Metacognitive Schemes as a Tool for Teaching English to Young Learners: Psychological Discourse

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Abstract: The article presents the results of a theoretical and empirical analysis of the problem of optimizing teaching English to students of primary school age, taking into account the requirements of the modern information society. It was stated that training should format an active approach to modeling the knowledge and competencies of students. This position of the authors allows us to consider thinking in a foreign language as the goal of learning and an indicator of the degree of language proficiency. As a research problem, the authors considered an attempt to evaluate the heuristic and developing resource of metacognitive schemes in the logic of projective-recursive technology for teaching English to primary school children. The authors present the results of a study of the dominant type of thinking of primary school students as an indicative construct of metacognitive development. It is proved that younger students are mostly characterized by sign and symbolic thinking; this confirms the possibility of using metacognitive schemes in teaching English to children of this age group. Particular attention is paid to the analysis of the practical experience of using metacognitive schemes in the practice of teaching English to primary school children at the Educational Centre «Interclass» (Kryvyi Rih). This technique involves the construction of a mental denotative graph that performs the function of sense formation and mental interpretations modeling in the students' minds. The obtained results complement the materials presented by scientists regarding the trends in teaching English to primary school children using a resource of metacognitive schemes.

Keywords: *metacognition; metacognitive pattern; sign thinking; projective-recursive technology; teaching a foreign language; primary school students.*

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Introduction

Radical transformations and inconsistency of the 21st century information society determine the multivector nature of semantic life chronotopes. Globalization, flexibility, openness and internationalization of the modern sociocultural space format the ideal conditions for «creative destruction» that give rise to a new order of the evolutionary development of the humanity. A dynamic, changing world also requires modification of the predictors of mental reflection as an initial global image, which predetermines the specifics of modeling worldview concepts of a human. The famous American futurologist Alvin Toffler in his book «Future Shock» (Toffler, 1970) emphasizes the crucial importance of the problem of changing the nature of a human in the information society and improvement of personal potential through accepting the values of the global world – tolerance, recognition of each person's identity and inter-cultural competence. This is especially evident in the system of the young generation development.

Representatives of the new Internet generation (metaphorically identified by the followers of the V. Strauss and N. Howe generation theory as generation «Z» and generation «A») are developing in the world of postmodernism and digital technology, which determines the variability of the universal matrix of the world order. They master the computer from childhood, develop digital literacy and integrate into the World Wide Web. This context requires the good level of English as a language of international communication.

The problem of teaching English is quite relevant and widely discussed among scientists, methodologists, and service consumers. (Ainoutdinova & Ainoutdinova, 2017; Banks, 2016; Kamyanova, 2014; Chrabaszcz & Gor, 2017; Tsehelska, 2018; Sullivan, 1996; etc.).

Significant discussions take place, in particular, in the problem field of the need to modify the trends in teaching English in a volatile information space (Ansari et al., 2017; Banks, 2016). The issues of monitoring and contextual designation of indicators of multidimensional quality of education are discussed in the world community (Angelini & García-Carbonell, 2019; Tokuhamma-Espinosa, 2015), the need for the integrity and multivector perception of educational reality which provides adequate learning experience for beneficiaries is emphasized (Serdenciuc, 2016), and described as stimulating the formation of students' cognitive interest in learning a foreign language (Angelini & García-Carbonell, 2019;

Zhurat et al., 2019; Jiani et al., 2019). However, the results of teaching foreign languages (especially in the school system) cannot be called impressive. One of the reasons, in our opinion, is the discrepancy between the methods offered by the language teachers and the mental resource of students of English.

Traditional methods offer imitation and passive-mechanical models of studying a foreign language (as the analysis of literary sources and the authors' own experience suggests) which do not provide the desired results (Foursha-Stevenson et al., 2017; Kamyanova, 2017; Tokareva, 2018; Tsehelska, 2018). T. G. Kamyanova in the analysis of practical advantages of the methods used in the practice of teaching English (the grammar-translation method of L.V. Shcherba (Scherba, 1974), the audiolingual and audiovisual methods, the cognitive method of Chomsky (Chomsky, 2006), the communicative method, etc.) emphasizes that only a «conscious approach to learning a foreign language with systematic mastery of linguistic material and consistent speech practice ... forms long-term analytical, synthetic and causal relationships, contributing to the development of foreign language thinking and coherent speech, which guarantees deep knowledge of a language» (Kamyanova, 2017, p. 43). Similar ideas are also voiced by Bland (2015), Jiani et al. (2019), Gardner (2000), Richards (1990) and Larsen-Freeman (1998) that focus on the importance of the development of speech and cognitive activity in accordance with grammatical schemes and semantic connections of a foreign language system, which determines the formation of linguistic and communicative competence of students.

A particularly vulnerable area for the multilingual development of students is the ability to independently construct the semantic structure of speech utterance, to understand the textual constructs of a foreign language (Khaleeva, 1989), which is relevant for preschool children (Cahyati et al., 2019; Creel, et al. 2016; Garton et al., 2019; Kharchenko, 2017; Pirozhenko & Soroka, 2018; etc.) and primary school age (Cahyati et al., 2019; Teaching English to Young Learners, 2015). This age group of children is sensitive to the speech development and formatting of the experience of «artificial bilingualism» (Voronin & Rafikova, 2017), and, consequently, to the formation of a secondary language personality (Cahyati et al., 2019; Karpenko, 2002; Ptitsyna, 2007), which reflects the learner's skills in a foreign language communication system at the intercultural level (Banks, 2016; Garton et al., 2019; Khaleeva, 1989) and capable of integrated language learning - CLIL (Bland, 2015). A secondary linguistic personality is formed in the process of acquiring the linguistic and conceptual worldview

of the studied language (Khaleeva, 1989; Osorina, 2017; Tokareva, 2018) that helps to realize a new sociocultural reality for the growing personality. In this context, the axiomatic scenario of primary schoolchildren resource potential development (including the study of English as a foreign language (EFL)) has to recognise the content of actualization of metacognitive processes in the development system of reflexive and metacognitive forms of mental activity.

Metacognition is considered by cognitive psychologists (Gibson et al. 2019; Chernokova, 2014; Verbitskiy & Kofeynikova, 2017; etc.) a mental process that allows voluntary and involuntary regulation of intellectual activity. One of the first in the psychology of metacognition were the concepts of Flavell (1979) and Brown (1987), which defined the phenomenology of metacognition as individual knowledge of personal cognitive processes that performs the functions of active control, regulation and organization of cognitive activity in achieving specific goals. Metacognition helps students understand the meaning of the studied content and manage their activities, which allows interpreting the metacognitive competencies of the personality as the basis for effective learning (Verbitskiy & Kofeynikova, 2017: 123–124). At the same time, the problem of psychological, pedagogical and methodological substantiation of strategies for modeling the skills of metacognition of primary school students is still on the periphery of scientific research. The developing potential of metacognitive schemes has never been studied sufficiently, the use of such schemes in foreign language acquisition allows teachers to qualitatively change the vector of students' language development.

Understanding the discussion content of the identified problem and realizing the importance of metacognitive development of children in the complex of psychological, pedagogical and methodological support of education, **the purpose of this study** was defined by us as concretization of trends in teaching English to primary school children in the dimensions of modern information society. As a **research problem**, we considered an attempt to evaluate the heuristic and developing resource of metacognitive schemes in the logic of projective-recursive technology for teaching English to primary school children.

Methods

The need to verify the above-mentioned theoretical provisions in the context of practice-oriented analysis of the possibilities of optimizing the

process of teaching English to children of primary school age led to the empirical study.

The multimodality of the problem field of psychological and pedagogical support for the effectiveness of teaching English to younger students determined the basic stages of the study.

At the first stage, the peculiarities of the primary school children thinking as an indicative construct of metacognitive development were identified. The secondary schools of the I–III levels (Krivyi Rih, Ukraine) were selected as the base for the empirical study. The sample consisted of 148 elementary school students (age group 6–7 years). To more fully determine the dominant trends in the overall dynamics of the respondents' thinking, the target sample was supplemented by adolescent students ($N = 144$). The legal aspect of the empirical study was regulated by the parents' consent on the participation of their children in the pilot program of teaching English.

As a psycho-diagnostic toolkit, we used a modified methodology «Types of Thinking and the Level of Creativity» (Il'in, 2004: 618–620), which allows us to identify the dominant type of thinking of respondents and assess the severity of creativity in human mental strategies. Primary data processing was carried out by calculating the average and percentage values of the material obtained. When compiling and analyzing empirical data, the computer statistical program IBM SPSS Statistics 19 («Statistical Package for the Social Science») was used.

Variables were checked for normative character distribution.

To compare the empirical distributions of the studied parameters, a variance analysis was performed – One-Way ANOVA using the criterion for parametric comparison of the values of the sample variances of two observation series (Fisher's φ -test).

At the second stage, a program of a formative experiment was implemented, aimed at analyzing the effectiveness of using metacognitive schemes in the practice of teaching English to primary school children. The empirical study was based on the Private Enterprise «Educational Center «Interclass»» (Krivyi Rih), which was certified as an institution of afterschool education in the humanitarian field. The main research method was the observation method, which allows assessing the quality of the process of teaching English to primary school children using metacognitive schemes and the effectiveness of training. The method of conversation with subjects of pedagogical activity was used, which makes it possible to specify the trends in the use of projective-recursive technology for teaching primary school learners of English.

Results and Discussion

The generalized data of the psychodiagnostic measurement of the types of thinking of respondents and the magnitude of the statistical significance of differences in the manifestation of the studied indicators between groups of students are shown in table 1.

Table 1 - Parameters of statistical significance of differences in the studied indicators between groups of respondents of different ages

Analysis criteria Types of thinking	Distribution of respondents by typological groups (%)		Univariate analysis of variance	
	Primary school students 6–7 years (N =148)	Adolescence 10–11 years (N =144)	Fisher φ -test	The significance level of differences p
Subject thinking	18 % (N =27)	13 % (N =19)	1,423	0,237
Symbolic thinking	26 % (N =38)	24 % (N =35)	0,451	0,717
Sign thinking	37 % (N =54)	33 % (N =48)	1,708	0,167
Image thinking	9 % (N =14)	17 % (N =24)	1,891	0,132
Creative thinking	10 % (N =15)	13 % (N =18)	0,417	0,796

A primary analysis of the data suggests that among students of primary school and adolescence, sign thinking prevails (37% and 33% respectively), which corresponds to the natural trends in the development of personality in a complex world. Symbolic thinking is also sufficiently represented among respondents (26% and 24% of students respectively). At the same time, creativity in respondents' mental strategies is not well displayed (only 10% and 13% of students of primary school and adolescence respectively). The data obtained allow us to state that, in the conditions of the modern information society, children of primary school age (as well as adolescents) are more oriented towards algorithmic work with information as an objective semiotic, sign system (language signs, written/ spoken text,

formulas, tables, charts). Younger schoolchildren are ready for the active transformation and assimilation of meanings fixed with the help of language signs and symbols that objectively exist and are enshrined in the culture, modeling the «personal meaning of perceived information» – knowledge (Verbitskiy & Kofeynikova, 2017: 125).

The statistical significance of differences in the types of thinking manifestation system between different age groups of respondents was determined using the method of univariate analysis of variance (the correctness of the use of univariate ANOVA is confirmed by the p -level of the Livin criterion (Nasledov, 2011) for the uniformity dispersions). The analysis results recorded the absence of statistical differences between the variances of the compared groups (at $p > 0,05$), the average indicators of the dominant types of thinking between the groups of primary schoolchildren and adolescents differ only quantitatively. The dynamics of the development of mental strategies of primary and secondary schoolchildren (6–11 years old) has no statistically significant structural changes. Therefore, the educational technologies used in school practice (in the traditional explanatory and illustrative format) contribute little to the development of the cognitive resource of students; the paradigm of education focused on the consistent formatting of knowledge is losing relevance in the modern information society. To model theoretical and practical competencies, as A. A. Verbitskiy and Yu. L. Kofeynikova focus on, «a person needs to make a double transition in their mind – from sign (information) to thought, and from it to action. Only in this case information turns in to meaningful knowledge» (Verbitskiy & Kofeynikova, 2017: 125). Therefore, in order to optimize learning (including the study of a foreign language), students must move from passive consumption of information to active transformation and conscious internalization of the experience gained.

The dominance of the sign-symbolic component in the mental strategies of primary schoolchildren and adolescents determines the feasibility of introducing conceptual schemes for organizing educational material into the learning process. This thesis is confirmed by the results of a formative experiment on the basis of the Educational Centre «Interclass» (Kryvyi Rih). The research program was focused on a qualitative assessment of the heuristic and developing resource of metacognitive schemes in the logic of projective-recursive technology for teaching English to younger students. For this, a complex of educational and developing metacognitive schemes (see, for example, Fig. 1, 2) was created (Tsehelska, 2018) and developed taking into account the principles of projective-recursive teaching technology (Bazhenova et al. 2019).

The system of teaching English to primary school children was modeled in a continuum of basic principles of the mental space functioning (Osorina, 2017) and a modern scientific world view, in particular, the principle of evolution and the principle of systematicity, which explain the holistic vision of complex developing systems (including the language system). The implementation of these principles led to the use of projective-recursive teaching technology (more common in the field of programming and computer literacy) in learning a foreign language. The content of the projective learning strategy is quite effective for open systems with a certain degree of unpredictability in development, the functional significance of which is revealed in situations of uncertainty and disequilibrium (this is precisely the system of teaching foreign languages). At the same time, human thinking regularly demonstrates recursive properties (lat. *recursio* – «return»), to which a language that shows the ability to generate embedded sentences and constructions expanding the concept sphere is adapted. Professor Anisimov, who studied recursion in various spheres of human activity, defines this phenomenon as a way of organizing a system in which the system creates its own modified copies at certain points of its development, includes them in its structure and interacts with them (Anisimov, 1988), as a result, mental processes are activated.

Learning English in a specially created open space of mental search, which allows conceptualization and expansion of the linguistic worldview, contributes to the consistent study and understanding by students of the mental structure of a foreign language, which develops the skills of consciously building an information model of a communicative structure (message). The indicative framework in this process is successfully created by metacognitive schemes constructed by analogy with the mental maps of Tony Buzen (Petrova & Egarmin, 2014: 10), taking into account the ontogenetic features of the development of primary schoolchildren psyche and the principles of projective-recursive technology for teaching a foreign language.

Modeling of metacognitive schemes for learning English involves the implementation of the methodological principle of the unity of consciousness and activity, which determines the implementation of anchoring technology in practice: *definition of a concept – understanding of logical-semantic sequence structuring of a statement – grammatical categorization – awareness of logical connections in the predicative field of a speech construct.*

In this context, it is advisable to work with younger schoolchildren using the symbolism of a sign (pictograms) that visualize and fix the logic of sentence building in a foreign language (see, for example, Fig. 1):

Figure 1. An example of an elementary pictogram to indicate a logical-semantic sentence structuring

The schemes of this type are considered as a basic for students to independently build grammatical and syntactic constructs of the foreign language they study (see, for example, Fig. 2).

The schemes used are complex and are meant to reach many goals. For example, when studying vocabulary on the topic «Land and Water Habitats» at the Educational Centre «Interclass» in the second form, students learn the lexical designations of their habitats (children have already learned the topic «Weather» and the adjectives that describe the weather) and, at the same time, using the scheme can form such sentences as: *There is sun in the desert. The weather is sunny.*

Land and Water Habitats			
<i>There is in the The weather is</i>
sun ____	desert ____	sunny ____	

Figure 2. An example of using an elementary pictogram for sentence building

Linguo-cognitive categorization of logical and semantic constructs of a foreign language plays an important role in the creation of metacognitive schemes that are used to teach English to younger students. Here we rely on the opinion of Professor T.M. Rogozhnikova, who works in the field of studying the dynamic aspects of the word meaning in the human existence dimensions, and notes that world science is increasingly recognizing the

inappropriateness of further ignoring the differences between the meanings, which are described from the standpoint of a logical and rational approach, and value that actually functions in the human mind (Rogozhnikova, 2008: 209–210). Awareness of the features of the functioning of the word in the semantic space of the speech subject (and, in particular, when studying a foreign language) necessitates the categorization of the conceptual field of the studied language segment, which allows ordering the variable meanings that are acquired when a student understands the bilingualism of the linguistic world view (see Fig. 3).

Figure 3. An example of categorization of the conceptual field «Clothing» in a metacognitive scheme

The experience of teachers shows that students' brains find the system of categories easier to assimilate and actualize as it reflects the systemic connections of the functioning of the concept, moreover, it gives a deeper understanding of a foreign language syntax and allows improving the skills of constructing questions. For example, for the description of clothing (Fig. 3), third-form students will use the categories already studied Size, Colours, Materials, Body Parts, Seasons and Weather. As a result, they will be able to ask such questions as: What size is it (e.g. a dress)? What colour is it? What material is it of? What body part is it for? What season is it for? What weather is it for?

For teaching English to primary school children teachers at the Educational Centre «Interclass» use three *types of metacognitive schemes*:

- indicative schemes (Fig. 1);
- conceptual schemes (Fig. 3 and 4);
- metacognitive schemes of the algorithmic type (Fig. 2 and 5).

Indicative metacognitive schemes determine the formation of basic foundations for modeling actions; they are used to explain new material and recycle the already studied topics.

Conceptual schemes (image schemes) contain the information about the studied object and its conceptual characteristics (Figs. 3 and 4) and perform the function of sense formation and construction of students' ideas about identifiable objects and the structure of the studied conceptsphere in the process of learning English. As a result of the generalization and systematization of sign information, a mental denotative graph is built in the students' linguistic consciousness, which provides an understanding of the grammatical connections between concepts in the structure of the language field.

Figure 4. An example of a conceptual metacognitive scheme

The *metacognitive algorithmic-type schemes* (Fig. 2 and 5) form the systemic content of mental experience (from basic algorithmic structures – following, branching, to template-patterns, patterns (Petrova, Egarmin, 2014) and make it possible to solve more significant tasks of English language teaching.

Figure 5. Example of the meta-cognitive scheme of the algorithmic type

At the same time, metacognitive schemes contribute to the students' more efficient structuring of information, understanding of logical dependencies when coordinating elements of mental denotation graphs of different orders in extension systems (linguistic recursion) of the conceptual sphere of the studied concepts. Algorithmic metacognitive schemes provide the assimilation of a clear logical model for building a speech pattern in a system of foreign language syntax by using images, signs, and differentiated color solutions.

Assessing the importance of mental algorithmic maps (we use them as a prototype of a metacognitive scheme), Bazhenova, Babich and Pak emphasize that such maps can serve as an illustration of the thinking process: they can suggest the missing (new, forgotten or insufficiently learnt)

information to solve the problem and become the basis for building a heuristic strategy for solving cognitive tasks of a certain type (Bazhenova et al. 2019).

The data obtained as a result of the formative experiment suggest that metacognitive schemes in working with children of primary school age provide the child with the opportunity to construct knowledge of a foreign language, learn new experiences in the chronotope of a success situation in accordance with their current level of awareness in this topic and their personal level of cognitive development. Feeling relatively safe, students are ready to solve more complex problems. Children reproduce educational material with ease, master the grammatical structure of the foreign language and confidently formulate speech constructions. This way they realize a personal intellectual resource, which implicitly contributes to the development of speech-cognitive and communicative competences of students in the problem field of the English language.

The positive results teaching English to younger schoolchildren are confirmed by the thesis about the nature of the use of associative thinking and structuring of conscious experience in hierarchical models based on the methodology of foreign language teaching (Petrova & Egarmin, 2014: 310). Such structures dynamically evolve over time, they complement and organize information flows in the schemes of internalized experience and strategies of speech-cognitive activity. Therefore, metacognitive schemes can be used both in the study of new material, and for monitoring information acquisition, understanding of educational material, the completeness of information perception in the logic of a foreign language and the development of communication skills.

The use of metacognitive schemes in the continuum of projective-recursive technology for teaching English to younger students is a productive method, since it 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 a person.

Conclusions

The results of this theoretical and experimental study confirm that the phenomenology of metacognitive and multilingual personality development in a modern dynamic information society is quite ambivalent and polysystemic. In this context a purposeful formatting of the speech-cognitive culture (including mastering a foreign language) determines the

effectiveness of mental modeling of reality by the students, which is especially important during the growing up period.

The basic trends in the speech development of a linguistic personality are intensively formatted at the stage of schooling, in particular in primary school. A primary schoolchild is also sensitive to the internalization of the artificial bilingualism experience, which models the learner's competence resource in a system of foreign language communication.

Stimulating the heuristic potential of the intellectual activity of primary schoolchildren necessitates the creation of an educational environment filled with samples of constructive speech-thinking activity and new ways of modeling the skills to carry this activity out. Particular attention in the complex of multilingual development of children and adolescents is required by the problem field of conscious construction of the metacognitive structure of speech utterance in a foreign language. In this context, the optimal developmental effect is demonstrated by the method of introducing metacognitive schemes into the learning process in the logic of projective-recursive technology for teaching English, which significantly expands the age framework of metacognition. A theoretical analysis of the psychological, pedagogical and methodological literature and our own work experience allows us to conclude that the method of using metacognitive schemes for presenting educational information when studying English by primary school students is well combined with the traditional teaching system, as well as with any innovative teaching technology, and therefore allows us to improve the process of developing students' linguistic consciousness.

The practical use of metacognitive strategies for structuring multilingual experience in learning English includes metacognitive understanding of lexical and grammatical norms of a foreign language by the students, their metacognitive visualization of thought strategies, and reflective metacognitive interviews. Here we also need to take into account development of thinking skills using Bloom's Taxonomy, which allows controlling competency and development of the intellectual resource of primary school students.

The results of the study of the trends in teaching English to primary school children in the resource dimension of projective-recursive technology for teaching English using the system of metacognitive schemes presented in the article can help to solve a wide range of theoretical and practical problems associated with understanding the dynamic context of psychological semantics that accompanies the multilingual personality development.

The study does not disclose all aspects of the problem of using metacognitive schemes in the continuum of projective-recursive technology for teaching English to primary school children, but it opens up prospects for further studying the trends of metacognitive and multilingual personality development in the changing information world. In particular, the content of determining the cognitive-affective mechanisms of the development of language consciousness in the educational environment of the New Ukrainian School may become a promising area of research.

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