Research article

Psychosemantic Typology of Student Positional Strategies in Structural and Dynamic Education Environment

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Abstract

Introduction. This paper presents the basis for the structural and dynamic model of positional strategies in the university information and educational environment. Theoretically, it shows possible variations of the psychosemantic description of the typological combinations of complex positional strategies. The novelty lies in the development and approval of a research model for the psychosemantic typology of positional strategies when students perform reflective educational tasks. **Methods**. The study used content analysis of texts of reflective educational tasks completed by students who were forced to study remotely in 2020–2021 (due to the pandemic). The procedure for categorizing psychosemantic levels of cognitive development enabled the determination and identification of 16 positional strategies by combining their dynamic and structural components in a two-dimensional environment. **Results**. The results of content analysis were presented to determine the dominant positional strategies of students in the structure and dynamic environment of a particular educational situation. The highest degree of dominant positional strategies associated with the dynamic level of emotions and the structural level of constructs was recorded. Strategies at the structural symbolic level and strategies at the dynamic imagination level were considered the least expressed. **Discussion**. Some contradictory trends found in the analysis of positional strategies are discussed. On the one hand, there is some personal maturity among the respondents, and on the other hand, there is insufficient participation in the deeper structures of the world, as well as the evident inertia of the 'education baggage' of students. We emphasized the importance of recognizing the diversity of individual education strategies and the need to harmonize psychosemantic organization in the education process.

Keywords

positional strategies, structural dynamic environment, information educational environment, psychosemantic levels, cognitive noetic development, cognitive formations, psychosemantic model, modal vectors, structural attractor, typological combinations

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Highlights

➢ The structural and dynamic model of positional strategies in the university information and educational environment helps empirically identify typological combinations of psychosemantic cognitive formations according to four organizational and four dynamic strategic vectors.

➢ The criteria for the classification procedure of psychosemantic levels of cognitive development of students allow a psychosemantic description of the options for the combination of complex positional strategies with horizontal, vertical, and diagonal trends, reflecting the dominance of one or another attractor (organizational or dynamic), integrating various modal vectors.

➢ Minimization of deficit limitations on the balance of potential of students' positional strategies can be understood as an educational resource for cognitive and noetic development in a modern university.

Introduction

The use of the term 'strategy' in cognitive research has a fairly clear history, presented in the classical psychological works (Solso, 2006; Tikhomirov, 1984; Kholodnaya, 2019; Vekker, 1976; etc.). We should note that the analytical studies of Dirlik & Aydin-Unal (2014) showed that the definitions of the term 'strategy', which exist in modern cognitive psychology, have their own meaning for certain circumstances of a particular organization (i.e., only in their context). D. A. Rytsev (Rytsev, n.d.), when classifying these definitions into groups ('strategy–method'; 'strategy–goal'; 'strategy–structure'), revealed considerable terminological limitations in all three groups. Relying on the holistic model of personal cognitive-noetic development proposed earlier by V. I. Kabrin, which essence lies in the mutual conjugation of dynamic and structural psychosemantic modalities (Kabrin, 2021), we believe that in today's extremely popular studies on educational strategies for the actions of users of electronic educational platforms, the emphasis should be placed on fully advanced level-related cognitive strategies. At the same time, it is important to take into account the total dominance of the psychosemantic factor over its physical locomotion and sensory component in a strategic action. Unlike an *algorithm*, a strategy can have a large number of degrees of freedom as the possibilities of its 'locomotor' implementation. We have identified a universal semantic core, which directly accentuates the upper levels of psychosemantic cognitive formations – value-semantic and conceptual-target ones. It is expected that they provide two lower levels of constructive solutions and symbolic expressions.

Our structural and dynamic model of positional strategies in the university information and educational environment assumes their identification in a two-dimensional environment – according

to four organizational and four dynamic strategic vectors. Each positional strategy type is formed by one of the sixteen possible intersections of these vectors.

Since the structural and dynamic variations of strategies are cumulative (each subsequent variation includes the previous one), the positional types of strategies can be arranged in terms of a general index of their development. Table 1 presents this index (see Table 1).

Table 1

General index of positional strategy development in the structural and dynamic matrix

	Motivation	Perception	Imagination	Emotion
Symbols	1	2	3	4
Constructs	5	6	7	8
Concepts	9	10	11	12
Values	13	14	15	16

In the structural and dynamic environment of the matrix, each positional strategy is created by combining one of the four dynamic and four structural-level descriptions (Table 2).

Table 2

Psychosemantic typology of positional strategies in the structural and dynamic model of cognitive-noetic development

	Motivation	Perception	Imagination	Emotion
Symbols	1.1	1.2	1.3	1.4
Constructs	2.1	2.2	2.3	2.4
Concepts	3.1	3.2	3.3	3.4
Values	4.1	4.2	4.3	4.4

The theoretical possibilities for complex strategies are as follows:

1) A *horizontal* trend that shows the dominance of an organizational attractor that integrates dynamic modal vectors.

2) A *vertical* trend that reflects the dominance of a dynamic attractor integrating structural modal vectors.

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3) A *diagonal* trend that shows the achievement of a progressive structural and dynamic synthesis, a balance of intersecting attractors.

In this context, it is possible to give a psychosemantic description of any combination of positioning (nuclear, 'cellular') strategies.

The main question to be answered when translating the psychosemantic model into typology is what kind of experienced and perceived psychological resource the user of the information educational environment relies on (assurance, hope, preference, habitude)? Here we offer criteria descriptions of four dynamic and four constituent positional structural-level strategies that are formed by the essential characteristics of the psychosemantics of the model of personal cognitive-noetic development.

All 16 position strategies are determined by a combination of dynamic and structural components.

The dynamic components of positional strategies are as follows:

1. *Motivational self-determination* is the manifestation and formation of interests as well as the search for information to distinguish them in areas and topics (what I want to do, who I will become).
2. *Study and analysis* of interesting subjects, tools, situations, and related stories.
3. *Forecast, design,* planning of work on the use and creation of interesting situations, tools, and objects; the accompanying and subsequent fantasies of the productive imagination.
4. *Evaluation of the effectiveness* (optimity) of the achieved results, the way to experience successes and failures, taking into account assessments and feedback from important people.

The structural components of positional strategies are as follows:

1. The symbolic level includes all statements and actions that symbolize (demonstrate) involvement and commitment to something greater, which stands behind the symbol as more significant, but diffused and indefinable.
2. The constructive level includes objectified representations and constructs focused on a certain subject-event reality, highlighting its essential concretizing and generalizing features, by which objects, situations, events are classified, qualified and distinguished.
3. The conceptual level includes concepts that detect and master contradictions, problems and determine goals, objectives, and ways to solve them.
4. The value-meaning level includes value-meaning orientations based on an intuitive (noetic) understanding of the temporal (temporal and transtemporal) forms of being. They are formed by emergent changes and transformations. Thus, the description of all 16 positional strategies is formed by a combination of dynamic and structural components. Thus, complete strategies will be four-level strategies with a clear value-semantic dominant, realized by the structures of the third, second, and first levels. Any combination of combined inter-level (vertically oriented) positional strategies should be considered as developing strategies.

The proposed typology of strategies is universal in relation to the content and its educational, professional, and subject specificities. This enables the comparison analysis of strategies presented or revealed by students from different grades in different educational programs.

Methods

The main research methodology was an analysis of content derived from the results of two reflective project tasks, which for students served as learning tasks in one of the basic disciplines

corresponding to the main educational programs. Such tasks enable students to spontaneously express their psychosemantic intentions, which we consider to be the psychosemantic units of their actual consciousness. This ensured the reliability and authenticity of materials.

We regarded the concept of categorization as metalinguistic for content analysis in a broad sense – from the perceptual categories of J. Bruner to the transcendent philosophical value categories. In the context of the holistic approach, interlevel categorical relations suggest that they are 'charged' with an active structural dynamic factor – the potential for qualitative transitions from 'the successive to the simultaneous', i.e. from the sequential to the simultaneous, from dynamics to structure. In linguistics, such examples may be the phenomenon of substantiation – the transformation of a verb into a noun, as well as the principle of recursion in the generative grammar of N. Chomsky (Chomsky, 1972; Everett, 2018). It therefore also applies to the principles of categorization, which are the basis for content analysis procedures (Tarshis, 2018; Almaev, Bessonova, & Murasheva, 2020).

The procedures for identifying the psychosemantic levels of cognitive development are based on certain theoretical contexts and criteria foundations as follows:

1 Symbolization level (nominal structure):
➢ *criteria aspects* (according to dynamic modalities):
– attention;
– choice;
– archetypal experiences (magical metaphors);
– symbolization – naming (keyword);
➢ *theoretical contexts:*
– background – figure (Gestalt psychology);
– field – quantum (holistic physics and psychology) (M. Talbot) (Talbot, 2014);
– archetype – symbol (archetypal Jungian psychology) (Jung, 2015);
– naming – naming as a basic cognitive process (the Sapir-Whorf hypothesis of linguistic relativity) (Borodai, 2013).

2 Structural level (differential structures):
➢ *criteria aspects* (types of constructs):
– identification (designation);
– distinction;
– assimilation;
– unification;
➢ theoretical contexts:
– general semantics (S. Chase) (Rimskaya & Kirillov, 2000; Chase, 2015; Serkin, 2008);
– the theory of personality constructs by J. Kelly (Kelly, 2000);
– the concept of perceptual categorization by J. Bruner (Bruner, 2008; Filatova, 2011);
– Sapir–Whorf hypothesis of linguistic relativity (Borodai, 2013);
– experimental psychosemantics (Petrenko, 2010; Kabrin, 2021; Tolstova, 2007; Bruner, 2008);
– fractal theory (J. Glick) (Glick, 2021).

3 Conceptual level (problem structures):
➢ *Criteria aspects:*
– sensitivity to contradictions;
– acceptance (recognition of contradictions);

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– transformation of problem situations;

– development of contradictions in a new concept (solution of problem situations);

➢ *Theoretical contexts:*

– the concept of strange attractors (J. Glick) (Glick, 2021);

– the concept of integration (tense unity) (S. Beer, cited by Jackson, 2016);

– the concept of stress transformation in the theory of transcommunication (V. I. Kabrin) (Kabrin, 2005);

– N. Chomsky's theory of generative grammar (principle of recursion) (Chomsky, 1972);

– methods of synectics (combining the incompatible) (G. Ya. Bush) (Bush, 1985).

4 Value-sense level (emergent structures):

➢ *criteria aspects:*

– thirst for changes and fear of them;

– rethinking of losses, meaning of life, and meaning of death;

– rethinking of a catastrophic change in lifestyle;

– understanding the transgenerative nature of existence – values of emergence, transformation, and disappearance;

– a radical change in attitudes towards goodness, truth, beauty, and mystery;

➢ *theoretical contexts:*

– philosophy of life;

– the maxims of the classical scholars (Ecclesiastes, M. Montel, P. Maria, etc.);

– ideological texts of transpersonal psychology (library of the series "Texts of transpersonal psychology");

– research into the higher states of consciousness (R. Bucke, O. Huxley, S. Taylor, E. Tolle, K. Wilber, etc.) (Bucke, 2008; Huxley, 2010; Taylor, 2017; Wilber, 2004).

Classical content analysis is also combined with hermeneutical, phenomenological, narrative psychology methods (E. Ya. Tarshis, E. Betti, A. Giorgi, M. L. Crossley) (Tarshis, 2018; Betti, 2011; Bogomaz, Morozhanova, & Turkovsky, 2019; Crossley, 2013).

In the proposed approach, the categorization levels are defined in terms of criteria that are close to the analytical units of the account. They can include all words and expressions in the semantic area of any criterion moment. Table 3 shows the content of the categories for each coding index.

Table 3

Category coding table

Category coding index	Content of categories
A	*Motivational self-determination* is the manifestation and formation of interests as well as the search for information to distinguish them in areas and topics (what I want to do, who I will become)
B	*Study and analysis* of interesting subjects, tools, situations, and related stories
C	*Forecast, design,* planning of work on the use and creation of interesting situations, tools, and objects; the accompanying and subsequent fantasies of the productive imagination

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Table 3

Category coding table

Category coding index	Content of categories
D	*Evaluation of the effectiveness* (optimity) of the achieved results, the way to experience successes and failures, taking into account assessments and feedback from important people
E	*Symbolic level* includes all statements and actions that symbolize (demonstrate) involvement and commitment to something greater, which stands behind the symbol as more significant, but diffused and indefinable. Options: allegories and parables, hints and allusions, rituals and memes, brands and trends, phantoms and superstitions, etc.
F	*Constructive level* includes objectified representations and constructs focused on a certain subject-event reality, highlighting its essential concretizing and generalizing features, by which objects, situations, events are classified, qualified and distinguished
G	*Conceptual level* includes concepts that detect and master contradictions, problems and determine goals, objectives, and ways to solve them. Concepts assimilate contradictory, conflicting opposites in a new form. It is important to learn to distinguish between concepts that open up perspectives and concepts that lead to a dead end
H	*Value-meaning level* includes value-meaning orientations based on an intuitive (noetic) understanding of the temporal (temporal and transtemporal) *forms of being*. They are formed by emergent changes and transformations

Results

The proposed research model was tested on a sample of first-year students and undergraduates who were forced (due to the pandemic) to study via distance learning at the Faculty of Psychology of the National Research Tomsk State University in 2020–2021. A total of 88 participants took part in the study. Using the results of the content analysis of the creative works of the respondents (exhibited in the LMS Moodle e-learning environment), the indicators of positional strategies were calculated as the sum of the generalized indices of the 2 corresponding categories in the two-dimensional structural and dynamics environment of the matrix. The mean value (22.00) and standard deviation (4.2) for the groups were calculated. Based on the obtained results, the range of 17.8 to 26.2 was determined as average, i.e. the average severity of a particular positional strategy.

The general results of the content analysis for determining the dominant positional strategy in a student group are shown in Table 4.

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Table 4

Psychosemantic typology of positional strategies in the structural and dynamic model of cognitive-noetic development

	Motivation	Perception	Imagination	Emotion
Symbols	14.78	17.21	12.16	21.01
Constructs	25.46	**27.89**	22.85	**31.70**
Concepts	19.34	21.77	16.72	25.58
Values	22.37	24.80	19.75	**28.60**

The results obtained allow us to conclude that students, who express the motivational components of self-determination, choose value-sense structural and constructive strategies and as their most frequent forms of statements. This may indicate a relatively high level of reflection of first-year students. The first year of university education (including a master's degree) is a period of crisis for students, because adaptation and acceptance of a new life status presupposes reasoning about the value component of life and attempts to concretize new experience, embedding it into the existing system of cognitive constructs for perceiving information and their image of the world.

To evaluate the severity of different strategies within the sample, descriptive statistics were calculated for each positional strategy. The results are presented in Table 5.

Table 5

Strategies for the entire sample of subjects

Positional strategy	Mean value	Std. error of the mean	Median	Std. devia-tion	Dispersion	Min.	Max.	Percentile		
								25	50	75
AE	0.17	0.01	0.15	0,11	0.01	0	0.56	0.08	0.15	0.24
AF	**0.29**	0.02	0.3	0.15	0.02	0	0.69	0.18	0.3	0.38
AG	0.22	0.01	0.23	0.12	0.01	0	0.59	0.15	0.23	0.29
AH	0.25	0.02	0.24	0.14	0.02	0	0.67	0.16	0.24	0.34
BE	0.20	0.02	0.16	0.14	0.02	0	1	0.11	0.16	0.24
BF	**0.32**	0.02	0.3	0.18	0.03	0	1	0.2	0.3	0.41
BG	0.25	0.01	0.24	0.14	0.02	0	1	0.15	0.24	0.32
BH	0.28	0.02	0.26	0.15	0.02	0	1	0.17	0.26	0.35
CE	0.14	0.01	0.13	0.1	0.01	0	0.39	0.06	0.13	0.23

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Strategies for the entire sample of subjects

Positional strategy	Mean value	Std. error of the mean	Median	Std. devia- tion	Dispersion	Min.	Max.	Percentile		
								25	50	75
CF	0.26	0.02	0.24	0.15	0.02	0	0.71	0.15	0.24	0.33
CG	0.19	0.01	0.19	0.1	0.01	0	0.47	0.13	0.19	0.25
CH	0.22	0.01	0.22	0.12	0.01	0	0.59	0.13	0.22	0.3
DE	0.24	0.02	0.25	0.14	0.02	0	0.61	0.13	0.25	0.33
DF	**0.36**	0.02	0.33	0.16	0.03	0	0.74	0.26	0.33	0.46
DG	**0.29**	0.02	0.27	0.14	0.02	0	0.67	0.2	0.27	0.39
DH	**0.33**	0.02	0.31	0.17	0.03	0	0.68	0.21	0.31	0.44

Statistics		
Mean value of positional strategies		
N	Valid	16
Minimum		0.14
Maximum		0.36
Average value		0.25
Standard deviation		0.06
RMS error		0.02
Percentiles	25	0.21
	50	0.25
	75	0.29

Note: AE is a strategy that combines the categories 'motivation' (A) and 'symbols' (E); *AF* is a strategy that combines the categories of 'motivation' (A) and 'constructs' (F); *AG* is a strategy that combines the categories of 'motivation' (A) and 'concepts' (G); *AH* is a strategy that combines the categories of 'motivation' (A) and 'values' (H); *BE* is a strategy that combines the categories of 'perception' (B) and 'symbols' (E); *BF* is a strategy that combines the categories of 'perception' (B) and 'constructs' (F); *BG* is a strategy that combines the categories of 'perception' (B) and 'concepts' (G); *BH* is a strategy that combines the categories of 'perception' (B) and 'values' (H); *CE* is a strategy that combines the categories of 'imagination' (C) and 'symbols' (E); *CF* is a strategy that combines the categories of 'imagination' (C) and 'constructs' (F); *CG* is a strategy that combines the categories of 'imagination' (C) and 'concepts' (G); *CH* is a strategy that combines the categories of 'imagination' (C) and 'values' (H); *DE* is a strategy that combines the categories of 'emotions' (D) and 'symbols' (E); *DF* is a strategy that combines the categories of 'emotions' (D) and 'constructs' (F); *DG* is a strategy that combines the categories of 'emotions' (D) and 'concepts' (G); *DH* is a strategy that combines the categories of 'emotions' (D) and 'values' (H).

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On the basis of the obtained results, we should note that the dispersion level, which indicates the extent to which the indicators obtained are grouped around the average value, is quite low. The values of all positional strategies are mainly grouped near the mean value. This indicates that the value of the average level can be used to assess the level of expression of certain positional strategies in the majority of respondents. Therefore, we can distinguish a number of positional strategies, which severity exceeds average values: motivation and constructs (AF), perception and constructs (BF), emotion and constructs (DF), emotion and concepts (DG), emotion and values (DH). This enable us to say that in the study sample a constructive level of strategies is expressed, which is characterized by representations and constructs oriented to the subject-event reality. The result obtained may indicate both the formed orientation to follow specific, objectified interests, and the dominance of evaluating the effectiveness of the results achieved. When performing reflective tasks, organizational elements such as, generalization, classification, enumeration of features, etc., inherent in scientific knowledge, turned out to be a priority. The level of the 'emotion and value' (DH) strategy shows the presence in the consciousness of students of certain value-meaning categories associated with life motivation, reasoning about the values and meanings of activities executed in different spheres of life and their rethinking.

Positional strategies that show values below average are as follows: motivation and symbols (AE), perception and symbols (BE), imagination and symbols (CE), imagination and concepts (CG). The low result may be due to a lack of positive self-determination experience at this stage of life. In addition, we also recorded the fact that the motivational component is poorly expressed in the form of symbols, allegories and parables, showing involvement in global and significant phenomena.

The most dominant positional strategies were found in students with a sufficiently high dynamic level of emotions (emotions and values, emotions and concepts, emotions and constructs) and an organizational level of constructs (constructs and motivation, constructs and perception, constructs and emotions). These respondents were able to classify phenomena in multiple ways, assess actions, and phenomena, and could also take into account the assessments of the constructs of subject-event reality that were directed towards them. The rarest positional strategies were related to the organizational symbolic level (symbols and motivation, symbols and perception, symbols and imagination) and the dynamic imaginative level (imagination and symbols, imagination and concepts). We should note that the organizational level of symbols is the most difficult to master and deeply understand. Despite the fact that this level is represented to a certain extent in the results of all first-year students who participated in the study, it is insignificant for all others, both in dynamic and organizational components. This confirms again the previously recorded research fact that first-year students are largely focused on a particular subject-event reality using generalization and concretization features, while it is significant for them to evaluate the effectiveness of the results achieved, taking into account feedback from important others.

Discussion

Therefore, psychosemantic analysis of the considered positional strategies implemented by students in the structural and dynamic environment of a particular educational situation made it possible to identify some contradictory trends. Thus, we can conclude that the respondents

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have a certain personal maturity, since indicators for all strategies related to value-meaning and conceptual levels, as well as emotional components, are at an average or high level, i.e. the study participants are able to comprehend and independently resolve problem situations, especially personally significant ones, as well as to form symbolic statements on the evaluation of the effectiveness of the results achieved. However, there was a clear manifestation of insufficient participation of the respondents in the deepest organization of the symbolic layers of the world, which may be due to the lack of formation of relevant experience at their present stage of life.

The positional strategy (PS) of motivational values (AH) is considered to be the most common. It became clear that there was a problem with further analysis of the thesaurus of value-meaning formations. PS based on emotional structures (EF) have a slightly lower occurrence, which corresponds to the ideological orientation of education and gives hope for the future.

The third dominant PS is the PS of promising constructs (BF), which is fully consistent with traditional subject-oriented education. It is symptomatic that the total frequency of the appearance of dynamic components in dominant PS directly confirms the cumulativeness of psychological modalities along the dynamic vector – motivation (A) – 50 %, perception (B) – 30 %, imagination (C) – 10 %, and emotion (D) – 10 %.

A variety of PS combinations were weakly expressed among students. Only 10 respondents (out of 88) identified two dominant PS – perceptual symbols (BE) and perceptual constructs (BF). Only one student had four PS, but they also had a common perceptual basis – however, only at all four organizational levels (BE, BF, BG, and BH). Consequently, the problem of promoting the formation of various educational strategies among students remains relevant. The results of a pilot study of students' positional strategies in the context of the structural and dynamics model of personal cognitive development show that the long-term impact of our country's education process on young people's cognitive development is quite realistic.

The analysis of the general frequency structural and dynamics matrix of the psychosemantics of positional strategies shows the greatest expression of the organizational level of the constructs and the emotional dynamic vector at all levels. If the first trend reveals inertial educational baggage of students, then the second one shows the actual opportunity for university teachers to harmonize the psychosemantic organization of the educational process. This applies in particular to the imaginative-conceptual positional strategy (CG), which is the least represented in the strategic potential of a student and is mostly associated with the development of the creative potential of an individual.

In discussions on the results achieved, it is important to draw the attention of modern information technology developers to the need to attract more diverse diagnostic tools for psychological support in the monitoring of user actions in the electronic educational environment of a modern university.

Analyzing the existing experience in the development of intelligent learning environments shows that the prediction of the models of interaction with an information learning environment needs efficient cognitive interfaces that can adapt to the user of the learning environment (Chen, Zou, Xie, & Wang, 2021; Yin, Alqahtani, Feng, Chakraborty, & McGuire, 2021; Slade & Prinsloo, 2013). In addition, the adaptive selection is based on the pre-diagnosis and subsequent adaptation of the learning system (Zhang & Chang, 2020). Currently, many researchers develop various adaptive learning systems based on biometric, cognitive and

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other characteristics and preferences of students (Elbahi, Omri, Mahjoub, & Garrouch, 2016; Panasiuk, Szymkowski, Dąbrowski, & Saeed, 2016; Laamanen et al., 2021; Curum & Khedo, 2021). Psychological support for the personalization process of the electronic educational environment for specific users should be one of the priority tasks, including the development of new diagnostic tools designed to discover and evaluate psychological new formations as educational results.

In this respect, it seems appropriate for the next phase of the study to conduct an analysis of the content of psychosemantic areas at the level of their thesauruses and possibly at the level of narratives and discourses of each positional strategy. This can reveal the depth of development (manifestation) and the potential for developing students' complex positional strategies when elaborating appropriate educational modules in the modern university information and educational environment.

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O. M. Krasnoryadtseva made important contributions to the study plan and critically examined the contents of the overview part of the article.

V. I. Kabrin worked with sources and wrote the overview part of the article.

E. A. Shcheglova made important contributions to the study, analysis, and interpretation of the results.

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