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**INTERDISCIPLINARY OUTCOMES AS A NEW COMPONENT OF
EDUCATIONAL STANDARDS**

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Abstract

The new component, such as requirements for interdisciplinary (“meta subjective”) learning outcomes was introduced into the Russian National standards of Education recently. With this regard the article presents the problems of the interdisciplinary approach to learning and discusses the essence of interdisciplinary learning outcomes in the terms of students’ subject experience. It analyses the main approaches to interdisciplinary learning’s understanding and implementation in school education and provides the practical ways for the achievement of these objectives by means of different school subjects. The inclusion in the school curricula of a special interdisciplinary course forming learning skills and ways of knowing is argued. The authors focus on the specially constructed tasks forming learning skills and ways of knowing, evaluates their samples in pedagogical literature and subject guides. Based on the experience of creating mentioned tasks, they give a classification of interdisciplinary tasks for students and propose new criteria to classify them.

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Keywords: School education, cognitive activity, interdisciplinary approach, ways of knowing, universal educational actions, methodological knowledge.

1. Introduction

The National standards of education, adopted in 2009 - 2010, in comparison with the normative document of 2004, were supplemented with a new component, such as requirements for interdisciplinary (“meta subjective”) results of education. The structure of interdisciplinary results included so-called universal educational actions (cognitive, regulatory and communicative) and interdisciplinary concepts. The integrative approach to the educational process was not new in Russian education. Nevertheless, the idea of integrating the content of education in connection with the implementation of the requirements for learning outcomes was perceived as a new stage in education. This innovation was developed in basic educational programs of primary education (Primernaya osnovnaya obrazovatel'naya programma osnovnogo obschego obrazovaniya, 2017) and secondary education (Primernaya osnovnaya obrazovatel'naya programma srednego obschego obrazovaniya, 2015; Ryzhakov, 2014). The special block in each program began with a section that examined the basic approaches to the formation of universal educational actions. It took into account continuity and was in accordance with the level of education and the psychological characteristics of students of different age.

Considering the content of education as a unity of different kinds of experience, such as: a) the cognitive activity experience, fixed in the form of its results (knowledge); b) experience in implementing known methods of activity; c) creative activity experience; d) emotional-value relations experience (Vorovschikov, Orlova, 2012), it is necessary to determine the position of interdisciplinary education results. Is the “interdisciplinary experience” a specific unit, or each structural component of the experience, identified by Lerner and Skatkin, includes interdisciplinary component? The relations between and the sequence of personal, interdisciplinary and disciplinary (course) results that National standards of education gives, require refinement. The idea of Serikov reflects this necessity in the most general form: “The assimilation of the logical and objective characteristics of the world, which occurs in the learning process, increases the person's orientation in the environment, including it in the chain of cause-effect relations and objective dependencies of nature. However, the essential forces of a person may not be in demand, since they manifest themselves when a person enters into a relationship with another person (Slobodchikov), and this happens when a person discovers the meaning of the cognisable subject, as well as the meaning of knowledge itself.” (Skripkina, 2011).

2. Research Questions

The search for an answer to these questions cannot remain in theory. The implementation of the National standards of education transferred it to practice and demanded an assessment the potential of both a) school subjects in achieving interdisciplinary results and b) separate subject (course, module), “teaching interdisciplinarity” (International Baccalaureate Organization, 2014). There are examples of a comprehensive solution in the international pedagogical experience. The programs of the International Baccalaureate are aimed at implementing the interdisciplinary approach in the form of transdisciplinarity (primary school) or interdisciplinarity in the subsequent stages of education (for example, the Middle year's program, along with mastering interdisciplinary concepts, demands to develop a deeper understanding of learning skills for application in meaningful contexts and in several academic subjects) (Pintrich, 2002). These results are achieved by the integration of a system of general concepts, the use of

a global context, a unified system of cognitive skills (approaches to learning) (International Baccalaureate Organization, Peterson House, (2015), and unified requirements for evaluation. At the final stage of the study (the Diploma program of the International baccalaureate), the compulsory for each student Theory of knowledge course reveals the problems of cognitive activity. Theory of knowledge implies “knowledge of knowledge and tools for obtaining it” (International Baccalaureate Organization, 2015) and combines the deeper learning of cognitive concepts, ways of knowing, and methods of inquiring. Therefore, the research question of this study can be formulated as follows: what kind of tasks and assessment and classification criteria can be used within the frames of meta-subject learning outcomes introduction.

3. Purpose of the Study

The purpose of this study is to substantiate interdisciplinary experiencing the sphere of education, and suggest classification for the interdisciplinary tasks.

4. Research Methods

The authors use the analysis of the main approaches to understanding and implementing meta-subjectivity; modulation of the meta-subjective module; and construction of meta-subject tasks.

5. Findings

Such terms as “interdisciplinary approach”, “interdisciplinary course (subject)” and so on started to be actively used in Russian education since the 1990s. Nevertheless, the concept “interdisciplinary approach” still has not a strict definition in domestic pedagogical science. In foreign pedagogy, the concept of interdisciplinary approach implies “an approach where people or information using more than one discipline will collaborate and obtain more detailed information about a topic or situation” (Jones, 2009). C. Jones noticed that “the interdisciplinary approach is uniquely different from a multidisciplinary approach, which is the teaching of topics from more than one discipline in parallel to the other, nor is it a crossdisciplinary approach, where one discipline is crossed with the subject matter of another. Interdisciplinary techniques go beyond these two techniques by allowing students to see different perspectives, work in groups, and make the synthesising of disciplines the ultimate goal” (Asmolov, et al., 2010).

In the Russian pedagogical science to determine the concept of interdisciplinary approach also required to establish its differences from the crossdisciplinary and multidisciplinary approaches. The domestic interpretation of interdisciplinarity included so-called methodological knowledge as well as the integration of educational content. The methodological knowledge was close in meaning to metacognitive knowledge as “knowledge about cognition in general, as well as awareness and knowledge of one's own knowledge.” [19] In Fink’s taxonomy methodological knowledge could be shown through Application, Integration and Learning how to Learn. (Fink, 2003).

The essence of the interdisciplinary (“meta subjective”) approach in education was most fully considered in the works of Gromyko and Khutorskoy. Both authors proceeded from the fact that under the

modern challenges and opportunities, school education must go beyond teaching only separate subjects. Common in their position was that they did not reduce interdisciplinary education to “techniques of working with knowledge”. It was assumed that no less important was the acquisition of some new knowledge, which directly leads to mastering certain universal methods of cognitive activity. Students have mastered interdisciplinary knowledge and skills learning special discipline. Such disciplines as “Problem” (Gromyko, 1998), “Knowledge” (Gromyko, 2001b), “Sign” (Gromyko, 2001), “Task” were developed and tested in the educational practice under the guidance of Gromyko. The definition of interdisciplinarity reflected the approach of Gromyko's school: “Interdisciplinary disciplines are subjects, different from the subjects of the traditional curriculum... Interdisciplinarity combines the idea of objectivity and, at the same time, over-objectivity, the idea of reflection in relation to object” (Gromyko, Polovkova, 2009).

Khutorskoy proposed such interdisciplinary courses as “Numbers” (grade 1), “Informatics and ICT” (grades 3-4), “Culture” (grade 5), “World studies” (grades 5-7), “Natural science” (grades 5, 10-11), in which, according to the author's opinion, “the semantic field of objects of cognition goes beyond the framework of traditional academic disciplines and is located on a meta level” (Psychology Dictionary, 2017).

Thus, developing the idea of interdisciplinary (“meta subjective”) approach, both researchers proposed to include new subjects in school education, but they filled them in various ways. In one case (Gromyko), these subjects were based on knowledge, which previously in the domestic philosophy allocated to a separate group of methodological knowledge. The activity side of new subjects was strengthened and enriched by the operations, called in Russian psychology and pedagogical science as universal educational actions. In another version (Khutorskoy), it was assumed that these new subjects should have an integrative, multidisciplinary content.

The relationship between traditional subjects and new interdisciplinary courses were also treated differently. Gromyko supposed that interdisciplinary learning implied the mastering of methods of cognitive activity that “lie above traditional disciplines and are not included in them”. Khutorskoy regarded the interdisciplinarity as a basis of traditional subjects: “The traditional academic disciplines (courses) centered around the fundamental educational objects and provided the basic level of educational results fixed by national educational standards” (Psychology Dictionary, 2017), while “interdisciplinarity is what is behind the content of one or several traditional subjects, and is based over and at the same time in a root connection with them. Interdisciplinarity cannot be divorced from traditional subject content” (Khutorskoy, 2012).

It was mentioned that according to the National educational standards students' ability to use interdisciplinary concepts and to apply universal educational actions (cognitive, regulatory, and communicative) referred to the interdisciplinary (“meta subjective”) results of education. Strictly speaking, the interdisciplinary concepts represented the content aspect of interdisciplinarity, the educational activities represented the aspect of skills. Describing the notion of “universal educational actions”, Asmolov wrote: “The term ‘universal educational actions’ in a broad sense means the ability to learn, that is, the person's ability to self-development and self-improvement through the conscious and active appropriation of a new social experience. In a narrower (strictly psychological meaning), this term can be defined as a set of ways students act (as well as related learning skills), ensuring its ability to

independently assimilate new knowledge and skills, including the organisation of this process.” (Kondrat’eva, Matyushkin, Rubashkin, 2016). The very term “universal educational actions” was subjected to criticism. In particular, Vorovschikov believed that it was more appropriate to use the concept “general educational skills”, which is generally accepted in Russian pedagogical science: it is not necessary to introduce new concepts to explain a phenomenon if this phenomenon can be explained using the traditional concepts.

Interdisciplinary concepts are given in standards without concretization (there is no any specificity of this component in the document), while the educational skills are diverse. So to apply cognitive skills means “to master the skills of cognitive, educational, research and project activities, problem-solving skills; ability and readiness for independent search using methods of solving practical problems, the application of various methods of cognition” (Federal'nyy gosudarstvennyy obrazovatel'nyy standart srednego obschego obrazovaniya (10-11 kl.), 2016). In one row there are types of activities of different levels. Along with this set, the document also mentions “information and cognitive activity, including the ability to navigate in different sources of information, to interpret and evaluate information obtained from various sources”. A reasonable and at the same time a rhetorical question arises about the specifics and levels of relationship between all these types of activities and the skills.

Thus, the understanding of the interdisciplinary (“meta-subjective”) approach by the developers of standards diverges from the basic ideas put forward in the 1990s - early 2000s. The document practically ignores the idea of a special interdisciplinary knowledge. At the same time, the set of skills (“universal educational actions”) is expanded and supplemented with regulatory and communicative skills.

The identification of the connection between the disciplinary and interdisciplinary content concerned the problem of correlation of methodological and disciplinary knowledge: if the first grew based on the latter or if it is given as ready-made form for comprehending, revealing new knowledge, solving cognitive problems at a different level of the disciplinary content? The answer reflected the nature and consistency of pedagogical influence:

- to derive this knowledge from the disciplinary content within the subject or
- to give the basics of methodological knowledge as a special course and show their application in different subjects. Nowadays, researchers and teachers inclined to the first variant: to identify and implement the potential of different subjects to form interdisciplinary knowledge and cognitive skills. For example, Dammer showed this in teaching physics (Dammer, 2014).

Our research (Lazebnikova, & Koval, 2016) also demonstrated that teachers, when planning the interdisciplinary results of students' educational activities, strove to act within the scope of the subject. Therefore, they took into account specific subject content. However, elements of duplication appeared in different courses: it was hardly appropriate whenever, for example, teaching integrative key concepts, to introduce elements of methodological knowledge about the distinction between generic and specific concepts, the ratio of their volume and content separately in different subjects. The direct formation of ‘universal educational actions’ caused difficulties in teaching and demanded additional time. At the same time, it was established that the formation of interdisciplinary concepts and skills (universal learning actions) as the basis for interdisciplinary results’ achievement (Serikov, 2012) “to a certain extent is in common for different subjects” (Koval, 2017). Thus, we again appealed to the creating a separate course

(educational module) of cognitive orientation aimed at the formation, development and reflection of methodological knowledge as a new component of the school curriculum.

The implementation of the new educational standards raised the question of using adequate methods and teaching strategies for achieving interdisciplinary results of education. The greatest spread was the development and use of special tasks aimed at universal educational actions' forming. The first experience showed certain achievements and identified a number of problems. Among the achievements were the variety of approaches to the design of such tasks and, as a consequence, the diversity of their models. However, there was no distinction of formative tasks from those that are appropriate for assessment. Further progress was hampered also by insufficient attention to the classification of the tasks. It would help to evaluate their effectiveness and to select the models, which could be the most appropriate in the classroom. In addition, the pedagogically grounded system of mastering interdisciplinary concepts and universal educational actions should be developed in order to reveal horizontal (between subjects) and vertical (in terms of education) ties.

In recent years, many publications of a practical orientation have appeared, containing examples of assignments that authors attribute as interdisciplinary tasks. One of the first approaches to the design of tasks offered the following:

- 1) consideration of the object from several positions (different sciences, points of view);
- 2) the transfer of an object, traditionally learned in one discipline, into the context of another;
- 3) reflection of the personal attitude of the object.

One of the interdisciplinary tasks designed in accordance with these requirements was as follows: "Russia has always been proud of its warriors and England (France, Germany) with its knights. Both were honoured in numerous folk tales, songs and novels. What are they like, what distinguishes them? Do a comparative analysis of the Russian warrior and European knight from the positions of history, literature; military science" (*Teoreticheskie osnovy sodержaniya obshchego srednego obrazovaniya*, 1983). The requirement, aimed at comparing of similar objects, implied the interdisciplinary nature of this task as far as the ability to compare included into the set of cognitive universal educational activities. An indication of the areas for comparison (history, literature, military science) made it possible to assign this task to interdisciplinary, aimed at synthesising knowledge obtained in the study of various subjects. At the same time, it could be assumed that the main efforts of students would be spent on recollection and reproduction of information.

6. Discussion

Analysis of the tasks shown that along with interesting models, there were types of tasks that was difficult to classify as interdisciplinary. Some groups of such tasks were:

1. Tasks of interdisciplinary nature which demanded to transfer knowledge from one school discipline to another according to their synthesis, application in a new situation. This type had a significant cognitive potential, they allowed destroying the partitions that prevented the comprehension of reality in its diverse connections and interactions. At the same time, this type of tasks was used earlier, long before the interdisciplinary approach.

2. Completely traditional for the academic discipline tasks that showed some formal signs of interdisciplinarity, f.e., “During the years of the Great Patriotic War, workers of our republic purchased loans for 500 million roubles, which is six times more than five pre-war years. Calculate the average annual amount of loans before the war”. Undoubtedly, the condition of this task, including specific historical material, is much brighter, more interesting for students, much more valuable in educational terms in comparison with the description of the processes of water transfusion from one pipe to another or simultaneous movement of objects from two points. However, the activity remained the same and unlikely lead to achieving of interdisciplinary results. The problem with the motion of objects could also be called interdisciplinary, in the opinion of some authors, if accompanied by the necessary commentary: “From points, A and B to meet each other cars drove at a speed of 60 km / h. Will they meet in two hours, if the distance between the points is 160 km?” The comments indicated that task as interdisciplinary because it checked the ability to compare the result and the question posed, but such correlation was a general requirement for any task and could not be a distinguishing feature of the interdisciplinary task.

3. Tasks based on the disciplinary knowledge, f. e., “Speaking to the shareholders, the general director of the company said, that the priority of the company is to increase the cost of shareholders’ capital. A year later, the report provided this information: a) the company provided 1.5 million roubles for the construction of a city hospital; b) the company spent 500 million roubles to open a network of new branches. How each of the described actions of the firm affects its capitalization?” The cognitive operation, which was the basis of the task, connected with the ability to correlate general and special information. This model could be regarded as widespread. In accordance with this principle, in particular, many tasks of the State Examination on social studies were constructed. The decisive condition for the fulfilment of such tasks was not connected with a cognitive operation. The tasks primarily dealt with the disciplinary knowledge (what the capitalization of an enterprise is, what factors contribute to its growth).

The samples demonstrated that the term “interdisciplinary task (assignment)” was interpreted widely. This could be explained, at least, for two reasons: firstly, by the lack of clarity in the definition of the interdisciplinary approach, and secondly, by general nature of cognitive tasks. A condition (extended or short) and a requirement (question) in any task contained an indication of the mode of activity (cognitive operation): compare and contrast, summarise and draw a conclusion, etc. Each of these operations could be considered as a kind of universal educational action. Therefore, almost every kind of cognitive activity could be classified as interdisciplinary. The exception, apparently, laid with the tasks aimed at simple reproduction (although even the simple retelling assumed a number of cognitive actions).

The indication for the mode of activity seemed to be a necessary, but insufficient demand for classifying a task as interdisciplinary. The cognitive operations should be transferred from the category of instruments of cognitive activity into objectives to form or assess. It is advisable to include in such tasks a piece of information to depict required logical operations or to give a brief description of the sequence of actions. The disciplinary knowledge in these tasks must perform a serving role. The processes of remembering, updating the information previously acquired should not distract from the main goal - the formation of cognitive action (skill) or the certain level of skill. Therefore, the assignment must include necessary information from a subject (subjects).

Tasks that contain comprehensive information in order to carry out the necessary actions have a significant pedagogical potential. Such tasks can be used both in training and in the assessment of its

effectiveness. If a student fails, it clearly reveals not the lacks of knowledge, but the gaps in mastering the modes of activity.

The last group of tasks includes an indicative basis of cognitive activity, a brief description of the required cognitive operation (universal educational action) and/or an algorithm of actions. Such tasks are especially important at the initial stage of the formation of cognitive skills.

The researchers of the Center for Social and Humanitarian Education of the Institute for Strategy of Education Development of the Russian Academy of Education used this approach to classification of interdisciplinary tasks as the basis for their design. New tasks were tested in teaching. The tasks may be used in teaching history, geography, social studies, in the extracurricular activity.

7. Conclusion

1. The interdisciplinary experience should be formed not only in teaching traditional disciplines but also by means of a special subject (module).

2. The proposed classification of interdisciplinary tasks could be the basis of creating new types of tasks for interdisciplinary teaching and learning.

3. The interdisciplinary approach changes the cognitive activity of students, teachers' strategies; requires new ways of monitoring and evaluating knowledge and skills. Further studies are designed to identify pedagogical conditions that ensure the inclusion of interdisciplinary tasks in education.

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