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COGNITIVE STRUCTURE OF INTELLECTUAL COMPETENCE IN LATE ADOLESCENCE

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The construct of intellectual competence, understood as a special type of knowledge organization, is considered in terms of conceptual, categorical, semantic abilities and cognitive-and-personality components of mental activity (cognitive demands, flexibility, critical, creative, selectivity, rationality, reflexivity, independence, dialogue, general intellectual culture). Participants: 102 students (59 girls and 43 boys) 9th grade Moscow school at the age of 15 years. Methods: "generalization of the three words" (Kholodnaya, 2002), "conceptual synthesis" (Kholodnaya, 2002), "The visual semantics of words" (Artemieva, 1980), "The semantic differential" (modification, Kholodnaya, 1983), "Features of thinking"(Sipovskaya, Kholodnaya, 2010). According to the results of the factor analysis, the structure of intellectual competence can be described by semantic abilities (differentiated measure of sensory activities). Indicators of cognitive and personality components of mental activity (cognitive needs, criticality, creativity, selectivity interests, rationality, reflexivity, independence, dialogue, common intellectual culture) associated with the conceptual and categorical abilities. The results display the complexity of cognitive-and-personal structure and the principle of multi-level organization of intellectual competence in late adolescence. The structure of intellectual competence in late adolescence opens out mental space, starting with the primary emotional-and-evaluative perception of an object (semantic abilities). Lack of correlations between indicators of intellectual competence and conceptual and categorical abilities, as we assume, may be due to immaturity of the higher levels of conceptualization needed to expand the intellectual capacities of adolescents. This assumption is supported by the lack of correlations between intellectual competence and indicators of cognitive-and-personality components of mental activity. These results enable the opportunities study manifestations of intellectual competence in childhood. This, in turn, will explore the development of competence in ontogeny and mechanisms for its formation, and will contribute to the development of new methods of diagnosis of intellectual competence.

Keywords: Intellectual competence, Activities, Abilities, Adolescence, Ontogeny.

Success in a particular professional activity is considered to be amanifestation of a particular form of intellectual and practical activities - professionalism or competence. There are a number of different studies (Chamorro-Premuzic T., Furnham F.; Chamorro-Premuzic T., Ateche A.; Janosik S. M., Chairperson; Creamer D. G; Kowalski G. J, Goryunova N.).Intellectual competence is a form of organization of knowledge and skills, with which a man can achieve good results in a particular activity. Due to the special significance and productivity of intellectual competence for experts, traditionally, this phenomenon was studied on professionals,for example, bookmakers, poker players and others. (Sternberg, 2002). Manifestations of the same intellectual competence in children have not been studied in detail. This situation complicates the understanding of the formation of intellectual competence and its

components. According to the principles of evolution, competence is not formed suddenly out of nothing. It forms evolutionary, converting a number of ancestral forms in offspring forms. "Adult" competence is the most mature form compared with the manifestations of competence in childhood because of the exercise of mental activities, bringing them to skills. However, it is possible to identify some general with "adult" competence components and examine their impact on the child's activity in such subject areas as, for example, schooling.

Investigations of manifestations of intellectual competence in late adolescence is perspective because of the need to form in children not only the knowledge and skills, but also ways to analyze and manage their cognitive activity. We should teach to provide ready-made knowledge, but also to teach a childto obtain independently, organize and use the information he needs. It requires the formation of a special type of knowledge organization, which would provide an opportunity to make effective decisions in a particular subject area, e.g. intellectual competence.

It seems promising to investigate manifestations of intellectual competence in older adolescents (15-17 years). Conceptual thinking is finally formedat this age. This ability provides aqualitative improvement of the intellectual resources of a teenager. Thus, L. M. Wecker (Wecker, 1976) suggested that the formation of concepts serves as a prerequisite for higher forms of intellectual activity, characterized by the maximum capability of intelligence.

Several studies have identified components of intellectual competence (Raven, 1977; Sternberg, 2002; Kholodnaya, 2002, Chamorro-Premuzic, Furnham, 2005 et al.). They are: 1) subject knowledge; 2) conceptual, categorical, semantic ability; 3) self-regulation; 4) intentional knowledge; 5) specific motivation; 6) cognitive-personal components (qualities), namely: cognitive demands, flexibility, criticality, creativity.

In this study we investigate: 1) the manifestation of intellectual competence as the ability to generate narrative (transformation of knowledge); 2) conceptual skills; 3) the ability of categorical and 4) semantic abilities.

Theoretical hypotheses of this study: indicators of intellectual competence, one manifestation of which is the ability of causing mental narratives (copyright text) associated with conceptual abilities, categorical abilities and semantic abilities.

Exploratory hypotheses of the study: there is a connection between the level of development of conceptual abilities (in terms of categorical, conceptual and semantic abilities measured by methods "Generalization of the three words", "conceptual synthesis", "visual word semantics", "semantic differential") and rates of formation of intellectual competence (measured in terms of narrative).

Thus, the subject of the study – the structure and the manifestation of the intellectual competence, the object of the study - students 9th grade Moscow schools, whose intellectual competence is forming in the process of schooling.

Methods

Participants: 102 students (59 girls and 43 boys) 9th grade Moscow school at the age of 13 - 16 years (median - 15 years).

Techniques

The first block.Techniques for extracting conceptual (categorical, conceptual and semantic) abilities.

"Generalization of the three words" (Kholodnaya, 2002)

Material of methodology "Generalization of the three words" consists of ten triads of words. Each triad is read out to the participants sequentially. Students should think what is common between these three

words and write down this feature in one or two words. 25 seconds are given to find out and to write the answer for each triad of words. The answer should be filled into the form.

Each answer was rated by the range from 0 to two points for each of the tentriads. The criteria: 0 points - lack of generalization; thematic generalization based on spatial or temporal proximity of objects; one point - analytic generalization; formal generalization; two points - strict categorical generalization using generic terms. The overall score is the sum of points for all triads.

Variables: categorical abilities.

"Conceptual synthesis" (Kholodnaya, 2002)

Material of methodology "conceptual synthesis" consists of three triads of the words, which are unrelated by the meaning. The participants asked to make the maximum number of meaningful sentences containing all these words. One triad of words is printed on each A4 form. Participants were given instructions verbally, in accordance with which the participants were asked make different versions of semantic connections between these three words, write each connection into the form in one or two sentences, so that all three words were used. Three minutes are given for each triad.

Each answer was rated by the range from 0 to three points for each of the three triads. The criteria: 0 points - lack of sentences; no semantic connections, or used only two words; 1 point - a simple listing of words in a sentence; 2 points - creating a context within the description of a specific situation; 3 points - a sentence with comparisons, analogies; all three words are of summarized by category or by detailed casual connections. The overall score is the sum of points for all triads.

Variables: conceptual abilities.

"Visual semantics of words" (Artemieva, 1980)

This methodology involves two tasks. Participants are given a white A4 sheet. Graphic representation of indeterminate shape is given in the upper part of that sheet. Students should answer two questions about each image. The first question: "What is it? What is it like? "(The response is written down). The second question: "What properties applied to this object?" (List of these properties is written down). There were givenfive images.

Analyzation of the semantic interpretations allocated different subtypes of interpretations: object-type interpretation (e. g. sun, bird); abstract-type interpretation (e. g. universe, God, mandala); geometric-type interpretation (circle, square).Analyzation of semantic features allocated different subtypes of semantic features: touch-type semantic features (e. g. cold, prickly); emotional-and-personal-type semantic features (kind, cheerful, sad); dynamic-type semantic features (running, developing speed of light); logical-type semantic attributes of (worn, complex, untidy, add). Points of the selected subtypes are summed with the points corresponding to the subtype for the rest of pictures.

Variables: the ability to objective-type semantic interpretation, the ability to abstract-type semantic interpretation to geometric-type semantic interpretation; the ability to form touch-type semantic features, the ability to form emotional-and-personal-type semantic features, the ability to form the dynamic-type semantic features and the ability to form logical-type semantic features.

"Semantic differential" (SD, modification, Kholodnaya, 1983)

The protocol is filled for each image of previous methodology " Visual semantics of words": participant had to put a label in one of the 7-column - "strong", "medium", "weak", "no", "weak ", " medium ", "strong .For each of the 20 antithetic scales participant rates the extent the two ends of the scale emphasized in relation to a specific image (elections in the "weak", "medium", "strong" columns) or fix the lack of any impression (selection in the" no " column). Time of the task is not limited. However, participants were asked to work faster, focusing on first impressions.

Each of the 5-graphics were graded by counting the number of elections in the "no" column (a measure of the lack of sensory expression, unemotional in intellectual activity), the responses in the "weak" and "medium" (a measure of differential participation of sensory expression) and the responses in the "strongly" (a measure of over-inclusiveness of sensory impressions, "flight to fantasies"). Scores for each of the columns were summed with scores corresponding graphs for the rest of the 4th pictures.

Variables: the degree of involvement of sensory and emotional experiences in intellectual property: the number of elections in the two graphs "strongly" SD - indicator of excessive severity of sensory and emotional expression in intellectual activity; the number of elections in the four columns "medium" and "weak" SD - indicator of differential involvement of sensory and emotional expression in intellectual activity; the number of choices in the "no" diabetes - an indicator of the lack of sensory and emotional expression in intellectual activity.

The second block. Methodology to extract intellectual competence "Narrative."

A narrative is an essay on a free theme. It reveals features of structuring and transformation of the data in the process of generation of a new context.

Students were given two white A4 sheets for writing essays. Participants were asked to write an essay on any theme they prefer. There was no information about standards or volume of the narrative. Participants were reported only that they should write as much text as it would be necessary to disclose the topic.

Indicators of the methodology "Narrative": general score. In particular, the measure of mental narrative's complexity.Criteria: 0 points - lack of written narrative; 1 point - a formal written narrative with descriptive sentences without expressing any point of view; 2 points - an narrative with the causal relationships; 3 points - a narrative with an argued position or contemplation; 4 points - two essays.Also, the texts were analyzed by sentences. There were: 1) the narrative of a factual type (facts, for example: "The Moscow Battle took place in 1941"); 2) narrative of systematizing type (selection of general categories, such as: "The Stalingrad Battle consisted of 3 stages: Stage 1: defense; Stage 2: the battle for the city, the 3rd stage: counteroffensive"); 3) narrative of argument type (argument of a statement such as: "He had not eaten for a few days: there was the famine in Leningrad"); 4), narrative of a question type (questions, suggestions, for example: "Could I fight against people?"); 5) narrative of interpretive type (alternative or more general context, for example: "But if we had not defeated Napoleon, the whole world would be ruled by the French – it wouldn't be normal"); 6) narrative of emotional-substantial type (an impersonal assessment in broad categories, such as: "Let us remember the heroism!"); 7) narrative of emotional-and-personality type (personal position to the described events, for example: "I cry when I watch movies about the war"). Points for each of the selected narrative types are calculated for each of these types separately throughout essay.

Variables: intellectual competence (general score), factual-type narratives (f-type), systematizing-type narratives (s-type), argument-type narratives (a-type), question-type narratives (q-type), interpretive-type narratives (i-type), emotional-substantional type narratives (e-s-type) and emotional-and-personality type narratives (e-p-type).

Results

The first step in analyzing the data was to check the normality of the distribution of all variables. For these purposes, descriptive statistics was used: expectation, variance, kurtosis and asymmetry, accounting for variations of these parameters. Analysis showed that the distribution of some variables is different from normal. That greatly reduce the scope of statistical data analysis –only methods of nonparametric statistics might be used.

The next step was to conduct a correlation analysis (Spearman) of conceptual, categorical and semantic abilities and general indicator of intellectual competence. The results of this analysis are presented in Table 1.

Table 1. Correlation between the total index of intellectual competence and conceptual (categorical, conceptual and semantic) abilities.

	Intellectual competence (general score)
Conceptual ability	**0,43****
Categorical ability	0,18
Ability to objective-type semantic interpretation	**0,30****
Ability to abstract-type semantic interpretation	0,03
Ability to geometric-type semantic interpretation	0,19
Ability to form touch-type semantic features	**0,44****
Ability to form emotional-and-personal-type semantic features	**0,28****
Ability to form the dynamic-type semantic features	0,12
Ability to form logical-type semantic features	0,19
Indicator of excessive severity of sensory and emotional expression in intellectual activity	-0,02
Indicator of differential involvement of sensory and emotional expression in intellectual activity	**0,27****
Indicator of the lack of sensory and emotional expression in intellectual activity	-0,11

Notes: * P <0.05; ** P <0.01; *** P <0.001; **** P <0.0001. Bold font highlighted significant correlations.

According to Table 1, the indicator of conceptual abilities significantly correlated with the manifestation of intellectual competence in late adolescence, while the index of categorical abilities - rather poorly. Thus, there is reason to believe a minor contribution of categorical abilities to the formation of intellectual competence in this age.

As for correlations of semantic abilities and intellectual competence, several different connections were identified: the ability of a semantic interpretation of the objective type, the ability to form semantic features of sensory and emotional-and-personality type and the differential involvement of sensory and emotional expression in intellectual activity.It is important to mention insignificant negative correlations of intellectual competence with excessive and insufficient severity sensing component activities.

Due to the fact that the overall intellectual competence happened not to be associated with all the components of conceptual abilities, a correlation analysis of particularcharacteristics of intellectual competence with conceptual, categorical and semantic abilities was carried out. The results of this analysis are presented in Table 2.

Table 2. Correlation relations of particular manifestations of intellectual competence and conceptual (categorical, conceptual and semantic) abilities.

	f-type	s-type	a-type	q-type	i-type	e-s-type	e-p-type
Conceptual ability	0,18	0,03	**0,22***	**0,38****	**0,22***	**0,31****	**0,38****
Categorical ability	**0,25***	**0,22***	**0,29****	**0,21***	**0,25***	**0,21***	0,14
Ability to objective-type semantic interpretation	0,14	0,12	**0,3*****	0,07	0,12	0,11	0,19
Ability to abstract-type semantic interpretation	0,01	-0,02	0,11	0,11	-0,07	-0,06	0,1

Ability to geometric-type semantic interpretation	0,11	0,04	0,11	0,08	0,04	0,06	**0,22***
Ability to form touch-type semantic features	0,17	0,13	**0,27****	**0,23***	**0,24***	**0,22***	**0,25***
Ability to form emotional-and-personal-type semantic features	0,14	0,04	0,08	**0,22***	0,16	0,16	**0,24***
Ability to form the dynamic-type semantic features	0,02	-0,15	-0,02	0,04	0,00	0,07	0,19
Ability to form logical-type semantic features	0,07	0,03	0,06	0,13	0,11	0,13	0,19
Indicator of excessive severity of sensory and emotional expression in intellectual activity	0,05	0,03	0,07	0,07	0,06	0,11	0,05
Indicator of differential involvement of sensory and emotional expression in intellectual activity	0,15	0,07	0,19	0,18	0,19	0,17	**0,23***
Indicator of the lack of sensory and emotional expression in intellectual activity	-0,05	-0,01	-0,13	**-0,20***	-0,1	-0,12	-0,2

Notes: * P <0.05; ** P <0.01; *** P <0.001; **** P <0.0001. Bold font highlighted significant correlations. f-type - factual-type narratives, s-type - systematizing-type narratives, a-type - argument-type narratives, q-type - question-type narratives, i-type - interpretive-type narratives, e-s-type - emotional-substantional type narratives, e-s-type - emotional-and-personality type narratives.

According to Table 2, conceptual abilities related by narratives ofargument, question, interpretive, emotional-substantial and emotional-and-personality types. Categorical abilities related to narratives of factual, systematizing, argument, question, interpretive, emotional-substantial types. Semantic abilities were very differentially associated with a particular manifestation of intellectual competence, partly repeating correlation of conceptual and categorical abilities, but completely ignoring the indicators of narratives of factual and systematizing type. In this case, attention is drawn to the fact that some indicators of intellectual competence, evaluated by the proposals of various types, correlate with conceptual as well as categorical and semantic abilities: narratives semantic type. Some narratives and correlated with the conceptual and categorical abilities: argument, question, interpretive, emotional-substantialtype. Among thatstands out narratives, that correlate only with one of conceptualabilities (narratives of emotional-and-personality type) or categorical abilities (narratives of factual and systematizing type).

Discussion

These results indicate the complexity of cognitive structure and principle of multi-level organization of intellectual competence in late adolescence. Thus, it was revealed the presence in the construct of intellectual competence both conceptual and categorical, and semantic abilities as three manifestations of conceptual experience. Similar results were obtained by M. A. Kholodnaya (Kholodnaya, 2012) regarding the conceptual structures. M. A Kholodnaya uses the term "nesting" of conceptual structures, indicating that the semantic and categorical structures are "nested" in the conceptual structure. Thus, the conceptual structures are mental carriers of all three types of conceptual abilities.

In accordance with results, the indicators of intellectual competence are also defined by the growth of conceptual complexity. Kholodnaya suggests that the expansion of the inner mental space and growthof methods of operating individual mental experience is typical for concepts. It was demonstratedin our study: the alphabet of such methods is characterized by intellectual competency. In general, it can be concluded that higher levels of indicators of intellectual (school) competence associated with higher rates of semantic abilities. This fact emphasizes the importance of ability to operate a variety of alphabets (ways of encoding information) for effective intellectual work.

According to the results of our study, the same conclusion can be drawn about the intellectual competence, which is characterized by semantic, categorical and conceptual abilities. The structure of intellectual competence deploys mental space, starting with the primary emotional-evaluative perception of an object by means of semantic abilities, passing categorization and reaching conceptual abilities with the possibility of the formation of new mental spaces. In contrast to the concept - mental structure within the individual experience - competence is closely relatedwith a particular subject area.

Thus, from our point of view, intellectual competence "shall" concept as an internal cognitive structure in the practical field. As a result,a new mental formation forms. This mental neoplasm(new formation is intellectual competence.

Nevertheless, some of the questions in this paper were not affected or covered superficially. They deserve a discussion. This,is for example, a study of the structure of conceptual ability; a study of the motivation as being an important factor of intellectual competence; individual manifestations of intellectual self-control; discussion of the specifics of the methods and methodological techniques, that are used in researches of competence and its components.

The studies, resolving these issues, will contribute to the further unfolding of the psychological mechanisms of competence, to improve its measurement tools. In general, the study of intellectual competence has become one of the most important areas in the science of psychology as it results inthe development of all sectors of society.

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