Information and Cognitive Activities of a Student
As a way to Interact with the New Information Reality

Galina Rudolfovna Vodyanenko

Perm National Research Polytechnic University, Russia, 614000, Perm, Komsomolsky Prospect, 29.

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The article considers the relevance and the method of changing the traditional model of cognitive activity, aimed at the interaction between the person (student) and the modern information and technologically rich world. A new model is proposed to call the information and cognitive activity. The existing model structure transformation is produced by increasing the conjugacy of components of thinking, information and engineering research activities. The pedagogical experiment for the development of information and cognitive activity by students is described, and the obtained data are discussed and interpreted herein.

Key words: Cognitive activity, Thought activity, Information activity, Research activity, Information and cognitive activity, Operational sphere, Motivational sphere, Critical thinking.

The global informatization processes, by penetrating into all spheres of social life, initiate the creation of qualitatively different information and technologically saturated, social and cultural environment of human activity that both changes the personal perception and understanding of renewing world’s realities by a person, and also requires a development of new ways of interacting with the surrounding informational reality (Toffler, 1995; Erickson, 2004; Hoffman, 2008). To perform the becoming informational reality cognition and transformation, it is necessary to update the structure of human cognitive activity, and to create its more modern model. In our opinion, the existing cognitive activity structure transformation occurs due to:

a) Deepening and expanding the sphere of thinking activity (and its understanding as a mental activity);

b) Movement of component of the information activity (which is part of any activity) into the independent position;

c) changing the vector direction of human interaction with the surrounding changeable world in the mainstream of active design and research search.

This new model of human cognitive activity, we suggest calling the information and cognitive activity, treating it as a special kind of human intellectual activity that in its composition integrates the cognitive and informational activities, which implementation is carried out within the design and research approach (Vodyanenko, 2013; 2014).

Such accents priority is particularly relevant for the contemporary Russian school, which is put today before the need to achieve the educational outcomes, set out in the Federal State Educational Standards (FSES). In particular, the FSES put forward the following as the main priorities:

a) Personality characteristics formation of the school graduate; the formation and
development of his readiness and ability to think critically, to develop the scientific understanding of the surrounding world;

b) Development of motivation for the education and self-education throughout his live, and for the modern innovative activity in the school graduate;

c) Formation of ability to make the unconventional decisions and to take the initiative in the school graduate, the ability to see problems, and to attack them, and by finding the right information, to develop the options of their possible solutions.

The information and cognitive activities (IGA) mastering by the students significantly contributes to achieving the stated educational outcomes.

METHODS

The process of IGA development is achieved in stages by the students - their age development levels served as marks. Taking into account the integrative nature of IGA, driven by the need of key activities implementation, within its system (thinking, information and research), at each stage, where its goals and objectives are formulated, and, respectively, are defined, and your means to achieve the designed result, the educational process is implemented simultaneously (synchronously) in three interrelated lines:

1 line
Purposeful formation of mental sphere of the student during the mental activities;

2 line
Development of understanding (content and meaning of perceived information) during the information activities;

3 line
Formation and growth of the student’s subjectivity (independence of choice and responsibility for the decisions taken) during the design and research activities.

Each line has its own peculiarities dictated by: 0) age characteristics of pupils, b) internal logic, which establishes the conditions for performing a certain kind of activity.

The “horizontal” interaction of activities (lines) is become possible by using the different kinds of educational problems. The process of such problems solving helps pupils to get an integrative complex of activity-related skills, the development and improvement of which effect on the success of mastering and IGA implementation quality. The peculiarity of problem tasks proposed to the pupils is that while working on them the key activities alternation of the IGA system takes place. At an appropriate stage of problem solving one of the active processes is put forward to the first position, while others don’t disappear, and temporarily move into the category of background. During your transition to the next stage of problem solving, the disposition of activity processes is changing, and other activities, which previously created a background for the implemented process, are becoming priority. Thus, the problem situation acts as a start for the thinking process (start of mental activity); in the next stage, when you define the problem, its formulation and search for the possible, the information activities process is becoming a priority. When you test the hypotheses and select the most appropriate variant of the decision, the design and research activities (the process of designing, research and modeling) come on the first positions. Thus, the solution of problem tasks integrates all three key activity processes.

EXPERIMENTAL

The pedagogical experiment, aimed at testing of hypothesis about changing the dynamics of IGA system development among the pupils in the conditions of corrected educational process, included the typical stages - ascertaining, forming, and control.

At the ascertaining stage of the experiment we: 1) defined the parameters of diagnostic and 2) designed the diagnostic complex, in the aggregate they allow to identify the IGA system development level among the pupils.

As the core parameters of IGA system development among the pupils we considered two variables: the level of IGA formation and the level of critical thinking development. The choice of such combination was determined by the fact that the productivity of any activity, and especially the intellectual activity (which the IGA is, as well), is closely connected with the thinking activity (mental activity).
The level of IGA formation was studied by two parameters - operational (instrumental) sphere and motivational sphere – and was evaluated by means of several diagnostic instruments. Namely: psychological tests of J. Barrett (Barrett, 2004), “Criteria for assessing the personal project” methods (Stupnitskaya, 2008); “Academic motivation of pupils” methods (N.V. Kalinina, and M.I. Lukyanova).

The level of critical thinking development (CT) was studied by two parameters: the main (basic) mental operations and a complex of skills, included in the instrumental (operational) composition of CT. This level was diagnosed by methods of “Comparison of terms”, “Triads” (for pupils of I degree) (Psychological Practical Training, 2007); methods of “Simple analogy”, “Allocation of essential features”, “Complicated analogy”, “Interpretation of sayings”, “The formation of artificial terms”, “The strategy of using the information when solving problems” (for pupils of II degree) by Vygotsky-Sakharov (Psychological Practical Training, 2005); methods of Bruner, “Tower of Hanoi”, “Instrument for the development and evaluation of critical thinking” (P. and N. Fachone) (for pupils of III degree).

The organization scheme of ascertaining (and all subsequent stages) experiment included two vectors, implemented simultaneously (in parallel): vector 1 – participants were trained together from 1st to 7th grades; vector 2 – participants were trained together from 8th to 11th grades. Our choice was determined by the time-saving factor for the conducting of this stage of the study.

For each vector of the experiment two groups were determined, homogeneous in all indices of applied methods:

**Vector 1**
- 1 grade (28 persons) – control (CG) and 1B grade (28 persons) – experimental (EG);

**Vector 2**
- 8 grade (27 persons) – control (CG) and 8B grade (28 persons) – experimental (EG).

At initial diagnostic of the operational and motivational spheres of activity and the level of critical thinking development by the vector 1 (1-CG and 1B-EG), and also by the vector 2 (8-CG and 8B-EG), the revealed indices, in general, were not statistically significant (although they were slightly higher than the theoretical mean index, equal to 2.00).

At the forming stage of the experiment we have developed and tested a program for the development of information and cognitive activities (IGD) by pupils. Such program represents a complex of pedagogical conditions and means, allowing to structure the educational process across the age-related vertical based on the method of activity modeling. Methodical basis of the complex - packages of educational problems, applied in various curricular and extracurricular classes.

At the control stage of the experiment we conducted the verification of obtained initial data

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<tr>
<th>Vector 1(1-7 grades)</th>
<th>Average level index (ALI)</th>
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<tbody>
<tr>
<td></td>
<td>EG</td>
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<td></td>
<td>Before</td>
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<tr>
<td>Operational sphere of IGA</td>
<td>2,08</td>
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<tr>
<td>Motivational sphere of IGA</td>
<td>2,10</td>
</tr>
<tr>
<td>Critical thinking</td>
<td>2,08</td>
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<tr>
<td>Vector 2(8-11 grades)</td>
<td>Operational sphere of IGA</td>
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<td></td>
<td>Motivational sphere of IGA</td>
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<td>Critical thinking</td>
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Significance of differences: * - p<0,05; ** - p<0,01
at the ascertaining stage using the same methods. The final diagnostics of operational and motivational spheres of IGA and the critical thinking (CT) detected a significant difference of indices of pupils in the EG and CG in both vectors and confirmed the positive dynamics of pupils’ promotion in the experimental groups. The results are shown in Table 1.

It is important to note that in the course of diagnostic the pupils in the EG showed both the promotion to the higher levels of motivation and the new quality of indices. Thus, in the 7B-EG (Vector 1) the predominance of internal motives with a strongly pronounced cognitive interest and the understanding of personal meaning of training were revealed, and in the motivation structure of the high school students in the 11B-EG (Vector 2) the profile and professional motives began to prevail.

Findings

Definitely, the issue of IGA diagnostic seems difficult and far from completely solved in the psychological and pedagogical science. At the given stage of the study, our task was to allocate such parameters of IGA, which, on the one hand, could reveal the essential (key) features of IGA, and on the other - could be reliably diagnosed and adequately interpreted.

Let us recall that the IGA represents an integrative combination of separate kinds of activities, during the mastering of which the multiple skills are formed, and various ways of activities are developed. In this case, the skills are formed as the synthesis of knowledge and skills, as the mastery of attitudes (operations) by the person, leading to the successful implementation of one or another activity. The skills to implement the necessary actions form an operational (instrumental) scope of activities. The fundraising of specific skills to implement the IGA (their composition, speed and accuracy) may serve as parameters, revealing the IGA system formation level. The initiating mechanism of human activity is a motivational sphere, given that namely the developing needs, interests, motives, and personal meanings incite man to actions, forcing him to start their implementation. By examining the motivational component of IGA system of the pupil, we get the opportunity to judge about the level of his IGA system formation, because, based on the degree of human involvement in the activity process, we can predict the probability of activities motives’ shift. At the same time it’s fundamentally important to study the dynamics of critical thinking development of the pupil during the IGA mastering. Mainly because, by thinking critically, a person both evaluates the results of his thinking processes and controls the course of reasoning, mobilizing all his intellectual potential, all his experience, and all his knowledge, and directing that powerful instrument for his activities implementation.

Thus, the data obtained in the course of this experiment (on the results of diagnostic of IGA’s key parameters) shows a significant exceeding of dynamics for the development and quality of IGA’s formation, which the pupils in the EG have demonstrated compared with the pupils in the control groups. The difference in the dynamics of pupils’ promotion in those groups is set in the statistically significant level. An additional argument in favor of the validity of proposed method (a method that provides more fast and qualitative formation of IGA system of pupil compared to the traditional educational process) was obtained in the course of correlation analysis, that let us to establish the close interaction between the development of operational sphere of IGA and the critical thinking level. However, now the question arises, How can you diagnose the interrelation between the motivational sphere of IGA and the critical thinking level?

REFERENCES

7. Bryon, M., Graduate psychometric test workbook. www.de.slideshare.net/Gonzalo Santiago/the-graduate-psychometric-test-workbook, 2005