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Cognitive Mental States: Conceptual Fundamentals, Phenomenology and Structural-Functional Organization

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Abstract: The article is dedicated to the research of the cognitive mental states for the purposes of the students' academic activity. The author enunciates the conceptual fundamentals for the exploration of the cognitive states and reports the findings proving the proposed theories. In particular, the cognitive states' peculiarities and their structural-functional organization during lectures, seminars and exams are described.

Key words: Subject · Academic activity · Cognitive states · Cognitive processes · Interaction · Structure · Functions

INTRODUCTION

The particular class of cognitive states connected to the subject's activity in the cognitive area is determined in modern psychology. Thus far, any states marked by the predominant activity of any of the cognitive processes, e.g., dreaminess, meditativeness, etc. are related to the group of cognitive states [1]. The classification of cognitive states was created basing upon this very criterion. However, the issue on the cognitive states' content, structure, functions, dynamics, interrelations with other psychic phenomena remains open. The reason is explained with not only contradictory theoretical concepts about this very class of states (up to denial of them), but also in deficient studies of the category of "state" in general. At the same time, there are enough strong arguments to extract the class of the cognitive states, which *are powered by the activity of not only cognitive, but also metacognitive processes*. In particular, the states of the kind could also include the whole set of distinguished states metacognitively based by definition: e.g., the state of surprise that is connected to integration of new knowledge into the tissue of subject's personal experience; the state of curiosity (also, the state of inquisitiveness related to it) is connected to the metacognitive processes' activation in the unfamiliar environment aimed to understand the occurring things; the state of confidence/diffidence-to the probable forecasting process as for achieving of aim or failing of it, etc. Moreover, the cognitive mental states can appear in course of selfconsciousness and realization of personal knowledge and experience (i.e. be metacognitively based for sure). Nevertheless, neither theoretic, nor experimental researches of mental states connected to the activity at the higher levels of the cognitive area, first of all, to the subject's metacognitive processes, have been performed up to the moment.

Up to date, there are only piecemeal studies of the cognitive mental states. It is reasonable to speak about the explorations tangentially related to cognitive states. Among these could be:

Researches of intellectual emotions [2-4] and emotional states connected to forecasting and expectations [5, 6].

Studying of emotional intellect as a system of personal traits or abilities in charge of interaction between emotional and cognitive areas in personality [7].

Performance of explorations dedicated to some particular metacognitive processes: decision-making [8], selfconsciousness [9], anticipation and forecasting [10], estimation [11-13], etc.

Studying of meta-emotions and their influence upon the emotional response orientation [14].

Researches of metacognitive processes' functioning in voluntary activity self-regulation and copying-processes [16-18], etc.

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Exploration of cognitive area and intellectual abilities [19-22].

In researches of cognitive states we proceed from the following conceptual fundamentals. The cognitive states serve as the general background of the cognitive activity treated as the psychological variable that integrates all levels of cognitive reflection and regulation. Cognitive abilities priming and development are connected to the activity at higher levels of cognitive reflection and regulation, i.e. metacognitive coordinations and intellectual abilities. From the point of view of dynamics, the cognitive states serves as a comprehensive functional system that integrates somatic, mental and meta-psychical processes (integrative mental processes, such as, targeting, decision-making, control, etc.; also metacognitive awareness, etc.). These states also interact with sense bearing structures of consciousness (values, personal senses, orientations and so on). Finally, they are connected to intellectual abilities (cognitive styles, intellect levels' peculiarities, learning ability, creativity) and other personal traits that are necessary for efficient activity. The framework factor of the cognitive states is the subjective meaningful target (or, the useful result) being shaped under the influence of the relevant motives of activity and sense bearing structures of consciousness.

The cognitive states possess their own specific character towards the other classes of states. Their priming is connected to the subjective meaningful situations, which could be determined as strange, new, indefinite, speculative. As compared to other mental states, the cognitive ones are characterized with more advanced level of integration, because they are supposed to involve the higher hierarchical levels of cognitive area-metacognitive, intentional, also intellectual abilities (the emotional intellect, as well) in their structure. The cognitive states emerge full blown in the problematic situation and stipulate inner-mental (cognitive) activity by virtue of initiating a wide range of intellectual exposures involved into the functional structure of this very state. In doing so, the target-conditioned involvement of the subject into the problem, or problematic situation solution is achieved. This very solution is caused by the cognitive regulation of the activity. The cognitive states influence upon the dimension (cognitive complexity) of the mental structures (i.e. 'mental experience' after M.A. Kholodnaya) and so, favor their multidimensionality, representation, also provide regulatory properties of this structures. Owing to the evolving function of the cognitive states, the correspondent “process-containing” sets are fixed and preserved within the structure of the human-being's mental experience.

The best suitable example for illustration of our conceptualization will be the research results as concerning the structural-functional organization of the subject's cognitive states in various situations of the academic activity.

MATERIALS AND METHODS

The structural-functional organization of these states has been studied in three situations of the academic activity, different from the point of view of content-a lecture, seminar and exam.

The survey sample was 143 students of various fields of study (Math, Physics, Biology, Psychology, etc.) in the Kazan State University. The average age of those surveyed was 19.7 years old.

The research was performed using the following methods and techniques:

Selfconsciousness Aspects Measurement Technique, including social and auto-selfconsciousness (M. Grant) [23].

A.V. Karpov and V.V. Ponomareva's Selfconsciousness Development Level Diagnostic Technique, including selfconsciousness of activity and communication (retrospective, current, perspective) [23].

Metacognitive Activity Involvement Diagnostic Technique (MAI) [23].

Teaching Styles Researching Method [23].

G.S. Nikiforov's Self-Control Development Level Diagnostic Technique [24].

V.I. Morsanova's Method “Behavioral Self-Regulation Style” [25].

A.O. Prokhorov's Checklist “Personality Mental State Relief” [26].

R.B. Cattell's Personality Factor Questionnaire (16 PF) [27].

B.S. Alishev's Values Structure Researching Method [28].

Uniform techniques of development level diagnostic and measurement for running, logical, mechanical memory; attention focusing and refocusing; thinking processes (concepts analysis and classification,

comparison and abstraction processes, logical thinking, induction by analogy [13], also analytical-synthetic cognitive style [29].

Test data processing was performed by means of component analysis procedure (Promax Oblique Rotation Technique) using the SPSS 15.0 statistical software.

Main Points: The analysis of students' reports proved that the cognitive activity of those surveyed was instantiated by quite complicated combinations of mental states. For a lecture, the following triad is typical: *calmness-commitment-drowsiness* (57 per cent), for a seminar: *liveliness-commitment-calmness* (53 per cent), finally, at an exam: *mental tension-concentration-excitement* (69 per cent). Thus, depending on the situation, the cognitive process goes with low intensity states (lecture), high intensity positive (seminar), or negative (exam) emotional states. Furthermore, the core states in the above mentioned triads are the *commitment* (lecture, seminar) and *mental tension* (exam). Their rate is higher than 60 per cent, as compared to the rest of the states.

Further on, the structural-functional organization of the cognitive states typical for each of the academic situations was explored.

The results suggest that in case of *lectures,* the core of the interrelations' structure is the set of characteristics representing various parameters of selfconsciousness, self-regulation and self-control, personal traits, axiological parameters, teaching styles and integral cognitive processes. The building agent is the *selfconsciousness* (general level, retrospective and current selfconsciousness) that integrates the parameters of metacognitive involvement into activity, self-regulation, self-control, intellect, thinking and also, personal traits (emotional lability, high self-control, expressiveness, predominance, rigidity, diplomacy, behavioral standardization, sociability). The personal traits build the “external boundary” of the variables' core set, hence, proving that the metacognitive regulation of the activity is connected to the peculiar set of personal traits.

Meanwhile, it should also be mentioned that the correlating average between the triads is insufficient enough (0.126). That bears evidences of the structure discretization, comparative independence of designated subsystems and their weak coordination [30]. The indicators of the mental states intensity are located at the periphery of the structure and connected to the set involving the variables of the personal traits (kindness, love), integrated the cognitive process of *planning* and the personal trait of *developed imagination* (M factor, after R. Cattell).

During the *seminar* the variables' set involving the characteristics of g*eneral intelligence, conception thinking, self-control total level* plays the key part in the interrelations structure. These criteria have the closest ties with the set of parameters represented with the values (devotion, beauty, power, justice, kindness) integrated cognitive process of planning, cognitive processes (attention refocusing, image thinking effectiveness, abstraction, generalization), teaching styles (synthetic, rational).

Thus, contrary to the lecture, the cognitive states' structure depends largely on the values of the subject. Besides, the intercorrelated average increases more than twice (0.298) as for the seminar. That gives evidences of the increase in the cognitive states' structure orderliness, coordinated participation of various subsystems of the states in the cognitive and academic tasks solution.

Basing on the findings, it is reasonable to assume that the principal function of cognitive states during the seminar is cognitive activity priming and intellectual abilities mobilization for better understanding and digestion of the taught sciences' subject matter (by means of academic tasks solution). Meanwhile, the sufficient dependence of these cognitive states on the subject's axiological area should also be noted.

Finally, the sufficient complication of the interrelations structure is fixed at the *exam*. In terms of quantity, this is reflected in the correlating average increase (0.313) as compared to the previous academic situations. The most significant criteria in the core triads are the behavioral self-control, behavioral self-regulation total level, emotional self-control. Thereby, the shift in emphasis to the *self-regulation* processes of *voluntary activity* and *emotional states* connected to it is stated within the interrelations structure. By reference to the peculiarities of the cognitive states' structural organization in course of exam, it is reasonable to assume that their principal function is the general self-regulation of both cognitive and academic activity in general.

The statistics represented in Table 1 fixes the role of the leading factors in the cognitive processes organization within the continuum *common-stringent* situation of the academic activity. Therefore, among these are the personal traits and metacognitive processes (lecture), intellectual abilities and values (seminar), self-regulation and personal values (exam).

Table 1: Relative occurrence frequency of cognitive states criteria involved into constituent subsystems (depending on the academic activity's situations)

	Criteria Number		
Psychological Characteristics	Lecture	Seminar	Exam
Axiological area	8%	25%	33%
Personal traits	33%	0	17%
Self-control and self-regulation	8%	12.5%	50%
Mental states intensity	0	0	0
Metacognitive processes	33%	0	0
Integrated cognitive processes	8%	12.5%	0
Cognitive processes and intellect	8%	50%	0
Cognitive styles	0	0	0
Teaching styles	0	0	0

CONCLUSION

The most common cognitive states in course of students' academic activity are the *commitment* (lecture, seminar) and *mental tension* (exam). Depending on the academic situation, these cognitive states respectively interact with low intensity (lecture), high intensity positive (seminar), or negative (exam) emotional states.

The complication of structural-functional organization of cognitive states, increase in integration rate among various subsystems, axiological parameters' role emerging within the states' integral structure take place within the range of *common-stringent* situation of the academic activity (lecture-seminar-exam).

Findings:

- The cognitive states manifest themselves as functional systems involving subsystems of metacognitive regulation, cognitive activity's emotional arousal, inner mental activity and personal-emotional regulation of thinking processes.
- The structure of cognitive states essentially integrates the personal traits, teaching stylistic parameters among them. Hence, they serve as personal mental states (this outstanding feature of the cognitive states is rarely mentioned by the researchers). The wide range of personal traits within the structure of cognitive states testifies that frequency of these states' priming and feeling could be connected with peculiar type of personality.
- Qualitative analysis of the cognitive states' structure suggests that these states are “metacognitive” by nature (if following the structure's “predominant” constituent criterion). The principal function of them resides in the cognitive activity priming, organization and regulation.

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