



## LEARNING AS A SYSTEM: DESIGN, DEVELOPMENT AND PERSONALIZATION OF SCHOOL EDUCATIONAL ACTIVITIES

### EL APRENDIZAJE COMO SISTEMA: DISEÑO, DESARROLLO Y PERSONALIZACIÓN DE LAS ACTIVIDADES EDUCATIVAS ESCOLARES

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#### ABSTRACT

This article defines the main approaches to understanding educational activity as a subject of psychological research. It characterizes the psychological content of educational activity, exploring it in the context of addressing general psychological issues and problems, as well as within the framework of educational psychology. It substantiates the methodological, theoretical, and empirical potential of using the system-genetic theory of activity to develop a psychological concept of student learning. A program for empirical research has been developed, and a methodological toolkit has been selected that is appropriate to the age characteristics of students at different levels of general education, as well as the psychological content of the functional blocks of the psychological system of student learning. Patterns of development of the psychological system of student learning throughout general education are identified. The characteristics of changes in the functional organization of the psychological system of student learning at different stages of general education are determined. The psychological content and development of methods for organizing the psychological system of student learning that contribute

to increasing and decreasing its effectiveness are characterized. The characteristics of gender differentiation in the organization of the psychological system of student learning at different stages of general education are identified. The main provisions of the psychological concept of the educational activity of a schoolchild are formulated and described.

#### Keywords:

Education, Student Learning, Educational Activity, Personalization, Design.

#### RESUMEN

Este artículo define los principales enfoques para comprender la actividad educativa como objeto de investigación psicológica. Se caracteriza el contenido psicológico de la actividad educativa, explorándolo en el contexto del abordaje de cuestiones y problemas psicológicos generales, así como dentro del marco de la psicología educativa. Se fundamenta el potencial metodológico, teórico y empírico del uso de la teoría sistémico-genética de la actividad para desarrollar un concepto psicológico del aprendizaje del estudiante. Se ha desarrollado un



programa de investigación empírica y se ha seleccionado un conjunto de herramientas metodológicas adecuadas a las características de edad de los estudiantes en los distintos niveles de la educación general, así como al contenido psicológico de los bloques funcionales del sistema psicológico del aprendizaje del estudiante. Se identifican patrones de desarrollo del sistema psicológico del aprendizaje del estudiante a lo largo de la educación general. Se determinan las características de los cambios en la organización funcional del sistema psicológico del aprendizaje del estudiante en las diferentes etapas de la educación general. Se caracteriza el contenido psicológico y el desarrollo de métodos para organizar el sistema psicológico del aprendizaje del estudiante que contribuyen a aumentar o disminuir su eficacia. Asimismo, se identifican las características de la diferenciación de género en la organización de dicho sistema en las distintas etapas de la educación general. Finalmente, se formulan y describen los principales postulados del concepto psicológico de la actividad educativa del escolar.

#### Palabras clave:

Educación, Aprendizaje del Estudiante, Actividad Educativa, Personalización, Diseño.

## INTRODUCTION

Throughout the development of psychology as an independent scientific discipline, the study of learning activity has remained one of its most persistent and complex areas of inquiry. This is due to its direct relationship with the management of knowledge acquisition, the design and implementation of educational processes, and the consideration of students' psychological characteristics across different ages and educational levels. These issues are further linked to the challenges of differentiation and individualization of instruction, the development of personalized educational trajectories, and the need to align teaching practices with the diverse cognitive, motivational, and social characteristics of learners in contemporary educational contexts.

In recent decades, the importance of learning activity has grown significantly as modern education systems have shifted from a predominantly knowledge-based paradigm toward a competency-based model. This transformation has introduced new demands regarding the definition, articulation, and continuity of educational outcomes across primary, basic, and secondary levels of general education. At the same time, the increasing emphasis on life-long learning as a fundamental educational principle has reinforced the need to understand the mechanisms and patterns that govern learning activity. Such understanding is essential not only for ensuring coherence between

educational stages, but also for establishing meaningful and sustainable learning outcomes that extend beyond formal schooling and support continuous personal and professional development (Damayanti, 2026).

The scientific literature reflects a growing and diverse body of research addressing learning activity from multiple disciplinary perspectives, including psychology, pedagogy, and sociology. These studies have examined individual and collective learning processes, the development of students at different educational levels, adaptation and support mechanisms, and the influence of psychological, social, and economic factors on academic success. In this context, numerous works have focused on educational management and leadership, as well as on the design of effective learning environments (Gioffre, 2017; Lunenburg & Ornstein, 2011; Ponomarova et al., 2025). At the same time, other studies have explored the impact of technological transformations on education, including virtual learning environments, MOOCs, and the integration of artificial intelligence in teaching and learning processes (Iasechko & Iasechko, 2024; Littlejohn et al., 2016; Stevens, 2007). In addition, recent research has emphasized the role of emotional education as a key dimension of learning activity, particularly in primary education contexts, highlighting how teaching practices, school experiences, and institutional conditions influence students' emotional development and, consequently, their learning processes and academic performance (Hernández-Bautista & Estrada-Girón, 2026).

Due to the close interrelationship between the concepts of learning activity, teaching, and instruction, a substantial number of studies in general and educational psychology have been devoted to analyzing their content and interconnections. These investigations have contributed to the development of a wide range of theoretical perspectives, including functionalist, associationist, cognitive, neurophysiological, and evolutionary approaches, each offering distinct interpretations of nature and mechanisms of learning (Iasechko et al., 2021; Martynets et al., 2020; Wolfe & Andrews, 2014). As a result, the field has witnessed the emergence of numerous pedagogical technologies designed to organize and manage learning activity, each grounded in specific theoretical assumptions and employing strategies to promote student success (Alexander et al., 2019; Balzer, 2020).

However, despite the richness and diversity of these theoretical and practical contributions, significant challenges remain. The multiplicity of approaches has led to fragmented and sometimes contradictory understandings of nature, structure, and outcomes of learning activity. In particular, the assumption that a greater diversity of pedagogical technologies necessarily leads to improved educational

outcomes has not been sufficiently substantiated. This situation highlights the need for a more systematic and integrative approach that allows for the organization and synthesis of accumulated knowledge, as well as for the development of a coherent conceptual framework capable of explaining learning activity as a complex and evolving psychological phenomenon.

Another critical limitation lies in the absence of a comprehensive and unified methodology for the psychological analysis of learning activity as a holistic system. Although a wide range of empirical tools has been developed to study individual components—such as motivation, cognition, and behavior, these approaches often remain limited to descriptive analyses and do not adequately capture the dynamic and systemic nature of learning processes. Consequently, there is a gap between empirical findings and theoretical explanations, which restricts the ability to understand how learning activity develops, functions, and transforms across different stages of general education.

In this context, the system-genetic theory of activity offers a powerful and theoretically grounded framework for overcoming these limitations. By conceptualizing learning activity as a psychological functional system characterized by systemogenesis, this approach makes it possible to identify patterns in its structural, functional, and developmental organization. It enables researchers to understand learning not as a simple progression through formal educational levels, but as a sequence of qualitatively distinct stages shaped by psychological transformations and the interaction of multiple system components. Furthermore, it provides a basis for identifying the key factors that determine academic success and for developing differentiated and individualized strategies that enhance the effectiveness of educational processes.

Within this theoretical and methodological framework, the purpose of the present study is to develop and theoretically and empirically substantiate a psychological concept of student learning activity that reveals its structure, patterns of development, and functioning throughout the process of general education.

**Subject** of study: the dynamics of student learning and the patterns of its systemic organization at different stages of general school education.

## MATERIAL AND METHODS

This study is grounded in the central hypothesis that schoolchildren's learning activity can be comprehensively understood through its structural, genetic, and functional characteristics when analyzed as a psychological system undergoing systemogenesis throughout general

education. From this perspective, learning is not a linear or uniform process, but a dynamic and evolving system that develops through qualitatively distinct stages. Each stage is characterized by specific forms of structural organization, uneven functional dynamics, and the progressive differentiation of ways in which students organize and regulate their learning activity.

The research draws on a solid theoretical and methodological foundation within the psychology of activity, integrating diverse approaches to the analysis of learning processes. A combination of theoretical, empirical, and interpretative methods was employed, carefully selected in accordance with students' developmental characteristics across educational levels. This methodological design enabled a comprehensive examination of the elements that constitute the psychological functional system of learning activity and their transformations over time.

From a theoretical standpoint, the study makes a significant contribution to educational psychology by overcoming fragmented interpretations of student learning. It provides an integrative framework that explains how the structure, functioning, and development of learning activity evolve throughout general education. It highlights the heterochronic development of key psychological components—such as motivation, goal setting, programming, and decision-making—and demonstrates how their roles and hierarchies shift across different stages. Furthermore, the findings confirm the robustness and applicability of the system-genetic theory as a powerful lens for analyzing not only learning activity but also broader forms of human activity.

In practical terms, the results offer a strong foundation for transforming educational practice. They show that academic success depends not merely on the development of isolated components, but on the coherence and organization of the learning system. This insight opens new possibilities for improving teaching strategies through stage-sensitive instruction, differentiated learning approaches, and targeted support for underperforming students. Additionally, the study underscores the importance of considering gender-related differences in the functional organization of learning, providing valuable guidance for more inclusive and effective educational interventions.

Overall, this research advances a comprehensive and systemic understanding of learning as a developmental process, offering both theoretical depth and practical relevance for enhancing the quality and effectiveness of education.

## RESULTS AND DISCUSSION

The relevance of researching the concept of learning activity is substantiated by the fact that in educational psychology, it is primarily considered in comparison with the concepts of teaching, learning, and instruction. Therefore, the first chapter draws boundaries between these concepts and the concept of learning activity. While there is relative consensus in educational psychology regarding the concepts of teaching, learning, and instruction, there is no consensus regarding the definition of learning activity. In our opinion, this is due to the fact that a broad definition of learning activity leads to its ambiguity and reduction to the concepts of teaching, learning, and instruction. The independent status of this concept is determined by the fact that the acquisition of knowledge, teaching, learning, and instruction are included in all types of human activity, whereas learning activity is characteristic only of the interaction between teacher and student in school, in which theoretical knowledge is acquired.

The advantage of this understanding of learning activity is that it captures both the procedural and the productive aspects of learning activity. In summary, we note that, firstly, learning activity is most often defined in the context of understanding the subject-action aspects of learners' activity, which forces researchers to reduce it to traditional concepts such as teaching, learning, and instruction. Secondly, the difficulty in delineating the conceptual field associated with the forms of learners' activity forces most researchers to limit themselves to the definition of learning activity given in the theory of developmental learning. Although this theory is aimed at understanding the learning activity of primary school students, this definition is often extended to other age groups.

The complexity and ambiguity of understanding learning activity in modern educational psychology is a consequence of the lack of a general theory of learning activity. An analysis of the development of ideas about learning activity in educational psychology has shown that a targeted approach to the development of holistic theories and concepts of learning activity only occurred in the mid-20th century. This transition was driven by the natural development of educational psychology as an independent branch of psychological knowledge. The first psychological theories of learning activity were the result of in-depth exploration of the problems of learning, teaching, and instruction. This became the basis for the beginning of the development of the theory of educational activity as an independent field of educational psychology (Bray, 2007).

Meanwhile, despite the productivity of this theory and its widespread use in educational psychology, a number of researchers also highlight its significant shortcomings: a lack of strict delineation between the subject and psychological aspects of activity analysis; the priority of analytical approaches in understanding the factors that contribute to the development of educational activity, the mechanisms and methods for managing it, etc.

Due to the broad understanding of educational activity and its reduction to other concepts, the leading results on the methods of its organization, the factors ensuring the effectiveness of the student's activity, etc., were obtained by solving general psychological problems aimed at understanding the methods of knowledge acquisition, the organization of cognitive activity, the management of educational activity, etc. In this regard, significant results were obtained within the framework of the development of cognitive psychology, in which the leading approaches, which interpret the process of knowledge acquisition in different ways, are the informational approach, the approach explaining the processes of cognition using a computer metaphor, the modular and neuropsychological approaches. One of the most important achievements of cognitive psychology was a deeper understanding not only of the phenomenon of knowledge itself, but also of the methods of its acquisition. This result was reflected in the development of the cognitive-stylistic approach, which became the basis for the development of pedagogical models and technologies for organizing the educational activities of students (Guasch et al., 2011).

Meanwhile, despite the leading role of cognitive psychology in addressing the issues discussed above, the most important contribution to understanding the mechanisms of learning activity was made during the development of learning problems in psychology. However, it is again worth noting that, during the development of learning problems, the concept of learning activity as an independent entity was not posed. The history of the development of theories, concepts, approaches, and models of learning shows that their focus was on specific aspects of behavioral learning, methods of assimilating experience, and the management of behavior and cognitive activity.

A crucial condition for the development of modern learning activity theory is the domestic tradition of studying the issues under discussion. This applies primarily to the history of the 20th century, when data on the specific features of the organization of child learning was obtained, which became the basis for the emergence of the most well-known approaches to understanding learning. The development of cognitive psychology and behaviorism, which became the basis for examining the problems of

teaching and learning, for a long time occurred virtually independently of the development of psychology in the 20th century. This resulted in the formation of a unique domestic tradition of research into learning activities, which has led to the development of theories used today in Ukrainian education practices. Two relevant areas of research can be identified, within which issues of learning activity have received significant attention in psychology: understanding the goals and objectives of learning activities in the context of the development of pedagogical ideas in the 1920s and 1930s; and the problems of learning, development, and education in the cultural-historical theory of higher psychological functions (Leighton & Griffioen, 2023).

The nature of the demands placed on students at different stages of general education, the developmental outcomes of learning activities during specific periods, and the psychological content of each individual block lead to uneven and heterochronic development.

This idea can be well illustrated by the example of the changing contribution of individual blocks to the development of the system—motivation and learning goals. The changing place of these blocks in the development of the learning system clearly reflects the presence of common and specific characteristics, characteristic both of other blocks in the system and of each of the blocks under consideration individually. The dynamics of changes in the contribution of motives and goals to the development of educational activities can be assessed using Figure 1.

The figure 1 illustrates the dynamic contribution of motivation and goals blocks to the functioning of the psychological functional system of educational activity across different stages.

In the case of motivation, its contribution follows a clearly non-linear trajectory. It begins at a relatively low level in the early stages, followed by a sharp increase that reaches its peak around the middle of the process (approximately stage 4–5). This peak suggests that motivation plays a central, system-forming role during the initial consolidation of learning activity, when students are adapting to educational demands and developing engagement with learning. After this point, motivation declines noticeably and stabilizes at a moderate level, indicating that while it remains important, its dominant influence decreases as other components of the system become more structured and autonomous.

By contrast, the goals block shows a different developmental pattern characterized by gradual growth with some fluctuations. Initially, its contribution is low, reflecting

the limited capacity of students in early stages to set and regulate learning goals. As development progresses, the role of goals increases, with a first moderate peak in the middle stages, followed by a slight decline and then a steady and more pronounced increase toward the final stages. This final rise suggests that goal setting becomes increasingly significant as students achieve higher levels of cognitive and personal maturity, enabling more conscious regulation of their learning activity.

Overall, the figure reveals a complementary and shifting relationship between motivation and goals. Motivation dominates in the earlier and middle phases, acting as a driving force for engagement and system formation, whereas goals gain prominence in later stages, supporting self-regulation, intentionality, and the optimization of learning activity. This pattern reflects the transition from externally supported and emotionally driven learning toward more internally regulated and goal-oriented educational activity.

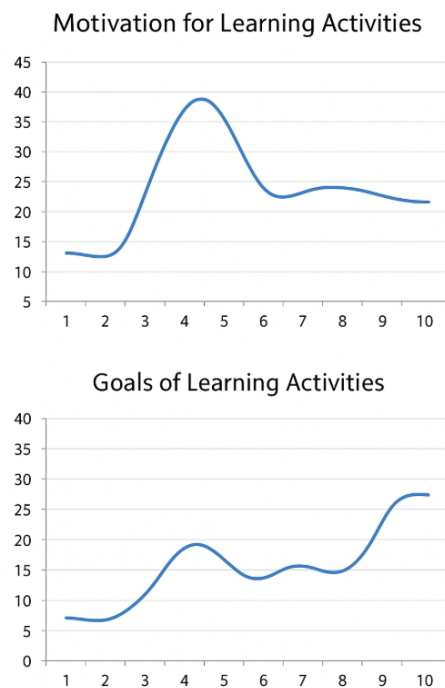


Figure 1. Change in the contribution of motivation and goals blocks to the functioning of the psychological functional system of educational activity.

The uneven dynamics of the blocks' contribution to the system's development manifests itself in varying degrees of intensity during different periods of school education. Furthermore, using these blocks as an example, we see that each is characterized by periods of growth, peaks, and declines in the intensity of its contribution to the development and functioning of the system. Furthermore,

while the role of motivation for learning activity generally stabilizes by the end of the first stage of development, the significance of learning goals continually increases (Hnatyshena et al., 2023).

The most important result of the conducted analysis is the understanding that the development of the schoolchild's system is a nonlinear process, accompanied, on the one hand, by a prolonged deployment of the system, reaching the peak of its organization and the transition to optimal functioning (developmental stages). At the same time, three periods of the system's development are embedded within this process, each of which is specifically associated with the stages of its development. The prolonged deployment of the system's resources from the beginning of school education to the 7th grade includes two periods of development, during which the deployment of the system's resources, reaching the peak of its development and optimal functioning are repeated twice. Considering that the intensity of the integration processes increases each time and reaches its peak by the 7th grade, it can be said that the psychological mechanisms of the schoolchild's development are realized through periods. This results in the transition of the schoolchild's activity system to optimal functioning (grades 8-11), which indicates the development of a specific type of educational activity of the schoolchild by the end of general education.

An analysis of the theory and history of research on learning activity has revealed a number of key issues that necessitate the development of a psychological concept of schoolchildren's learning activity. Contemporary educational psychology is characterized by a multitude of approaches, concepts, and theories of learning activity at various levels of education, often with virtually no correlation in their understanding of the psychological structure of learning activity, the mechanisms for its continuous implementation, and the methods and means of psychological analysis. It should be especially noted that the diverse theoretical foundations of the many existing studies on this issue prevent the abundance of theoretical, empirical, and experimental data from being combined into a unified, comprehensive theory of learning activity.

2. The study established that, in contemporary psychological knowledge, the study of learning activity is conducted in both broad and narrow aspects of its understanding. On the one hand, the topic of learning activities touches upon many general psychological issues related to the study of the processes of organizing human cognitive activity, knowledge acquisition, learning, the development of the subject of knowledge, etc. On the other hand, learning activities are among the most important issues and problems studied in educational psychology.

Numerous approaches to its study examine the mechanisms and patterns of organizing learning activities, identifying the structural elements and units of analysis of learner activity, etc.

However, all this does not allow us to say that the use of learning activity research experience in various approaches, concepts, and theories provides a way to explain the development and functioning of learning activities as a holistic and continuously evolving psychological entity. Therefore, this problem can be considered highly relevant to modern psychological knowledge.

The study resulted in the development of a psychological concept of schoolchildren's educational activity, revealing it as a holistic psychological entity with a structure characterized by systemogenetic patterns of development and functioning in the process of general school education. The concept describes the structural characteristics of schoolchildren's educational activity, reveals the patterns of its development and functional organization in different periods of general school education, characterizes the methods of organizing schoolchildren's educational activity that lead to different levels of its success, and establishes the features of specifically female and male methods of organizing educational activity. The development of schoolchildren's educational activity is realized as a complex multi-level process, which is based on changes in quantitative indicators and qualitative states of the schoolchild.

The latter is manifested in the presence of macro-, micro- and mesolevels of system-forming processes, at each of which the schoolchild solves specific normative and psychological problems. At the macro level, the development of a student's educational activity is realized in the form of chronologically and qualitatively determined stages, during which the problems of acceptance, mastering, improvement (the first stage - grades 1 - 7-8) and optimal functioning (the second stage - grades 8 - 11) of the student's educational activity are solved. At the micro level, the development of a student's educational activity is realized in the form of periods during which the student solves psychological problems, the specificity of which is determined by the experience of developing educational activity and the psychological mechanisms of their successful solution (the first period - grades 1 - 4, the second period - grades 5 - 7-8, the third period - grades 8 - 11).

At the meso level, the development of a student's educational activity is reflected in the form of the implementation during each period of uniform in form phases of development of the educational activity system - the growth of integration of the system at the beginning of the period,

achieving the peak of its organization in the middle, curtailment and optimal functioning at the end. The change of each stage, period and phase is associated with quantitative and qualitative changes in the level of organization of the system and the hierarchical organization of its structural elements.

The patterns of development of schoolchildren's learning activity identified in this way allowed us to address the problem of understanding the specific features of its development beyond primary general education, scientifically demonstrate the integrity and continuity of general school education, establish chronological frameworks, and explain the changing levels of development of learning activity based on its unique psychological characteristics.

The result of solving psychological problems during each stage, period, and phase of learning activity development is the formation of a specific type of learning activity by the end of general education. At the organizational level, this type of learning activity is characterized by the collapse of system-forming processes, the sufficiency and optimality of their functioning, and a defined set of system elements that ensure its effective functioning.

It has been established that the dynamics of the development of schoolchildren's learning activity are specifically linked to changes in its functional organization at different stages of general education. The latter is characterized by the cyclical functional contribution of system elements to the success of its implementation, an increase in the intensity of this contribution during moments of system resource deployment (grades 2, 6-7), and the continuous optimization of psychological methods and means of learning activity. The need for students to solve psychological problems at different stages of their learning process determines the growth and decline of the functional role of individual components and elements of the system.

The study provides a systematic description of the methods used to organize schoolchildren's learning activities, which contribute to their success. It has been established that the leading factor in the successful implementation of learning activities is a more sophisticated functional, rather than structural, organization. It has been shown that the key elements of successful functional organization of learning activities are established in the first period of their development.

It has been established that, as students develop, specifically female and male methods of organizing learning activities develop. On the one hand, it has been established that, during general school education, a unified hierarchical structure of learning activities develops among students of both sexes. On the other hand, the effectiveness

of its implementation at the level of academic achievement consistently increases for female students and decreases for male students. Thus, the female method of functional, rather than structural, organization of learning activities is more effective than the male method. The psychological analysis of activity used in this study, previously tested on various types and modes of human activity, was applied for the first time to the study of schoolchildren's learning activities throughout their general education. This allowed us to establish patterns in the development of schoolchildren's learning activities, identify qualitatively and chronologically distinct stages, periods, and phases of their development, and describe the structural and functional characteristics of schoolchildren's learning activities. Overall, the technology of psychological analysis of activity made it possible to address key issues in the modern theory of learning activities.

Using the methodology for analyzing the consistency of the basic and leading elements of a system, we were able to validate the assertion that a specific type of schoolchildren's learning activities develops during general education, substantiate the qualitative nature of differences in the methods of organizing learning activities that contribute to the improvement and reduction of their success, and establish qualitative differences in the functional organization of learning activities specifically for women and men.

## CONCLUSIONS

The development of student learning throughout general education follows a dynamic and progressive process, structured in qualitatively distinct stages that reflect changes in its structural, functional, and psychological organization. These transformations are shaped by the normative and cognitive demands characteristic of each educational stage, evolving from the initial formation of the system to its optimal functioning.

This process unfolds across interconnected levels of organization—macro, micro, and meso—which operate simultaneously. In the early stages, psychological resources that support learning activity were developed and consolidated, whereas in later stages, these resources are reorganized and optimized to achieve greater efficiency. Throughout this trajectory, students not only refine their strategies but also develop a deeper understanding of learning, transitioning from externally driven activity to a process closely linked to personal development.

The functional organization of the learning system exhibits a cyclical nature, characterized by phases of increased integration followed by adjustment and optimization. Within

this framework, certain components—such as motivation and planning—consistently play a key role in academic success, while others gain importance depending on the stage. Additionally, there is a shift from the predominance of cognitive factors in early stages to a stronger influence of personal factors, fostering autonomy and responsibility in learning.

At the same time, different forms of organizing learning activity emerge, influencing academic achievement. While structural organization is more decisive in the initial stages, functional organization becomes more relevant in later phases. Gender-based differences in the functional organization of learning are also observed, with certain patterns—particularly those associated with female students—tending to demonstrate greater effectiveness in solving educational tasks.

Overall, the analysis of learning as a psychological functional system provides a comprehensive understanding of its development, revealing consistent patterns in its structural, functional, and genetic organization. This perspective offers a solid foundation for the development of theoretical and practical approaches aimed at improving educational processes.

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