisation of scientific literature; structural-functional modelling, used to substantiate the component composition of student adaptation to a variable environment; comparative-pedagogical analysis of technologies currently applied to support such adaptation; and pedagogical observation, used to identify typical difficulties encountered by students and academic staff under conditions of a continually changing educational environment.

RESULTS AND DISCUSSION

1. The pedagogical essence of adaptation to a variable educational environment.

Adaptation to a variable educational environment is understood in this study as a continuous, rather than a one-off, process by which the student maintains and improves the quality of learning while the tools, formats, and organisational conditions of study are themselves subject to periodic change. Unlike adaptation to a new institution, which is typically concentrated at the beginning of a course of study, adaptation to variability

recurs throughout the entire period of study, each time a significant element of the educational environment is updated.

2. Structural components of adaptation. The analysis allows student adaptation to a variable educational environment to be represented as a unity of three interrelated types.

Cognitive-informational adaptation comprises the ability to orient oneself quickly within a new source of information, a new digital tool, or a new instructional format, and to reorganise one's own learning strategies accordingly, in line with Piaget's processes of assimilation and accommodation.

Socio-communicative adaptation comprises the ability to establish and maintain productive working relationships with peers and academic staff under changing conditions of group composition, communication channel, or mode of collaboration, whether face-to-face, blended, or fully online.

Organisational-activity-based adaptation comprises the ability to reorganise one's own study routine, time management, and work habits in response to changes in scheduling, assessment procedure, or the balance between independent and supervised work.

3. Technologies supporting adaptation. The analysis of pedagogical practice allows several groups of technologies to be identified as particularly effective for the purposeful support of the components described above.

Adaptive and blended-learning technologies expose students, in a structured and pedagogically supported manner, to a variety of instructional formats and digital tools within the course of ordinary study, thereby building cognitive-informational adaptation through repeated, low-risk practice rather than through occasional, high-stakes encounters with an unfamiliar format.

Technologies of scaffolded autonomy provide a calibrated sequence of support — worked examples, guided practice, and independent application — that is adjusted as a new tool or format is introduced and gradually withdrawn as the student's competence with it grows, in accordance with Vygotsky's principle of scaffolding.

Collaborative and peer-support technologies — structured peer-learning groups, rotating team roles, and cross-group projects — support socio-communicative adaptation by giving students repeated, varied practice in establishing working relationships under changing group conditions.

Technologies of continuous formative feedback — regular, low-stakes checks of understanding and structured self-assessment — support organisational-activity-based adaptation by allowing students to detect and correct disorganisation in their own study

routine promptly, before it accumulates into significant academic difficulty, in keeping with the cyclical logic of self-regulated learning.

4. Pedagogical conditions for effective implementation. The effectiveness of the described technologies depends on several conditions: the deliberate, planned introduction of variability into the educational process for pedagogical purposes, rather than its occurrence as an unplanned disruption; the corresponding readiness of academic staff to design scaffolded, gradually adjusted support rather than either rigid instruction or unstructured exposure to change; a classroom and institutional culture in which temporary difficulty during a period of adjustment is treated as a normal stage of adaptation; and the availability of regular diagnostic monitoring capable of identifying which students and which type of adaptation require additional pedagogical attention.

5. Problems and solutions. The first problem is the tendency of academic staff to introduce new tools, formats, or requirements without sufficient scaffolding, on the assumption that students will adapt independently; the solution is the systematic training of staff in the design of scaffolded introduction sequences for any significant educational innovation. The second problem is the uneven pace of adaptation among students, which unstructured approaches tend to leave unaddressed; the solution is the regular diagnostic monitoring of the three components of adaptation described above, allowing targeted support to be directed to students and components most in need of it. The third problem is the fragmentation of collaborative learning opportunities across individual courses, which limits students' practice in socio-communicative adaptation; the solution is the coordinated, cross-curricular institutionalisation of collaborative and peer-support formats. The fourth problem is the delay with which organisational difficulties are typically identified, often only at the point of formal assessment; the solution is the introduction of continuous, low-stakes formative feedback mechanisms that allow organisational-activity-based difficulties to be detected and addressed promptly.

CONCLUSION

The results of the study show that student adaptation to the variability of the modern educational environment is not a single event to be managed at the point of enrolment but a continuous, three-component process — cognitive-informational, socio-communicative, and organisational-activity-based — that recurs throughout the period of study and can be purposefully supported through an appropriately selected complex of pedagogical technologies.

The analysis confirms that adaptive and blended-learning technologies, scaffolded autonomy, collaborative and peer-support formats, and continuous formative feedback

constitute a coherent, mutually reinforcing set of technologies capable of supporting all three components of adaptation, provided that they are applied systematically and are accompanied by regular diagnostic monitoring.

The systematic introduction of these technologies, the targeted preparation of academic staff for the design of scaffolded support, and the establishment of regular diagnostic monitoring of student adaptation are proposed as the principal directions for translating the described approach into practice. The consistent implementation of these measures would allow higher education institutions to reduce the academic difficulties that currently arise from the variability of the educational environment and to prepare students capable of continuing to adapt productively once they enter a labour market characterised by comparable, and likely increasing, variability.

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