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USING VISUAL APPROACH FOR LANGUAGE ACQUISITION

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Abstract—The subject of accelerating learning skills, particularly language, it is important for both those who work in the field of education and training and people who are to get adapted to a new environment (they need lots of new skills and, above all, a foreign language), Therefore, the creation of modern IT systems to simplify and accelerate the study of language is a very urgent topic and requires to search for new ways and solutions. The research is interdisciplinary at the intersection of pedagogy, psychology and linguistics on the one hand, and tools of exact sciences, systems analysis and IT on the other hand. Our aim from this paper is to apply the Structural Visual Method (SVM) both for studying high-level structures of abstraction, and studying specific linguistic phenomena and developing new ways of teaching based on a new application.

I. INTRODUCTION

Adult education in modern conditions is becoming more urgent, due to intensive and profound changes not only in the scientific and technical, but also in the socio-cultural sphere and acquisition new languages. The consequence of these changes is a rapid obsolescence of knowledge and skills in the production and social environment, and growth of people's needs. The information has become so much that it has lost value, and the ability to use the structures and visual models have come to the forefront.

There was a paradoxical situation: in the most important spheres of life - work, finance, recreation, health, nutrition, and family - the skills of such activities are almost not developed by education, and even this goal is not usually set. And the knowledge that has become widely available in the era of the Internet and Wikipedia, and the outdated ways of transmitting them through lectures and synopses continue by inertia to form the basis of all learning activity.

The general education school copes well with teaching the skills of written language, abstract thinking with the help of signs - mathematics, physics, and chemistry. But children come to school with already formed oral language skills, so the theory of their formation and the study of mechanisms in pedagogy pays much less attention. They engage in this in other areas - correctional pedagogy, speech therapy, psychology, physiology and medicine. And useful and practical lessons from these industries are almost never used in teaching foreign languages. And this sphere it is rather conservative and poorly integrates both the results of research in related industries and the opportunities provided by scientific and technological progress and IT technologies.

In this study, the tools of exact sciences and IT technologies were used to study the possibility of instrumental testing of hypotheses about mastering another language from leading linguists and psychologists (Stephen Krashen [1], Noam Chomsky [2], Stephen Pinker [3]) and the possibilities of measuring and management of this process, to begin with in a strictly limited and formalized space of meanings and the corresponding linguistic forms.

The proposed Structural-Visual method (SVM) [4] offers a new approach for the harmonization of terminology in interdisciplinary projects, and it can be used to create new tools for learning skills and foreign languages. The essence of the approach is structured knowledge, which moves from the most basic to the more complex and translating information about the rules (e.g., verb conjugation) of the subject field into a visual form. Development of visual meta-language to non-verbal communication with the teacher-student, human-computer, and human-human systems can help improve training and create a new generation of LMS.

II. FUNDAMENTAL DIFFERENCE BETWEEN THE FORMATION OF LINGUISTIC AND OTHER SKILLS

Language skills are the basis for communication and thinking. And verbal thinking allows you to consciously manage any other activity. In addition to the acquisition of the language skills by themselves. As in this case the object of activity and an instrument of activity is itself this activity, which is a violation of not only scientific laws, but also common sense.

Such facts have long been discovered by scientists (experiments by Zhinkin, Chistovich [6], the theory of Leontiev [5], Galperin [6], Pinker [3], Krashen [1]), but the main structural reason given above was never clear is formulated.

However, the transfer of knowledge about the language continues to make up a significant part of the educational process in many curricula and methods, often replacing the process of acquiring skills. Or, there is a skew in the other direction, knowledge of the language is simply discarded and all emphasis is on

unconscious processes. This approach works, but it is extremely time-consuming for both the teacher and the student. It has long been shown that conscious training in many cases is almost an order of magnitude more effective than simple imitation, unconscious copying.

We propose to transfer knowledge about the structure of the language from the verbal to the visual form, thereby creating the opportunity to use them as an indicative basis for planning, managing, controlling and correcting the training of primary language skills both by the teacher and by the student himself.

This is impossible with the verbal design of such knowledge, which is quite correctly noted by Krashen in his hypothesis of the monitor [1]. In fact, this is not a hypothesis, but a logical conclusion, which follows from Gödel's incompleteness theorem [7] and Russell's theory of logical types [8]. To rigorously test the validity of Krashen's hypotheses and our ideas, experiments are needed to measure the language skills and the speed of their change. Because of the complexity, the hierarchy of the language and a very large number of structural levels, and the absence of a generally accepted model of this structure, accurate measurements were carried out mainly at the lower levels of this structure - levels of sounds, syllables, words and concepts.

There are a huge number of tests and methods for measuring verbal and nonverbal cognitive abilities included in IQ-like tests and studies. A lot of work has been done on the research, measurement and standardization of testing the level of cognitive abilities of children in the process of their development and learning. But for testing isolated grammatical skills, accurate measurement and comparison with the average values of instruments is extremely small, especially for adult students.

The level of competence and the speed of change in grammatical skills are measured mainly in a subjective, evaluative way. It strongly depends on the applied models of the language (which can exist practically unlimited quantity), since on any model constructed with the help of the description (language), the structure of the language of this description is inevitably superimposed, which is completely unobvious for the performer of the description within the system of this language. The last known methods for measuring isolated grammatical skills and the speed of their acquisition were developed in the fifties and sixties of the last century [9]. Therefore, the idea arose to apply modern IT products and services to obtain such data.

To obtain accurate and commensurate data, it is proposed:

• To allocate a strictly limited area of lexical and grammatical meanings, corresponding to actually observed processes.

• Transfer these meanings to the structural-visual code (SVM), which is understood equally by the speakers of any language.

• Identify the structure of the transformations necessary to transfer these basic meanings in the target languages (Lingvomap, Dynamics [2]).

• To measure the exact values and speed of the formation of encoding-decoding skills from the SVM into simple sentences of the pupil's native language.

• Measure similar processes for the language being studied.

• Explore and formalize possible ways of training isolated skills and their combinations.

• Explore the patterns of the formation of language skills from scratch and the patterns of retraining.

• To study the patterns of obtaining skills for the different structures of pairs of languages.

• Obtain a tool for quick controlled workout of isolated skills.

• A tool for motivating trainings demonstrating fast and measurable success.

• The ability to manage training parameters in order to optimize ways, methods and forms.

• The possibility of expanding the space of meanings through cooperation with representatives of different countries and peoples, different subject areas of activity and various scientific directions for the creation of a unified Visual Meta-language [4].

III. HUMAN PERCEPTION AND INTERACTION WITH VISUAL MODEL

According to the structural differential of Korzybski [10] and the generally accepted scientific picture of the world, events in the physical world create signals that enter the human body through the organs of perception, causing in it relevant perception processes that have both a physiological and a psychic component (as its information component).Perception has its internal structure, according to the works of Ivanitsky and Edelman [11, 12], etc., with memory and with the limbic system responsible for motivation and emotion. The perception cycle is completed by returning the signal to the primary projection zone, which creates the image of the perceived object.
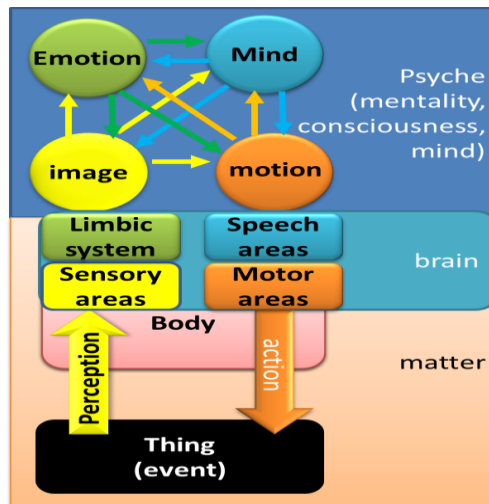
Figure 1. Model of human perception of the world.

The objects to which attention is directed are realized at the first level of abstraction (the yellow and orange circle in Fig. 1). And then they are denoted by linguistic signs at the next level of abstraction, verbal (blue circle in Fig.1). As Korzybski has shown, the depth of such abstraction is unlimited. What, on the one hand, creates enormous advantages for man as a thinking being, on the other hand, there is a danger of separation from reality in sterile scholasticism.

We are interested in the fact that linguistic signs are present on all three levels:

• In the form of sounds of speech and signs in texts that can be digitized and processed by computers.

• In the form of images of these sounds and texts formed in the sensory and motor systems (and, as Ivanitsky and Edelman showed, consist mainly of information stored in memory, and not from the input signal).

• And in the form of signs of language that encode other images and actions for the processes of thinking and communication.

That is, the signs of the language, physiologically located on the second level of abstraction as images, are structurally located on the third level, being the code for images of the lower level.

This duality requires a very careful tracking of the levels of words and terms that a particular theory operates on, and do not allow their displacement and entanglement, which is extremely difficult without the use of special methods such as various methods for constructing diagrams and visualizing structures, including the our proposed Structural-Visual Methods [13].

IV.STRUCTURE OF NEW GENERTION OF LMS

The process of creating a new generation of LMS with The basis for the coordination of terminology, methods, procedures and structures is a visual meta-language tools and systems analysis, as a link between IT, humanities field, science, theory and practice, and social processes. To control the process of formation of language and work skills of adults, the authors recommend a conceptual solution in the form to create a training system [2]. The generalized structure of the new generation LMS is shown in Fig. 2.
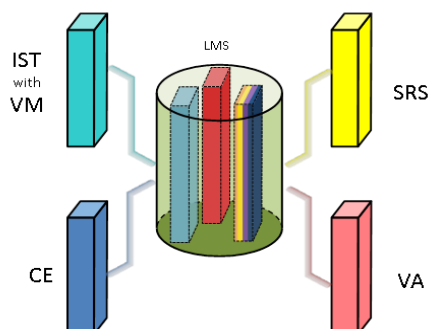

Figure 2. LMS Generalized structure,
where: IST with VM (Interactive Speech Trainers with Visual Models),
SRS (Speech Recognition System), CE (Continuous Evaluation),
VA (Virtual Assistant).

This new training system will integrate the following points:
- • Methodical principles, grounded in the works of A.Bandura [14] and P. Galperin [6].
- • Visual Models [15], Generate a synergistic effect, both in the first stage of mastering a foreign language and in a "barrier to overcome" phase.
- • Use the achievements of the field of information technology as a tool to ensure the implementation of learning objectives with continuous monitoring of the current situation and obtain the results of learning assured in a limited number of steps

The development of the main components of LMS is carried out in three interrelated steps:
- • Further improvement of the SVM by modeling the structure of the developed activities based on the Visual Models.
- • Setting up the subsystem of Continuous Evaluation and the management of the learning process in real time.
- • Creation of a set of Interactive Speech Trainers that correspond to different levels of competency of the students.

The use of modern information technology combined with the use of effective models to acquire skills allows reducing or even completely eliminating the impact of these barriers and thus accelerating training and enhancing their success by conveying the synergistic effect of all stages of language formation skills, especially "barriers to overcome" (Fig. 3).
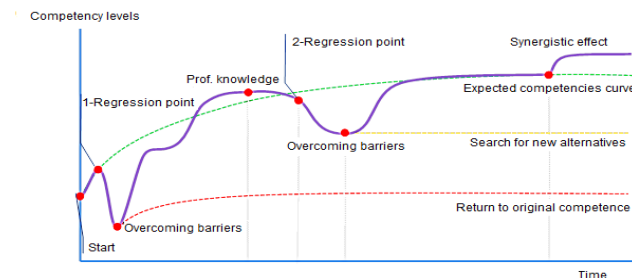

Figure 3. The learning curve with the transfer of synergistic effect.

V.MODELS OF TEACHING LANGUAGE

For the application of the SVM in linguistics, it is proposed to encode information on the method of constructing an English sentence using spatial placement and the form of visual objects, and about temporal forms and related senses-using spatial placement and color.

The color values are learned in advance by the pupil with the help of the native language on illustrative examples. At the same time, the meaning is transferred from the language to the intermediate visual sign system, which allows the student to understand the meaning of perceived or produced constructions in the studied language without reliance on the native language.

Models contain the necessary set of temporary forms and constructs of the types of supply required for this level of language proficiency or according to the curriculum of this training course. For example, the simplest model for constructing a simple narrative sentence in 4 time forms for an action verb is shown in Fig. 4.
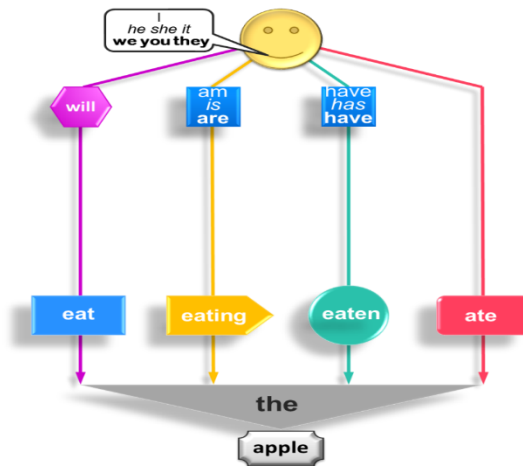

Figure 4. Model structure of declarative sentence.

Grammatical transformations appear graphically, without words. This allows the student not to think about the use of native grammar, but directly use visual structure to create the correct English sentence.

In Fig. 5 shows the full model of all types of active forms of active voice. It can be applied at higher levels of grammatical competence to systematize knowledge and understand the complete structure of a system of times.
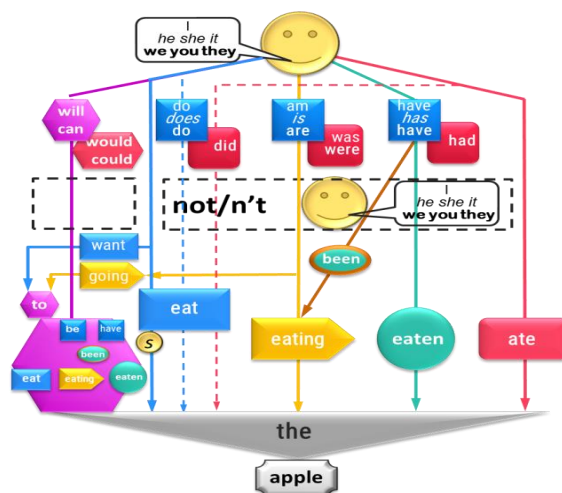

Figure 5. Full model for all temporary forms

This approach allows us to start the mechanism from the first sessions, directly linking the sentences of the language being studied to the meaning behind them, and to exclude negative interference from the structure of the native language, which in many cases may differ significantly from the target language. We are using these models in different LMS simulations to accumulate experiences which will help the technical teams to:

- Develop simulation models.
- Optimize designs before construct any new version.
- Accurately detect weak spots.
- Efficiently explore multiple design alternatives.

VI. CONCLUSION

Currently, this program is being under further development to reach the target result and facilitate learner training on the language. We are updating and developing this program, while conducting experiments to continue to reach an integrated program for teaching all foreign languages. Experimental verification of the training materials, test simulators and elements of the proposed approach on a limited group of students showed results similar to those that were obtained by the rapid development of other training techniques for Galperin theory [6]. There was a reduction in training time for performance of specific actions in (3-30 times) and an increase in the success of training with 10-25% to 80-95%. These are preliminary results that require additional verification and independent testing.

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