



**Цимбалару
Анжеліка Дмитрівна —**

доктор педагогічних наук, старший науковий співробітник, завідувач відділу початкової освіти Інституту педагогіки НАПН України. Фахівець у галузі навчання і виховання молодших школярів. Очолює комісію з педагогіки та методики початкового навчання Науково-методичної ради з питань освіти МОН України. Автор понад 100 наукових праць.

MODELLING THE ACADEMIC SPACE OF THE JUNIOR SCHOOLCHILDREN: A DIDACTIC ASPECT

In the article, the didactic constructor of modelling the educative space of junior schoolchildren was represented. It is based on the emphasis on two interconnected subjects of pre-education: the educative environment and the students' comprehension of it. Correspondingly the author specifies the vectors of modelling the educative environment of the junior schoolchildren in two systems of axes; the first one includes the students (in accordance with the dominating channel of the academic material perception, way of its processing, the leading style of the academic activity and biological time), and the second one covers the school (content structuralizing, the ways of the organization of the academic interplay, object context and astronomical time).

Keywords: pedagogical modelling, educative space of the junior schoolchildren.

Reorientation of the aims of teaching predetermines a new stage of the school education development. The results of the analysis of the modern state of the development of the primary school demonstrated that the axiological aspect in the pupils' academic space is of special significance.

Academic space as an object of pedagogical researches is considered by homeland and foreign scientists (N. Bastun, V. Bykov, S. Bondyryeva, T. Borysova, O. Veryayev, S. Hershuns'kyy, V. Hynetsins'kyy, B. El'konin, Yu. Zhuk, O. Leonova, N. Rybka, A. Samodrin, B. Serikov, V. Slobodchikov, T. Tkach, I. Shendrik, H. Shchevel'ova, I. Frumin,

and others); as a rule, it is found as the result of the integration of the structural and content elements of educational systems (in correspondence with the certain political, geographical, administrative or historical and ethnographical characteristics). Therefore, the concentration on the realization of the academic requests of each personality stimulates the necessity of modelling the academic space of each pupil in the academic space of different ranges that were founded by the integrated processes (European, CIS counties', each state's, district's/region's, and school's ones). The systematic realization of this task requires the definition of the didactic fundamentals of the task-oriented modelling of the academic space at school in general and at primary school in particularly, being a starting point of the pupil's academic space at the comprehensive educational institution.

Taking into consideration the modern context of the comprehension of the term *educational space at school*, it is possible to notify two interrelated transformations subjects: school environment and pupils' activity aimed at its acquisition. Correspondingly, it must be modelled in *two* systems of axes: *depending on pupils* and *depending on the educational institution*. The effectiveness of this process is dependent on the parameters of each system. In this article, we specify the choice of them.

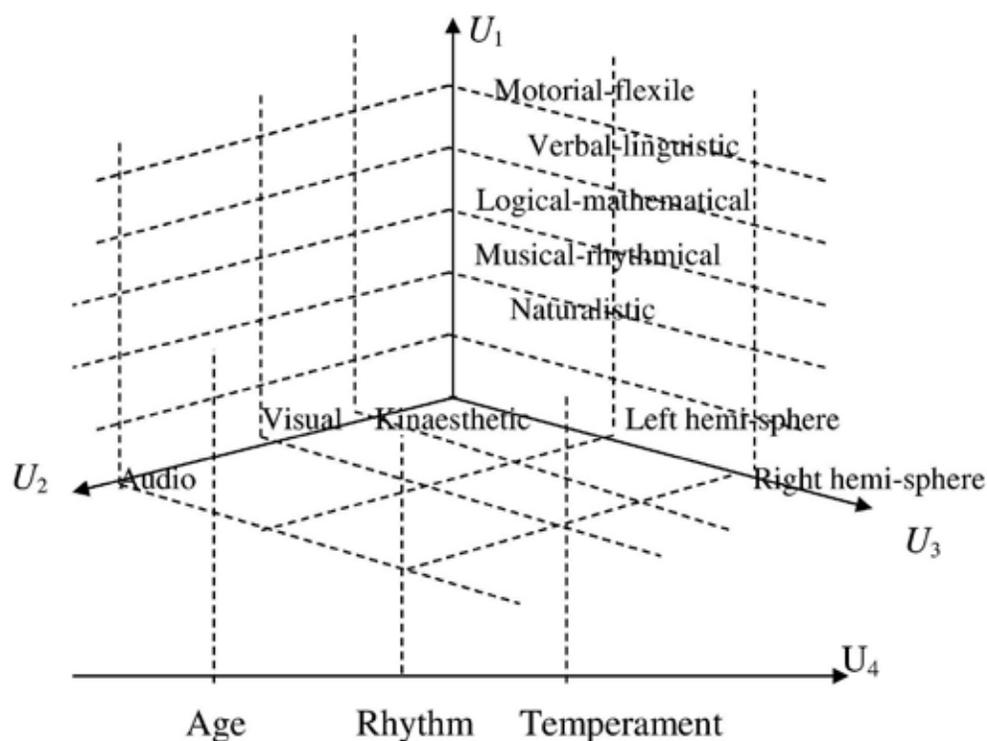
Excepting the possibility for the increase of the vectors quantity, four dimensional systems of axes can be basic for the construction of the academic space at school; all their vectors are equisignificant for the achievement of the expected result. For the implementation and the usage of such constructor of modelling the academic space, its instrumental provision is important. The choice of scales for each vector is based on the understanding of the fact that the effectiveness of the didactic model in practice is dependent on their ponderibility and clearness in the process of comparing the likeness (uniformity). Therefore, certain parameters that were chosen for each system of axes must guarantee the integrity and the effectiveness of the didactic model, have features that are common for everyone as well as take into account the peculiarities of each personality orientation at the modern achievements of not only pedagogy but also health care maintaining, organization of social influences, etc. Such controversy was overcome by means of creating a didactic designer depending on the priorities of the subjects for whom the academic space is provided on the basis of the integration of pieces of knowledge in pedagogy, psychology, mathematics, and physiology. In our case, its addressees are junior schoolchildren.

Taking into consideration the fact that any selected parameters of the constructor are the artificial theory product, a special attention was paid at the creation of complex which will guarantee not the bottom-line feature of the academic space at school but its applied character and diagnostics. Taking it into account, the experimental schemes of modelling the academic space at school was developed with the corresponding system of axes: depending on pupils (pic. 1) and depending on the educational institution (pic. 2).

The choice of vectors of **the system of axes of modelling the academic space depending on the personality** (see pic. 1) was based on the leading intellectual and psychological factors that determine the peculiarities of human's re-

action at the environment as well as his/her interrelation with the academic space; they require certain academic means for the provision of the effectiveness of its results and were discovered by the psychologists (G. Gardner [1], A. Maslow [2], K. Young [4], R. Sperry [6]).

The vectors were chosen on the basis of such junior pupils' age peculiarities as the sensitiveness of the development of the skills of the information mental processing by means of the child's perceptive apparatus, overrepresentation of the exploratory forms of environment cognition and development of the elements of art, craftsmanship, music, drawing, and writing. Therefore, the following factors are specifying for the studying personality: the style of the academic activity (U_1), the channel of the perception of the academic material (U_2), its acquisition peculiarities (depending on dominating of one of the cerebral hemi-spheres) (U_3), and biological time (U_4).



Pic. 1. The four-measured system of axes of modelling the academic space depending on the personality

The vector of the channel of the academic material acquisition promotes finding out the leading parameters of a personality that determine the effectiveness of all kinds of his/her activity. These are the types of a personality in correspondence with the representative channels (sensor modalities) which are used by a human for the perception and the transmission of information: audio, visual and kinaesthetic ones.

The personalities whose *audio* channel is dominating are divided into those who perceive the heard data better and those who, on the contrary, comprehend the orally pronounced information more properly. This parameter provides an opportunity for the representation of the material by means of a message, a mini-lecture, report, etc. which can be prepared not only by a teacher but also by pupils or represented with audio equipment. Besides, this parameter predetermines the organization of disputes, discussions, usage of audio methods such as musical illustrations, poetry, etc.

Those whose sight (*visual*) sensor of information acquisition is prevailing are divided into iconists for whom images are quite informative and verbalists who acquire data, mainly, through a word, a text. In accordance with this parameter, the reciprocity of pupils with texts, their symbols such as pictures, schemes, tables where an emphasis is placed on certain components by means of colour, font, and other visual means. Such presentation of academic material is possible with the usage of readers, computers, textbooks and handbooks, didactic material, etc.

The personalities with the *kinaesthetic* channel of the information perception are divided into those ones who perceive in the process of moving when the majority of muscles of arms and legs are active as well as those who perceive data through manual dexterity, in other words, by means of the moving fingers. Taking into account this parameter, the direct actions with an object must be projected, for example, mouldering, embroidering, cut-outs, usage of gestures and physical exercises, writing, etc.

The vector of dominating of the cerebral hemi-sphere has such parameters for the organization of the schoolchildren's activity: with the dominating *left* or *right hemi-sphere* or *without an obvious lateral asymmetry*. In accordance with the theory of R. Sperry, the professor, people whose left hemi-sphere is dominating make logical exercises as well as the tasks that require rational thinking, comparison and making an optimal decision more properly whereas those whose right hemi-sphere is prevailing need creative tasks, the opportunity to generate ideas, to search for the new variants of the problem solution. Taking into account this parameter, the reciprocity of the schoolchildren with the objects of the school environment that demand the inductive or deductive thinking, analysis or synthesis of information is organized. For those with no obvious lateral asymmetry, a balanced organization of the academic reciprocity without any preference for a certain type of thinking is important.

The vector of the academic activity style has such parameters as *naturalistic, musical-rhythmical, logical-mathematical, verbal-linguistic, motorial-flexible ones* (interpersonal and inner-personal styles defined G. Gardner are not consciously comprehended as they will be taken into account in the process of modelling the academic space regarding to educational institution taking into consideration the vector of the reciprocity organization). These very parameters determine the skills and abilities as well as the desire and the needs of schoolchildren.

The time vector of modelling the academic space depending on the personality predetermines taking into account biological time regarding the following parameters: age ones, eurhythm, and temperament.

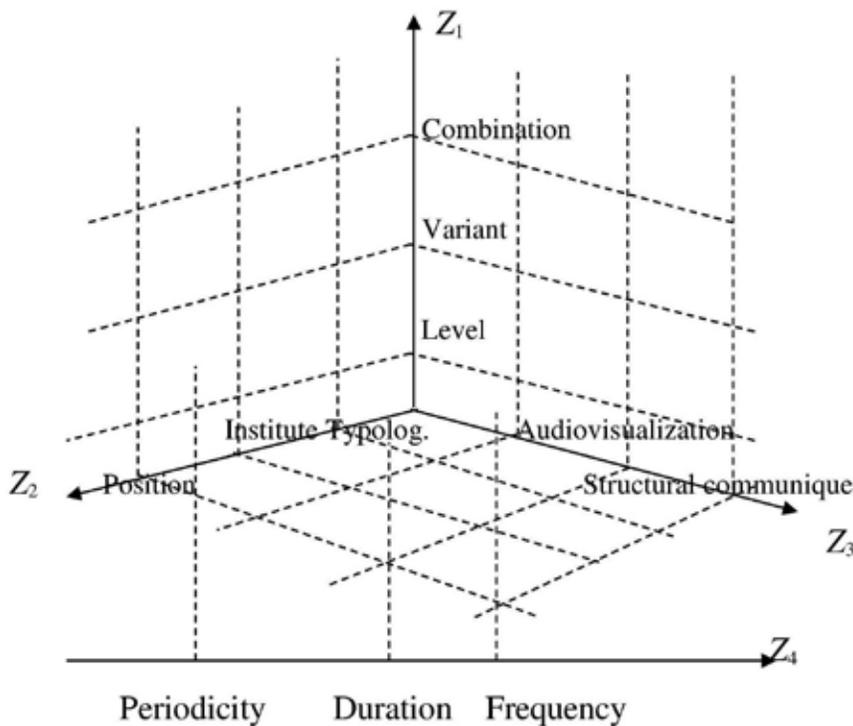
Age parameter predetermines taking into consideration the age peculiarities of the studying people, the addressees of the educational space projecting at school. In accordance with the results of the theoretical studies on the psychic development of a human (L. Vyhotskyi, O. Leont'yev and others), the choice of the leading kinds of academic activity that are correspondent to the age of those for whom a model of the academic space is created (a pupil, a teacher, parents): *cognitive, playing, labor, exploratory, retrieval, project ones*, etc. (each of them comprises such procedures as *setting an aim, determination and selection the effective realization ways, results assessment*, etc. which will guarantee the sequence of the parameters of this vector as against the definition of them as separate types). Besides this, the sensitive and crisis periods of the personality's development must be under consideration (for example, for studying a certain subject).

The parameter of eurhythm comprises biorhythms: the pupil's activeness/passiveness in a certain time of a way, a week, a month, a quarter (a term, etc.) and an academic year for certain actions. They impact the structuralizing of the academic periods for the increase of the results effectiveness.

The next *parameter* of the time vector includes the type of the pupils' *temperaments* (sanguine, choleric, melancholic, phlegmatic ones) for the purpose of the optimization of the ways of the achievement of the results of their activity, the increase of their productivity. Therefore, the analysis of the literature that covers this problem demonstrated that sanguine people are sensitive, active, hard-working, and successful in their labour which gives them an opportunity to achieve a quick result. Choleric people are active, emotional, confident and determined in the achievement of the results; they are not afraid of difficulties and overcome them easily whereas phlegmatic people are calm and able to work for a long time without getting exhausted; they are very attentive. Melancholic people are quiet, uncertain, find it hard to overcome the obstacles; they are reserved but always ready to help others. Therefore, this parameter predetermines the work of a pupil in groups, in pairs and independently (its frequency and duration) taking into consideration the peculiarities of each type of temperament.

The choice of **the vectors of the second system of axes depending on the educational institution** (see pic. 2) is determined by a complex of the educational

environment structural components that were discovered by the researchers of this problem (V. Panov, V. Yasvin, and others) as those ones that need to be projected, namely, the subject, the social, and the activity-based (technological) components. In spite of this, the choice of vectors is predetermined by the components of the social control which is thoroughly studied by the developers of the model at each level from the international to the individual one (the level of each parents and every pupil). That is the reason why the following vector can be found for the four-measured system of axes: education content (Z_1), reciprocity organization (Z_2), object context (Z_3), and astronomical time (Z_4).



Pic. 2. The four-measured system of axes of modelling the academic space depending on the educational institution

The content vector of modelling the academic space at school depending on the educational institution can be described by such parameters: level, variative, combinatorial ones.

In every microenvironment, the *level* parameter predetermines the reciprocity of the choice of tasks, the projects of different levels of complexity: available, sufficient (defined by the State standard), and of high complexity. Such approach makes it possible to take account of the children's skills in the result of the provision of the variety of the levels of complexity for each subject. In the

profession-oriented schools, the high level will be considered for the subjects in accordance with the institution specialization. At the same time, this parameter will promote taking into consideration the peculiarities of the children's personal development. For example, for the schoolchildren with time-lagged psychological development (TPD), dyslexia or dysgraphia, the tasks of the comprehensible level will be selected.

The *variative* component predetermines the creation of a wide range of different variants of academic courses and programs (developmental, elective, specialised, basic, authorized, and others). They can be both the courses that are already active in the market of academic services and those ones which are being developed by the pedagogical staff and certain teachers at school (under the condition of their approval to be used by the corresponding institutions). Therefore, this component guarantees the opportunities for taking into consideration both the state, the regional component of the education content and a comprehensive educational institution (for instance, the peculiarities of the national and the social body of the schoolchildren, the ecological situation in the region, etc.).

The *combinatory* parameter comprises different subjects' combinations: studying certain subjects, integrated courses or series of a few (or all) subjects that are included in the educational plan in that or another grade. In this case, the content that is defined by the State standards can be taught for children not only visually but also latently when the school community creates the special subculture of their educational institution (or region, village, etc.) on the principles of cultural creativity influenced by the peculiarities of the modern society acquiring the necessary pieces of knowledge.

The vector of the organization of the academic reciprocity can have such parameters as positional-thematic, instrumental, and typological ones.

The *positional-thematic* parameter predetermines the organization of the personality's activity in every microenvironment of school both by the help of the teachers and in the process of the reciprocity with the schoolchildren as well as the amateur performances. In this case, the personality has an opportunity to be a pupil, a researcher, an expert, a performer, in other words, to play the role of those who are studying and those who are teaching variable or simultaneously (in different microenvironments).

The *instrumental* parameter influences the optimal choice of the kinds of the activity organization (the online study mode, full-time tuition, and part-time education) depending on the quantity of subjects (the individual work, the work in pairs, in groups, in the staff, current, collective work, etc.). The corresponding forms of learning (a lesson, an excursion, a practical course, a laboratory work, a mini-conference, etc.), the methods that are appropriate for each of them (for instance, the illustrative-explanatory, the project method, and others) as well as the stages (for example, studying new material (first-stage acquisition), repetition,

comprehension (the usage of the learnt material in practice), control, correction) are chosen.

The *typological* parameter covers such kinds of reciprocity as “a human-a human” (the system of the pupil’s reciprocity with other participants of the educational process that is controlled by the ethic and the legislative norms of behaviour), “a human-a sign” (the organization of the reciprocity with a visual and a semiotic systems as a sensitive perception of the reality that has some meaning and is used for the purpose of the preservation and the transmission of the information: the work with a book, schemes, diagrams, tables, and other didactic material), “a human-nature” (the organization of the reciprocity with the objects of the uncreated environment), “a human-equipment” (the work with the computers, audio and video equipment such as readers, tablet PCs, etc.).

The vector of the object context is the quality of the academic space for its purposes. The components can be such variants of its specific organization as audio visualization, objects structuralizing as well as the communiqué of subjects (in the ranges found out for modeling taking into consideration the addressees, etc.).

The parameter of the *audio visualization* is the colored and the light usage of devices for the increase or the decrease of the sound effect (lingaphone systems, microphones, earphones, etc.), visualization (video systems including interactive boards for the film and animation accomplishment, the usage of the static visualization means, etc.), other objects that are necessary for the corresponding arrangement of objects in the room (for example, a thematic one) as well as the choice of the place in the room (including beyond the comprehensive educational institutions where the space is modeled, namely, museums, theatres, town (village) libraries, greenhouses, farms, musical schools, art schools, other educational institutions, etc.) or in the open air (in the town/village, namely, in the zoo, arboretum, park, wood side, square, street, area near the monument, etc.).

The parameter of *structuralizing* covers the possibility of zoning, the provision of the polyfunctioning or the re-structuralizing of the room through the corresponding placement of objects or their particular selection (for example, the desks-transformers that can be transformed in the large and the small tables not only for the sedentary work but also for the work in the upright position).

Communiqué component controls the movement geometry and the opportunity to place the pupils either for the sedentary work or for the work in the upright position (at desks, writing cabinet, on the carpet, humpties, etc.) studying in a circle, a semi-circle, rows, groups, pairs, and so on.

The time vector of modeling the academic space depending on the educational institution covers taking into consideration the astronomic time and comprises the parameters of periodicity, frequency, and duration.

The parameter of *periodicity* is the organization of the work of the participants of the academic process in certain periods: terms, trimester, quarters, semes-

ters, etc. Academic period can consist of five or six-day working weeks. In its turn, the academic week can have different sequences of working days and holidays, for example, two working days – one holiday (or one day of the individual or independent work at home), three working days – one holiday, etc.). During the working weeks, each academic day has its own periodicity, as well. It can consist of both separate lessons and double classes, trinarities, blocks, etc. with breaks. In this case, the duration of lessons and breaks can be different (in accordance with the sanitary and hygienic norms).

The parameter of *frequency* includes the possibility of the pupil's brush-up of the academic material of any period (when a certain topic or paragraph was being studied) if it is necessary at any time (even if this is the topic of the previous years of learning) in any age and without any limitations of the brush-ups quantity. It also covers the provision of the opportunities for the re-examination of the level of academic achievements if a pupil is not satisfied by the previous results.

The parameter of *duration* includes the opportunity for every child to have the tempo of studying each topic that is appropriate for him/her personally (the individual tempo) for every subject in order to achieve the desired results.

Therefore, the experimental scheme can be observed as a didactic constructor for the creation of the model of the n -dimension space of school events where n is a quantitative index for the choice of the vectors for each system of axes (depending on the personality and depending on the academic institution). The choice of certain parameters of each vector is interdependent either in one system of axes or between them. Combining the components of every vector provides the variation of models and multidimensionality of the academic space. For example, in the intersections of the content vector with others, the opportunities appear for both the organization of the co-operation of students with a teacher (acceptance of aims of studies, that are set by a teacher, the control and the assessment of the academic results of studies by a teacher) as well as for interactive learning (setting a common aim by all pupils, their mutual control and mutual assessment) and self-training (the formulation of one's own purpose, self-control and self-assessment). At the same time, the educational co-operating of schoolchildren is organized with technical equipment (video- and audio equipment, including the use of ICT) and different forms are chosen, for example, the meeting with the specialists, excursions, lessons on nature, etc.

Efficiency of the didactics constructor is predetermined by the fact that according to the theory of probability, the change of one of parameters of the multidimensional system does not influence a result. The constancy of the system provides stability for a student. The changeability of vectors parameters, on the basis of which the academic space is designed in relation to educational establishment, provides the dirigibility and the authenticity of the system. Such non-rigid regulation provides the opportunities for the system self-development. The freedom degree of

a constructor is determined by the amount of parameters for the design, where the minimum includes four vectors in every system of axes (depending on a student and depending on the educational establishment). In the determination and the experimental specification of other parameters taking into account the variability of primary education at the same time, we find the prospects for the further researches

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Цимбалару Анжеліка Дмитрівна
МОДЕЛЮВАННЯ ОСВІТНЬОГО ПРОСТОРУ МОЛОДШИХ ШКОЛЯРІВ: ДИДАКТИЧНИЙ АСПЕКТ

Презентується дидактичний конструктор моделювання освітнього простору молодших школярів, вихідним положенням для побудови якого стало виокремлення в об'єкті моделювання двох взаємозалежних предметів перетворення – шкільного середовища і діяльності учнів з його освоєння. Обґрунтовано вектори моделювання освітнього простору молодших школярів за двома системами координат – стосовно учнів (за домінуючим каналом сприйняття навчального матеріалу; способом його опрацювання, провідним стилем навчальної діяльності і біологічним часом) і відносно закладу освіти (за структуруванням змісту, способом організації навчальної взаємодії, об'єктним контекстом і астрономічним часом).

Ключові слова: педагогічне моделювання, освітній простір молодших школярів.

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Ключевые слова: педагогическое моделирование, образовательное пространство младших школьников.