AGE-RELATED DYNAMICS OF INTELLECTUAL DEVELOPMENT IN COMPREHENSIVE SECONDARY SCHOOLCHILDREN

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https://doi.org/10.5281/zenodo.20624792

Abstract. *This article examines the age-related dynamics of intellectual development in middle school students from late childhood to late adolescence (grades 3 to 10) using both longitudinal and cross-sectional methods. Utilizing the Wechsler Intelligence Scale for Children (WISC), the study analyzes the qualitative and quantitative changes in the structure of general (G-factor), verbal, and non-verbal intelligence. The findings indicate that integration processes predominate in the structure of intelligence at the age of 13–14, whereas processes of differentiation and individualization begin to emerge at 15–16 years old. Finally, the authors provide practical recommendations for organizing intellectual education and implementing individualized developmental programs within the environment of mainstream public schools.*

Keywords: *intellectual development, age-related dynamics, adolescence, verbal intelligence, non-verbal intelligence, longitudinal study, Wechsler intelligence scale, integration, differentiation, intellectual education.*

Introduction

The intellectual education of students constitutes one of the core priorities of modern comprehensive schools. The development and implementation of intellect-intensive technologies within the school educational process cannot be achieved without carefully considering the patterns of age-related changes in intellectual structure, particularly the sensitive periods of personality development.

In foreign literature, the following perspectives on the intellectual development of adolescents can be identified. As L.S. Vygotsky pointed out: "The traditional psychology of the transitional age tends to see the emotional changes as the central core and principal content of the entire crisis, thereby contrasting the development of the adolescent's emotional life with the intellectual development of the schoolchild" [1]. However, it is precisely the restructuring of the intellectual sphere that serves as the foundation for subsequent fundamental changes across the entire personality system of the adolescent. Due to intellectual development during adolescence, the child's sphere of consciousness expands, a groundwork is laid for the adequate understanding of others, and the foundations of self-awareness and conscious intellectual self-regulation are established.

The most profound attention to the problem of adolescent intellectual development is observed in the works of L.S. Vygotsky and J. Piaget. Despite existing differences, both authors emphasize that starting from the age of 11–12, a nearly complete restructuring occurs in the child's intellect, resulting not only in the emergence of its new forms but also in the subsequent reconfiguration of prior forms based on this new foundation. L.S. Vygotsky considers the emergence of conceptual thinking (ponyatiniye) to be the central neoformation of the adolescent's intellectual sphere. Through concepts, the child becomes capable of systematizing the perceived

world in all its diversity, an intellectual restructuring of elementary cognitive functions takes place, and new possibilities for self-awareness open up. "Intellect emerges as an effect of changes in interfunctional connections, representing a specific 'alloy' (synthesis, integration) of cognitive processes restructured by the categorial apparatus of conceptual thinking" [7].

J. Piaget associates the qualitative restructuring of intellect during adolescence with the emergence of formal-logical thinking (the stage of formal operations). Due to the formation of formal operations, the possibility for fully-fledged intellectual adaptation arises, and "thinking becomes free relative to the real world" [5]. Both Vygotsky and Piaget emphasize that the qualitative restructuring of intellect characteristic of adolescence is significantly prolonged in terms of time. "It would be an error to imagine that the adolescent's entire thinking is encompassed by concepts" [2]. This is akin to the view that an adult thinks solely on the basis of the laws of formal logic. Abstract thinking is not a quantitatively predominant form, especially in early adolescence. In this regard, tracing the quantitative and qualitative changes in the structure of adolescents' intellect arouses considerable interest.

Studies on the age-related dynamics of adolescent intellectual development conducted by a number of foreign psychologists have revealed several patterns. Thus, based on the experimental results of V.A. Averin and J.A. Balakshina, the uneven nature of the intellectual development process during adolescence is emphasized, distinguishing two distinct periods: the sensitive period (ages 12–13) and the critical period (ages 13–14). The first period is characterized by the highest rates of development, particularly in indicators of general awareness and the capacity for generalization, whereas the second period is marked by the stabilization of most verbal and non-verbal intelligence indicators. [1].

Similar conclusions can be drawn from the results of other studies. For instance, according to data by I.A. Pinchuk and N.K. Shelyakhovskaya, the level of verbal-logical reflection in adolescents increases significantly during the transition from the 5th grade to the 6th and 7th grades, followed by a slight decrease by the 8th grade [4].

In studying the age-related dynamics of intellectual development, most authors equate intellect with thinking and, rather than viewing it as a general ability, focus predominantly on discrete functions and traits (reflection, generalization, classification). A theoretical analysis of existing approaches to the concept of "intellect" reveals that there is currently neither a single definitive understanding of intellect nor a unified approach to its measurement. However, one aspect is certain: the understanding of this phenomenon cannot be restricted to its functions, activity outcomes, or quantitative IQ metrics. In our view, given the current level of knowledge regarding its nature and mechanisms, intellect can be conceptualized as a "black box" for which the determining operational factors, as well as the functional manifestations emerging as derivatives of its structure, are known.

Organization of the Research. This study was conducted using the cross-sectional method among students of comprehensive secondary school No. 11 in the city of Yangier. The dynamics of intellectual development were evaluated in 3rd to 6th-grade students (23 participants). Students with higher intellectual parameters were included in the experimental group: the group average IQ value for the third grade constituted 126 points,

As a tool for measuring the characteristics of the participants' general intellectual development, the children's version of the D. Wechsler scale adapted by Yu.I. Filimonenko and V.I. Timofeev was utilized [8]. The methodology is based on the hierarchical model of Wechsler's intelligence, which posits the differentiation of the general factor (G-factor) into verbal and non-

verbal intelligence factors, which, in turn, are subdivided into a series of specific factors corresponding to individual subtests. The Wechsler scales are among the most renowned and proven instruments in intellectual psychodiagnostics, enabling the disclosure of its structural features, the determination of the level and interrelation of several specific abilities, as well as their contribution to the integral assessment. The obtained data were processed using correlation and factor analysis methods [3].

Statistical processing of the data revealed the specific characteristics of standardizing the Wechsler scale and interpreting the obtained metrics. In this regard, it is pertinent to note the appropriateness of shifting the IQ interpretation scale slightly to the left.

RESULTS AND DISCUSSION

Dynamics of Intellectual Development in the Transition from Early School Age to Early Adolescence.During the transition from early school age to early adolescence, no tendency toward an increase or decrease in intelligence quotients (IQ) is observed. In the transition from the 3rd to the 6th grade, from the 3rd to the 7th grade, and from the 3rd to the 8th grade, the group-average IQ indicators do not change significantly. Statistical analysis conducted using the sign test revealed a significant increase in students' performance on the "Information" and "Object Assembly" subtests.

It can be assumed that the intellectual development of early adolescents is primarily associated with the expansion of their worldview, as well as the accumulation and systematization of knowledge. The outcome of this process is the formation of a knowledge base, which constitutes one of the essential components of human intellect. This fact is corroborated by the rather high and significant correlation coefficients (ranging from 0.70 to 0.78) between IQ and the results of the "Information" subtest across various ages. Since the performance scores on this subtest demonstrate a sufficiently high mutual correlation across all three longitudinal studies at different ages (0.75, 0.68, and 0.75), the observed increase in performance cannot be interpreted as accidental.

The significant increase in performance on the "Object Assembly" subtest in the first and second longitudinal studies is, apparently, linked to the development of students' analytic-synthetic abilities and their capacity to correlate a part within the structure of the whole. This subtest differs from "Block Design" (in which no significant growth was observed) primarily because it engages the heuristic components of thinking, the ability to anticipate an ideal etalon, and the capacity to reconstruct the necessary integral image from individual elements. It is probable that between the ages of 11–12 and 14–15, the development of precisely these components represents the most crucial change within the non-verbal sphere of adolescents. It should be noted that the age boundaries in this study are, to a certain extent, conditional.

Based on the analysis of domestic and foreign literature, the concept of social behavior is defined for further research. Social behavior is a form of behavior of an individual or group, which is aimed at the formation and maintenance of interaction and relations between the individual and the people and groups surrounding him, contributing to the social structure of society and depending on the norms in it. Young people, as a special group of the population with specific age-specific behavioral patterns, are of the greatest interest for studying the relationship between Internet communication and social behavior.[9]

Regarding age-related characteristics, it can also be stated that adolescence represents a period of regulation over one's behavior, as well as a phase characterized by apprehension regarding future planning [10].

In conclusion, the Internet has transformed the social environment of youth in significant ways. Understanding the psychological aspects of Internet communication is essential for creating a safe and supportive digital environment that promotes healthy social development and well-being.[11]

CONCLUSIONS

Based on the investigation of the regularities of intellectual development in comprehensive secondary school students using longitudinal and cross-sectional methods, the following conclusions have been drawn:

1. **The Uneven Nature of Intellectual Development:** During the transition from early school age to early adolescence (grades 3 to 7–8), the general intelligence quotient (IQ) does not undergo sharp quantitative changes. However, during this period, qualitative indicators on the "Information" and "Object Assembly" subtests increase significantly. This indicates that intellectual development in the initial stage of adolescence occurs primarily due to the expansion of the worldview and the formation of analytic-synthetic abilities.
2. **Predominance of Integration Processes at Ages 13–14:** In early adolescence, integration processes occupy a leading position within the intellectual structure. Intellect develops as a holistic cognitive system and determines the adolescent's academic achievement level. Concurrently, it was established that the systematic coordination of scientific concepts within mainstream educational settings is not yet fully completed at this stage.
3. **Differentiation and Qualitative Leap at Ages 15–16:** In the transition from early adolescence to late adolescence and youth (grades 8 to 10), a significant quantitative increase in the general IQ level is observed (\(p=0.004\)). This growth is predominantly associated with the rapid development of verbal intelligence. In older school-age students, a distinct boundary (differentiation) occurs between the verbal and non-verbal spheres of intellect, along with the individualization of personal cognitive styles.
4. **Pedagogical Recommendations:** The obtained results demonstrate the necessity of differentiating the school educational process in accordance with age-related characteristics. While a system of games and training aimed at stimulating intellectual interests and unlocking creative potential is required for 6th to 8th-grade students, implementing individualized educational programs based on internal differentiation yields high efficiency for 9th to 10th-grade students.

REFERENCES

1. Averin, V. A. (1998). *Psychology of children and adolescents*. St. Petersburg.
2. Vygotsky, L. S. (1984). *Child psychology*. In *Collected works: In 6 volumes* (Vol. 4). Moscow.
3. Druzhinin, V. N. (1999). *Psychology of general abilities*. St. Petersburg.
4. Chalikova, O. S., & Zaitsev, A. V. (2000). *Page*.
5. Piaget, J. (1994). *Selected psychological works* (Translated from English and French). Moscow.
6. *Psychological problems of improving the quality of teaching and upbringing*. (1984). Moscow.
7. Kholodnaya, M. A. (1997). *Psychology of intelligence: Paradoxes of research*. Tomsk; Moscow.
8. Filimonenko, Yu. I., & Timofeev, V. I. (1994). *Manual for the methodology of studying intelligence in children using D. Wechsler's WISC*. St. Petersburg.

9. Turdalievich, M. D., & Ayubovna, F. S. (2022). Psychological aspects of Internet communication in the social life of youth: The results of the study of Internet dependence using Kimberly Young's method. *NeuroQuantology, 20*(12), 3409–3417.
10. Mirzayev, J. T. (2023). Psychological aspects of the influence of Internet communication on youth social behavior. *Academic Research in Educational Sciences, 4*(TMA Conference), 812–816.
11. Turdalievich, M. D. (2024). Psychological aspects of the influence of Internet communication on the social environment of youth. *Eurasian Journal of Academic Research, 4*(5-1), 110–115.