

Systemic-Functional Approach with using Digital Technologies in Teaching English to Primary School Students

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Abstract

A The article analyses the problem of professional support of polylingual personality development in the dimensions of a system-functional approach using digital technologies to teaching English to primary schoolchildren in the conditions of the dynamic modernity.

Purpose: *The purpose of the study was to identify the resource potential of the systemic-functional approach to teaching a foreign language (in particular, English) to primary school students with the use of digital technologies.*

Research methods and techniques: *The research required the study of theoretical aspects of the foreign language learning organization with the use of digital technologies and meta cognitive schemes. In the research process the following theoretical methods were used: the method of psycholinguistic and psychological literature analysis, the generalization of the data obtained as a result of the analysis, the identification and substantiation of predictors of effective English language learning for primary schoolchildren, the formulation of conclusions. The main method of empirical research was the observation method with the recording of quality indicators of learning English as a foreign language and further content analysis of the data. It allowed evaluating the effectiveness of teaching English to children of primary school age in the logic of given realities. The method of semi-structured interviews with the subjects of pedagogical activity was also applied, it allowed specifying the trends of using unformation and communications technology (ICT) for teaching English to primary school students. In order to statistically confirm the significance of the obtained data, the method of one-factor variance analysis (Fisher's φ -criterion) was used.*

Results: *The logical conclusions of the study allow us to state that the systemic-functional model of foreign language learning in the dimensions of the unstable present is a productive learning tool, which is based on the principle of the target purpose (meta function) of language and appears in language as an integrated whole, that helps to reveal different layers to the subjects of speech meanings and bring to life the grammatical resources of the language. It is appropriate to use digital technologies (primarily ICT) and the projective-recursive technology of working with meta cognitive schemes as predictors of the educational program. In this context, learning can be interpreted as an open evolutionary process of modeling the linguistic consciousness of an individual.*

Conclusions: *The article proves the optimal developmental effect of the ICT use in the process of learning a foreign language, which allows creating a comfortable educational environment for primary school students. In this environment the specifics of the genesis of the digital subculture children existence, individualizing the architecture of learning and expanding the age limits of meta cognition have to be taken into account. The effectiveness of the research project was confirmed by variance analysis data (at $p \leq 0.05$). The obtained results significantly complement the materials presented by the scientific community regarding the trends in the English language learning by primary school students in modern society.*

Keywords: ELearning a Foreign Language (L2), Blended Learning, System-Functional Approach, Digital Technologies, Metacognitive Schemes, Primary School Age.

1. Introduction

Polymodality, global digitalization and the system-integrative continuum of the modern information society determine the need to rethink the dimensions of the 21st century world system universal matrix. The reformation of the educational coordinates architecture should become especially urgent, and in particular, the teaching of a foreign (primarily English) language, which is designed to help schoolchildren develop intercultural communication skills and integrate into the English-speaking world of technologies of the networked international space. The representatives of the modern Internet generation, who are “digital natives” of the globalized present, have mastered computer and digital literacy since childhood, they use various gadgets in everyday life. In this context, the expediency of using the developmental resources of digital technologies, the Internet in the organization of foreign language learning for primary school students does not need to be proved [1].

The problematic field of foreign language learning has become the focus of attention of scientists, teachers and consumers of educational services, who are concerned with the issues of the educational process modernization in a changing information space [2-5]. After all, the semantic discourse of the “literacy” concept in the 21st century is no longer considered as a person’s ability to competently use language in a monocultural environment. Literacy today involves the ability of an individual to navigate in a complex communicative space, which is characterized by multimodal meaning-making, local diversity and globality of paradigmatic connections, the ability to be aware of the intercultural meanings contextuality [6].

Both educators and scientists are actively discussing the issue of foreign language teaching methods, as traditional pedagogical technologies are limited in the ability to simulate a foreign language environment and create conditions for authentic communication in a foreign language [7-11].

Therefore, the modern dimensions of foreign language learning undoubtedly require the delineation of an innovative contextual resource of the multidimensional quality of education indicators [12]. They also need to be focused on ensuring the integrity and multi-vectority of perception and internalization of the educational experience pragmatics, as well as stimulation of students’ cognitive motivation in learning a foreign language [6, 12-14]. The specified markers of foreign language teaching in a modern post-industrial high-tech society are difficult to imagine without the comprehensive use of digital technologies, which is particularly urgent for teaching English to children of primary school age [4, 15, 16].

This age group (6-10 yearolds) is particularly sensitive to the systematic development of metacognitive forms of mental activity, formatting of the “learned bilingualism” experience and the constructive modeling of the secondary language personality, that is capable of integrated foreign language learning [17-20]. In this context, the axiomatic scenario for the development of the resource potential of primary school students (especially when learning English as a foreign language (EFL)) can be recognized as the content of

metacognitive processes actualizing using digital technologies [4, 15, 21-24].

Analysis and generalization of a fairly wide scientific research content allow us to state that in the field of teaching foreign languages to schoolchildren with the use of digital technologies (and primarily ICT), mixed (hybrid) courses that combine information and communication technologies with traditional classroom practice are the most popular; they make it possible to implement flexible training formats by taking into account the age and individual typological characteristics of students, as well as adapting the educational material to the needs and expectations of schoolchildren [15, 25, 26].

Among the advantages of using digital technologies in the process of learning foreign languages by primary school students, it is worth noting the expansion of variable combinations of the organization of learning possibilities, and above all, the expansion of forms and tools of knowledge transfer: emphasis on logical schemes of material presentation, information visualization (the use of visual reinforcement that promotes understanding), language practice (tasks, cases, etc.); the choice (and/or combination) of sensorimotor (auditory, visual, tactile) perception or interactive involvement in the continuum of augmented reality, game content (in particular, with virtual participants) [25, 26]. Learning with the help of digital technologies (primarily ICT) helps primary school students master the skills of listening and confident speaking in a foreign language, affects the formation of digital competence (the ability to effectively perform various tasks in a digital environment).

Thus, information and communication technologies appear in the dimensions of the educational space as a promising tool that is dynamically integrated into the system of everyday educational practice. At the same time, the problem of psycholinguistic and psycho-pedagogical substantiation of productive strategies for optimizing the teaching of foreign languages to children of primary school age with the use of ICT still requires systematic research. In particular, the developmental potential of the system-functional approach to learning foreign languages with the involvement of ICT in working with metacognitive schemes is insufficiently studied.

With an understanding of the discussion content of the specified problem and awareness of the importance of the individual metacognitive development in today’s information space, we organized an empirical study of the predictors of the system-functional approach to learning foreign languages, which aimed to outline the resource potential of the system-functional approach to learning a foreign language (in particular, English) with the involvement of digital technologies by primary schoolchildren. As a research task, we considered the possibility of evaluating the heuristic and developmental resource of ICT in the logic of the system-functional approach to teaching English to younger schoolchildren with using metacognitive schemes.

1.1. Research Methods and Techniques

The polyvalent character of the study of the system-functional content of teaching foreign (English) language to primary

schoolchildren determines the need for a comprehensive analysis of the effectiveness of the specified learning technology on the basis of a multi-perspective (integrative) paradigm. Here we need to take into account the prospects of using ICT to provide new opportunities for schoolchildren in the educational space. The scheme of the complex study provides for the expansion of the sphere of causal and functional dependence of younger schoolchildren's new mental constructs in the field of foreign language learning. A comprehensive approach determines the impossibility of local changes in the field of mental development of a specific individual without forecasting and maximum possible avoidance of negative side effects of the proposed solutions in the innovation and development program.

The convergence of two research vectors can be considered as the ontological referent of the research program for the introduction of a system-functional approach to teaching English with the use of digital technologies to primary school students, which allows to explain, understand and reconstruct the semantic field of the possibilities for optimizing the process of teaching a foreign language for primary school students: analysis and generalization of theoretical and methodological aspects of the resource capabilities of the system-functional approach to teaching English using ICT, which meet certain requirements for the formation of communicative and informational competences of younger schoolchildren; an empirical study of the possibilities of oral, intellectual and personal development of respondents in the context of the implementation of an innovative development program for teaching English as a foreign language to primary school students with the involvement of ICT and metacognitive schemes [4, 27].

The private enterprise "Educational center "Interclass"" (Kryvyi Rih, Ukraine), certified as an afterschool educational establishment, was chosen as the base for the experimental study. The main method of the research was the observation method with the recording of mastering English as a foreign language quality indicators and further content analysis, which allows to evaluate the effectiveness of teaching English to primary school children in the logic of the system-functional approach using metacognitive schemes and ICT; the method of semi-structured interviews with students (as subjects of pedagogical activity) was also applied. They allow to specify the trends of using ICT in the dimensions of English language teaching to primary school students.

The computer statistical program IBM SPSS Statistics 19 ("Statistical Package for the Social Science") was used for summarizing and analyzing empirical materials. The variables were checked for the normality of the characteristic distribution. In order to statistically confirm the significance of the obtained data, the method of one-factor variance analysis (Fisher's φ -criterion) was used.

1.2. Sample

The sample of the empirical study was made up of 38 students of the Educational Center "Interclas" (primary education group) aged 6-7, who were taught English in the format of a system-functional approach using digital technologies and

metacognitive schemes. As a control group, a group of the first grade (35 people aged 6–7 years) of a Kryvyi Rih secondary school was chosen. Foreign language training of primary school students in the control group was carried out according to the standards of the New Ukrainian School with a focus on speech grammar; the use of digital technologies in the educational process was limited to multimedia presentations. In order to comply with the principles of ethical and professionally adequate behavior accepted in the scientific environment, the authors obtained informed consent from the parents of potential participants of the empirical study regarding the involvement of primary school children in learning English in the logic of the system-functional approach using ICT and the projective-recursive technology of working with metacognitive schemes [27].

2. Results

The modern European socio-cultural space of the 21st century, oriented in the continuum of technological singularity, is characterized by a constant tendency to acquire new open models of educational practices aimed at ensuring the quality of the educational process. At the same time, the practice of teaching a foreign language is traditionally focused on learning the grammatical (formal) structure of a foreign language (morphology, rules of word formation, syntax), while the peculiarities of the language functioning remain on the periphery of the educational process. In this context, we share the opinion of B. Derewianka and P. Jones, who emphasize that focusing on the traditional grammar of a foreign language with an emphasis primarily on the syntactic accuracy of constructing language structures using basic lexemes will be sufficient enough only for students who are not interested in developing soft-skills that allow better orientation in the changing present [10]. Complete internationalization of the modern living space actualizes a new task of teaching foreign languages: it requires going beyond the boundaries of "correctly formatted sentences" that will help students to work successfully in the discourse range of foreign language contexts. Therefore, the organization of teaching a foreign language in modern conditions of educational paradigms sustainable development requires an understanding of the resource possibilities of the latest approaches to the formation of language competences. The materials presented in this article are a well-founded step on the way to solving the specified problem.

The research project involved the modeling of an open educational space (on the basis of the Educational Center "Interclass") by introducing a system-functional approach to the practice of teaching English as a foreign language to primary schoolchildren. The emphasis in teaching English was placed on the communicative competence of schoolchildren (listening, understanding, speaking). The use of digital technologies (primarily ICT) and the projective-recursive technology of working with metacognitive schemes were chosen as predictors of the curriculum.

We consider the system-functional approach as one of the most productive ways of teaching English according to the challenges of modern times [10].

The system-functional model of foreign language learning is based on the principle of the purpose (metafunction) of language: the use of language constructions in a socio-cultural context, which allows modeling the linguistic picture of the world (worldview function), interacting with other representatives of the language community (communicative-interactive function) and producing contextual coordinated coherent texts (text-forming function). The specified functions appear in language narratives as an integrated whole, revealing different layers of meanings to the speech subjects and realizing the grammatical resources of the language.

The systematic involvement of digital technologies in the educational process was carried out in the format of blended learning, which involves a combination of the possibilities of digital content (audio and video ICT resources) and classical means, forms and techniques in education. The use of ICT provided an opportunity to individualize learning, increase the cognitive activity of primary schoolchildren, and optimize the developmental potential of the educational environment. The analysis of scientific and teaching-methodological literature and the authors' own pedagogical experience prove that in the process of teaching a foreign language to primary school students, digital technologies allow:

- Create learning content that is familiar (and therefore comfortable) for children of the Internet generation (multimedia presentations, augmented reality, didactic, role-playing and simulation games, theatricalization (using ICT), animation, communication with virtual game participants, etc.), where the constant cognitive interest of children is supported;
- Presenting didactic information on the monitor screen in a visual form clear to primary school students, which corresponds to the age characteristics of the mental development of such children (predominance of involuntary attention, impulsivity, visual thinking, the need for reference schemes when solving problems, sensitivity to speech development and formation of bilingualism experience);
- Keeping children's attention on didactic material (bright images, moving objects, sound accompaniment, etc.);
- Stimulating cognitive activity and motivation of primary schoolchildren, creating a situation of success in communicative situations by means of training and

development programs.

- The following can be singled out among the obvious advantages of blended learning of English by younger schoolchildren:
 - The effectiveness of the educational process, determined by strengthening the motivation of younger students and diversifying learning techniques;
 - Optimal feedback in the dimensions of educational dialogue (both for the teacher and for the student), which proves the effectiveness of foreign language acquisition and allows to adapt training to the specific needs of the subjects of education;
 - The systematic nature of the learning process, because due to the use of ICT tools in the system-functional organization of foreign language learning, students can continuously be in the process of acquiring a foreign language, synthesize adaptive thinking strategies, and form self-education skills.

The projective-recursive technology of working with metacognitive schemes turned out to be an important predictor of the effective English language teaching to the children of primary school age in the logic of the system-functional approach with the use of digital technologies. This technology is more common in the field of programming and teaching computer literacy, but the experience of the Educational Center "Interclass" proves its effectiveness in teaching a foreign language as well. It is explained by the fact that the content of the projective learning strategy is quite effective in working with open systems characterized by a certain amount of development unpredictability, the functional value of which is revealed in situations of uncertainty (the foreign language learning system is characterized by such features). At the same time, when studying the cultural regularities of the foreign language functioning, human thinking began to demonstrate recursive properties (from the Latin *recursio* - "return"), to which the mechanisms of language acquisition are adapted, which determine the ability to generate nested statements and other linguistic constructions and expand the conceptual sphere of the worldview concepts. In the context of the above, the Educational Center Interclass uses metacognitive schemes (see, for example, Fig. 1) to teach English to primary schoolchildren. Such schemes contain information about the conceptual characteristics of the real world objects.

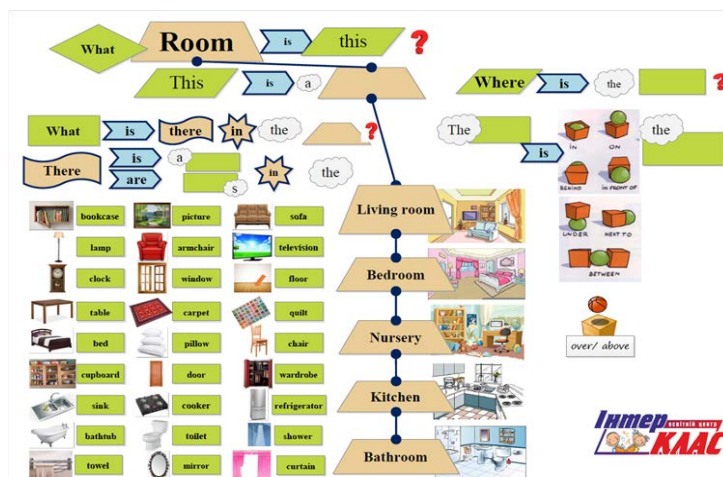


Figure 1: An Example of a Metacognitive Scheme

In the process of learning a foreign language, metacognitive schemas form the systemic content of the schoolchildren's mental experience: from basic algorithmized formations (in particular, categorization, description, cause-and-effect structures, sequences, etc.) to templates with meaning-making patterns. In such schemas generalization and systematization of symbolic information contributes to the formatting of the mental denotation graph in the language consciousness of students. This ensures that primary schoolchildren show understanding (rather than formal memorization) of grammatical connections between concepts in the structure of the language field, understanding of logical sequences of mental denotation graph elements of different order in systems of expansion (psycholinguistic recursion) of the conceptual sphere studied by schoolchildren. The data obtained as a result of the research allow us to state that in working with children of primary school age, metacognitive schemes provide an opportunity to construct knowledge of a foreign language, master new experience in the chronotope of success in accordance with their current level of awareness in this topic and personal level of cognitive development.

The parameters for evaluating the success of primary school students in learning a foreign language in the innovative "Interclass" program were picked up in accordance with the requirements of the State Standard of Primary Education regarding the mandatory learning outcomes of students' language and literary education (foreign language education) (Decision of the CMU, 2018). Representative markers of the success of foreign language learning among primary school students were analyzed: characteristics of learning material perception (listening), understanding of foreign language texts and production of foreign language constructions in communication (speaking). The generalized results of measuring quantitative indicators of the absolute frequency of the polymodal markers demonstration in mastering a foreign (English) language during the lesson (45 minutes) in the compared groups of the sample groups are shown in Table 1.

Primary data processing was carried out by the method of content analysis followed by calculation of average statistical values of the obtained material. The computer statistical program IBM SPSS Statistics 19 ("Statistical Package for the Social Science") was used to generalize and analyze the results of the empirical section.

Table 1: Parameters of Statistical Reliability of Differences in Indicators of Foreign Language Learning Between the Groups of Respondents

Analysis criteria	Distribution of respondents in typical groups		The value of univariate variance analysis	
	Experimental group (N=38)	Control group (N=35)	ϕ -Fisher's test	Level of significance of differences p
Markers of learning success	The frequency (absolute frequency) of the learning success marker demonstration			
Perception of information expressed in a foreign language in the conditions of direct and indirect intercultural communication (listening)				
Adequate response to perceived information verbally and/or non-verbally	0,42	0,12	1,973	0,038
Drawing / selection of illustrations based on what is heard; presenting information graphically	0,62	0,35	2,728	0,001
Comprehension of foreign language texts of various types for obtaining information and its critical evaluation				
Understanding the content of oral expression in a familiar everyday context	0,46	0,21	2,805	0,041
Critical assessment of information (analysis, interpretation)	0,27	0,17	0,451	0,717
Communicating with others orally and in real time using a foreign language (speaking)				
Correct pronunciation and stress in commonly used words in their statements	0,75	0,63	1,891	0,132
Ability to produce questions and information about oneself and everyday activities	0,32	0,28	1,708	0,167
The ability to create real-time simple messages using a few short sentences	0,83	0,34	3,168	0,017
The ability to interact with other people in various communicative situations	0,68	0,21	3,853	0,005

The results of the statistical stage of data analysis proved that the differences between the experimental and control groups of primary school students in identifying markers of foreign language learning are reliably significant relative to individual predictors of the logical ordering of speech-thinking dimensions of language awareness ($p \leq 0.05$). Pupils of the Educational Center "Interclass", compared to students of a comprehensive primary school, demonstrate statistically significant better results of learning English in the logic of the system-functional approach using ICT and the projective-recursive technology of working with metacognitive schemes in the listening ($0.038 = p \leq 0.05$ and $0.001 = p \leq 0.05$), understanding the content of oral expression in a familiar everyday context ($0.041 = p \leq 0.05$) and in identifying communicative competences: the ability to create simple messages in real time using a few short sentences ($0.017 = p \leq 0.05$) and interact with other persons in various communicative situations ($0.005 = p \leq 0.05$). The included observation of the work in the study groups of "Interclass" also proves that the children of the experimental group behave more confidently in educational situations and calmly take on solving complex tasks. They master the grammatical structure of a foreign language, use personal intellectual resources and adequately formulate language constructions of a foreign language system.

The positive results of the implementation of an innovative (systemic-functional) program with a wide application of digital technology resources and metacognitive schemes into the English language learning process of primary school students confirm the possibility of purposeful addition and ordering of competency scenarios for mastering a foreign language (listening, understanding, speaking) in internalized experience and strategies of language activity. The systematic use of ICT and metacognitive schemes in the English language learning by primary school students turns students into active creators of personal experience; in this context, learning can be interpreted as an open evolutionary process of modeling the linguistic consciousness of an individual.

Availability of data

Extended results of the research project presented in this article are available in the Mendeley Data Search system at <https://data.mendeley.com/drafts/2d7947vsjz>; doi:10.17632/2d7947vsjz.1 [28, 29].

3. Discussions

Recognizing that "technology and education have the most intertwined future" (Pegrum, 2009: 5), we are fully aware that one of the predictors of modern educational space optimization should be the investment in information and communication technologies (ICT) and systematic implementation of digital technologies in teaching practice (and, in particular, teaching foreign languages), which determine the qualitative transformations of students' language development [21].

At the same time, it should be taken into account that the pace of transformational processes in the dimensions of

the digital present deepens theoretical and methodological discussions, which opens a new discourse for understanding the markers of quality education. State standards of primary education (Decision of the CMU, 2018) declare: the goal of foreign language education is the formation of foreign language communicative competence for direct and indirect intercultural communication, which ensures the development of other key competences and the satisfaction of various life needs of the learner. However, as practice proves, traditional teaching models are primarily focused on the cognitive paradigm and students' assimilation of the foreign language grammatical structure, without taking into account the new meanings of the educational process caused by the development of the information society.

A similar situation arises in the field of digital technologies, which are considered primarily as a means of communication in distance education; other possibilities of ICT in the practice of teaching a foreign language are applied unsystematically. There are still some concerns about the feasibility of using multimodal pedagogy resources in educational practice, which may be caused by the level of teachers' digital education and the insufficient quality of computer-based educational programs [6]. After all, digital tools, ICT can be effective only if teachers are ready to use them and, what is also important, if such tools meet the needs of educators [9]. The results of a diagnostic interview with primary school teachers who teach a foreign language to younger students (74 people, Kryvyi Rih, Ukraine) showed that teachers primarily lack state support in providing high-quality digital technologies (68% of respondents) and in financing new educational materials developments (87% of respondents).

The obtained data require additional study, but it is already clear that digitalization of education requires significant investments and methodological support. This opposes the results of the study of educators' attitudes towards the introduction of digital technologies in the USA and Switzerland. Scientists emphasize that factors of external support and contextual resources, such as funding, did not affect respondents' decision to implement technologies [9]. In our opinion, this indicates a sufficient level of financial support for educators in more technologically developed countries, which allows them not to emphasize this marker the educational services quality, but to focus on the ease of use of digital technologies and the effectiveness of their application.

Therefore, we consider it necessary to emphasize that the process of digitalization of the educational space should be system-integrative and provide for a sufficient level of state support (comprehensive programs for the digitalization of educational institutions, the creation of digital infrastructure at the educational space), the presence of adequate methodological support (which guarantees the possibility of choosing variable digital technologies available for practical use to teachers) and stimulation of teachers self-efficacy (strengthening of professional and personal competences, motivation, confidence in one's success).

4. Conclusion

Comprehension of the results of this theoretical and experimental-empirical study confirms that in the modern technological society teaching a foreign language to children is characterized by ambivalence and systemic dynamics of paradigmatic development.

Therefore, the formal-grammatical model of foreign language competence formatting in education is being replaced by models of cultural personality development, among which the system-functional approach to foreign language learning should be recognized as sufficiently productive. It determines the effectiveness of mental modeling of the global socio-cultural space as an element of learners' language consciousness, and in particular it develops mental modelling in younger schoolchildren.

Systematic stimulation of the heuristic resource of the primary school children intellectual activity necessitates the creation of an integrative educational environment, saturated with examples of constructive speech and thinking activity and objectively new ways of modeling the skills of its implementation.

In this context, we believe that the optimal developmental effect of the use of digital technologies (and above all ICT) in the process of learning a foreign language is proven, which makes it possible to create a comfortable educational environment for primary school students. We also need to take into account the specifics of the digital children genesis, which requires individualizing the architecture of learning and expanding the age limits of metacognition.

The projective-recursive technology of working with metacognitive schemes, which ensures the conscious structuring of students' personal experience regarding the perception, understanding and construction of various types of foreign language texts, also requires special attention in the dimensions of the polylingual development of primary school age children in the logic of the system-functional approach using digital technologies, as well as experience in formatting skills for communicating with others orally and in real time using a foreign language.

The theoretical analysis of the psychological-pedagogical and methodical literature and the authors' own work experience allow us to conclude that the system-functional approach using ICT and the technology of working with metacognitive schemes in learning English by younger schoolchildren is well combined with the traditional education system, as well as with any innovative educational technology, and therefore allows improving the process of developing students' linguistic awareness.

The results of the study of trends in foreign language learning for children of primary school age in terms of the modern educational paradigm, presented in the article, are a part of a broader author's research project; the given materials do not reveal all aspects of the given problem, but, in our opinion, they can contribute to solving a wide range of psycholinguistic

practical problems related to understanding the dynamic context of professional support of multilingual personality development. In particular, the content of determining the mechanisms of language awareness development in primary school age students can become a promising direction of research.

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