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**TEACHERS READINESS FOR INTERDISCIPLINARY
INTERACTION: REALITIES AND PROSPECTS**

Igor Yu. Sinelnikov (a)*, Tatyana G. Zharkovskaya (b)

*Corresponding author

(a) PhD (Education), Senior Researcher, Institute for Strategy of Education Development of the Russian Academy of Education, 105062, Makarenko st., 5/16, Moscow, Russia, siu1104@yandex.ru*

(b) PhD (Education), Senior Researcher, Institute for Strategy of Education Development of the Russian Academy of Education, 105062, Makarenko st., 5/16, Moscow, Russia, tatazh2001@mail.ru

Abstract

The article deals with the problem of interdisciplinary interaction in school education in Russia and abroad: the increasing diversity and complexity of knowledge require interdisciplinarity.

Three main scientific approaches to the integration of knowledge and the formation of universal skills are formulated.

Among the main integrative strategies and ways of interdisciplinary interaction in school the authors can name: multidisciplinary - a parallel study of various problems on several subjects; interdisciplinarity - a close disciplinary interaction including work on common themes and concepts, the use of certain interdisciplinary, universal skills; transdisciplinarity - the full removing of disciplinary limits through the organization of project-based learning.

Basing on the survey results of 258 Russian schoolteachers, the authors reveal existing problems in understanding interdisciplinarity and its implementation in practice. The main conclusion of the research is that at the moment the overwhelming majority of teachers demonstrate their inability to implement the principle of interdisciplinary interaction.

As potential threats of situation development are indicated: risk of the ignoring by teachers the necessity of mastering knowledge and technologies in the field of interdisciplinary interaction; risk of non-priority use of interdisciplinary links and integrative strategies in school teaching and learning.

The authors propose specific steps to institutionalize interdisciplinarity in school education.

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1. Introduction

Today the issue of reorientation the education sphere towards overcoming the limits of subject teaching and integration of knowledge from various fields acquires particular actuality. To a large extent, this is due to the appearance of new branches of scientific knowledge and its rapidly growing specialization. According to B.Niculescu's figures, from 1950 to 2000, the number of specialized disciplines, many of which are taught at different levels of education, has grown 50 times - from 154 to 8000. To his opinion, this situation is to some extent a "catastrophe", demonstrating the absence of "unity of knowledge" and the need to restore its integrity (Transdisciplinarity, 2007). It is the diversity and complexity of knowledge that require the creation of interdisciplinarity (Medeiros, 2015).

The existing danger of "fragmentary learning" and the urgent need to replace it by training capable to embrace subjects within their context, their complex, their totality (Morin, 1999) - these problems have long been the focus of science and are being solved in the field of education.

The importance of interdisciplinary integration task is reflected in the UNESCO program documents "Interdisciplinarity in general education" (UNESCO, 1986), "Education for sustainable development - a transdisciplinary approach to education" (UNESCO, 2005), etc. One of the most ambitious international projects in the field of general education - International Baccalaureate (more than 70,000 teachers are employed and more than a million students study in more than 4000 schools around the world) - is built on the interdisciplinary basis and oriented to develop the ability of schoolchildren to use the concepts methods and forms of communication from several areas of knowledge for explaining phenomena and solving problems in ways not applicable within one discipline (Middle Years Program, 2010). The ideas and principles of interdisciplinary education are fixed in the documents of the state educational policy and are widely implemented in different countries of the world. In the national curriculum of Finland (it is one of the leading countries in the field of school education, according to the results of international research PIRLS and PISA) high priority is given to the issue of developing links between subjects: the role of the "interdisciplinary approach" in linguistic education especially emphasizes (the National Core Curriculum for Basic Education, 2016). In Russia the Federal state educational standards 2009-2012 put forward the mastering by students a complex of "universal learning activities" and "interdisciplinary concepts" used in various fields of knowledge as the most important requirement to the results of schooling. Moreover, in approximate programs for basic and secondary schools (5-9 and 10-11 forms), the possible variants of interdisciplinary connections that can be established between subjects of one or several fields of scientific knowledge (public, natural, mathematical and humanities) are listed in detail (Program of basic education, 2015; Program of secondary education, 2016).

All above mentioned illustrates the relevance and practical significance of interdisciplinary integration in school education.

2. Problem Statement

The analysis of Russian and foreign scientific publications shows that the value and potential of interdisciplinary interaction in the field of general education are universally recognized. It is obvious to all scientists that interdisciplinarity is "the path to be taken" when we come across phenomena which one can

not understand by looking at them from the standpoint of a particular discipline (Rényi, 2000). In the field of education, the establishment of "interpenetrating" ties between educational subjects, (1) allows one to obtain a holistic view of the phenomenon, observing it from different points of view; (2) makes it possible to cover all the properties and connections of the studied objects comprehensively, to approach the understanding of methodological ideas, the scientific worldview formation (Slastenin, Isaev, Shiyanov 2002).

However, the question of the necessity for interdisciplinary interaction is probably the only one which has no disagreements between scientists. On all other questions - "what for", "what", "how should it interact"? – there is a difference in approaches.

The first approach focuses on using the potential of interdisciplinary interaction primarily for the integration of knowledge. Here, some scholars believe that interdisciplinarity can fully manifest itself when the interaction between objects will not be vividly expressed, but simply will be built "around the nuclei which overcome the limits of disciplines" and focuses on topics, problems, historical periods, geographical spaces, human collectives, ideas, etc. (Torres, 1994). Others assume that "interdisciplinary learning is integrative", and therefore, with effective interaction, disciplines should not be simply juxtaposed around the "theme" but rather build strong disciplinary ties, placing the elements of different subjects in productive relations with each other, with time: only this will give a new, deeper understanding of the topic (Middle Years Program, 2015).

In the second approach the main goal of learning discipline interaction is not so much in obtaining new - integral knowledge, as in the formation and development of new skills (cognitive, communicative, reflexive). Proceeding from this, the teaching material of various disciplines is not intended to be used in all the diversity of content, contexts and connections, but as an information resource that can be "remelted" by various pedagogical means and "reorganized" in accordance with the logic of certain activity principles and abilities formation (Gromyko, 2001) and can be used within the framework of specially developed in schools modules, "metadisciplines", etc.

The third approach is based on the fact that the interaction of school subjects has a dual goal - the integration of knowledge and the formation of universal skills, - while the strategies and ways of the interaction may be different. This can be (1) "multidisciplinarity" - a parallel study of various topics or problems on several subjects; (2) "interdisciplinarity" - a close disciplinary interaction including work on common themes and concepts, the use of certain "interdisciplinary skills" (cognitive, researching, etc.); (3) "transdisciplinarity" - the full removing of disciplinary limits through the organization of "project-based" learning, built around topics and issues of interest to learners included in the real social context, presupposing the formation and use of "life's skills" (Drake, Burns, 2004).

In itself, the difference in approaches is not a drawback, moreover, for science this is a normal phenomenon, indicating the complexity of the object under study. However, in the field of education, where the planning of the teaching process and the practice of teaching require clarity and certainty, the existing difference in scientific approaches for understanding the goals and forms of interdisciplinary interaction can become a breeding soil for the emergence of various problems and risks. School administrators and teachers are the first to be attributed to "risk group": in fact, the requirements of educational standards and programs primarily are addressed to them and they must organize interdisciplinary education in school. Are

the teachers ready to work on the interdisciplinary basis? Can they meet the high requirements placed on them in a situation when science and educational policy set a fairly broad vector of movement toward the goal? These issues require thorough study.

3. Research Questions

The peculiarity of the present stage in the development of Russian school education is that many of the previously known pedagogical concepts and principles, strategies and practices in interpreting of federal state educational standards adopted in 2009-2012, on the one hand, have been enriched by new accents and meanings, on the other have not received proper specification. This fully applies to the issue of interdisciplinary interaction.

Thus, the term "interdisciplinary relations", known in science and in education for a long time is now often replaced by the term "polydisciplinary relations" in the texts of program documents and methodological recommendations (Asmolov, Burmenskaya, Volodarskaya, Karabanova, Salmina, Molchanov, 2008; Program of primary education, 2015; Program of basic education, 2015, etc.). The list of interdisciplinary concepts that have long been used in various disciplines (in the mathematical and natural sciences it is "function", "element", "transformation", etc., in the social and humanitarian sciences – "society", "the state", etc.) in the context of the requirements of new educational standards now is proposed to be expanded including in it various philosophical concepts (regularity, phenomenon, analysis, synthesis, system, etc.). It is assumed that the selection of concepts and the work with them schools must realize on their own (Program of basic education, 2015, Program of secondary education, 2016).

Obviously, in the situation of free choice and uncertainty the following questions raise the special research interest:

- Do teachers understand the new meanings and accents of working with interdisciplinary connections and concepts?
- How purposefully and regularly do teachers use interdisciplinary interaction?
- What conditions, in the opinion of educators, do they need for mastering and use of integrative strategies?

4. Purpose of the Study

The search for answers to the above questions determined the main goal of the research – to identify the degree of teachers' readiness to implement the principle of interdisciplinary interaction, earlier known, but new one in terms of the modern emphases.

5. Research Methods

For achieving this goal, a written survey method was used.

According to the hypothesis of the study anonymity of survey supposed significantly rising the level of objectivity of reported information.

The organization and holding of the study included:

- preparation of a questionnaire out of 14 questions (10 of them suggested the choice of one or several version of answers by the respondents, 4 questions suggested the possibility of free in form, detailed answer);
- placing the questionnaire in the Internet on a Google resource to provide respondents with the opportunity to answer questions online;
- informing potential respondents about the possibility of participating in online questioning via e-mail messages (information was sent to school principals and educational authorities in 7 regions of Russia);
- analysis and generalization of answers received from respondents.

6. Findings

In the survey conducted in November 2016 - February 2017 attended by 258 people (192 teachers, 61 administrators, 5 people who qualified themselves as specialists and employees).

From all the participants of the survey, the largest was the representation of general education school workers (56%): gymnasiums/lyceums, institutions of "non-standard" type (cadet schools, schools for gifted children, etc.), as well as schools with in-depth study of a number of disciplines are represented respectively - 19%, 16% and 9% of respondents.

As for the facts of the professional level of the survey participants, almost 4/5 of the respondents were experienced teachers working in general education institutions for more than 20 years (64%) and 10 to 20 years (20%).

The answers given by the survey participants showed the following.

- Responding to the question "Is there a Program of universal learning activities development at school where you work?" 22% of respondents found it difficult to answer; 13% noted that there is no such a program at school; 65% said they had a program.

- Answering the question, whether the teachers plan and organize the work on the formation of universal skills and the mastery of interdisciplinary concepts, 22% of respondents stated that they have plans for this work and its regular implementation (3-5 integrated lessons once a quarter/term); 36% indicated that they plan and sporadically organize the work (1-2 integrated lessons once a quarter/term); 31% noted that they don't plan the work, but sporadically organize; 9% indicated a complete lack of such work in plans and teaching; 2% did not answer.

- On the question, what concepts the teachers are considered "interdisciplinary", 3% of the survey participants demonstrated an understanding of the meaning of the term "interdisciplinary concepts" adequate to the requirements of educational standards; 9% tried, but could not build a correct conceptual row (general scientific concepts they alternated with purely objective ones); 33% demonstrated a complete lack of understanding of the nature and content of interdisciplinary concepts (various erroneous variants were suggested - "meaning of life", "planning", "reflection", "project activity", etc.); the overwhelming majority of respondents - 55% - did not give any answer.

- Only 41% of respondents answered the question: "What conditions are necessary for organization of effective work on universal skills formation and the development of interdisciplinary concepts?" Among the necessary conditions more often were called: (1) provision of the educational process with the relevant

educational, methodological, control and evaluation materials (31% of answers); (2) increase of self-education and qualification (25%); (3) acquaintance with the best experience of practicing teachers (10%); (4) work in a "team" with colleagues from their school (9%).

Thus, the results obtained show the following:

1) more than 30% of educators do not participate in the process of designing and organizing interdisciplinary interaction at school because they are lack of knowledge about the presence of integrative programs (plans) or because of their absence;

2) only 25% of school teachers purposefully and regularly use interdisciplinary integration as a resource for expanding and deepening the content of subject teaching; 40% of teachers are not planning the work with interdisciplinary concepts;

3) almost 90% of pedagogical workers demonstrate complete ignorance concerning the new approach to understanding the content of interdisciplinary notions which are presented in the program documents of the state educational policy;

4) more than 50% of pedagogical workers aren't capable to formulate the necessary conditions for mastering and using integrative strategies.

7. Conclusion

Based on the results of the research, we can say definitely that regardless of professional experience, the profile of school, specifics of the discipline being taught, presence/absence of program documents at school and the frequency of activities devoted to the interdisciplinary interaction.

- Absolute majority of pedagogical workers (90%) do not know and do not understand the new meanings and accents of the work with interdisciplinary concepts which are in documents of the national educational policy.

- The overwhelming majority of practicing teachers (75%) are not ready for a purposeful and regular use of interdisciplinary connections and integrative strategies in their work.

- The majority of pedagogical workers (more than 50%) cannot formulate their views on the conditions necessary for the development and use of integrative strategies that indicates the low level of reflection and insufficient attention to the question of interdisciplinary interaction.

Thus, the main conclusion that can be done from the results of the research is that at the present moment the overwhelming majority of teachers demonstrate their inability to implement the principle of interdisciplinary interaction, previously known, but new according to the accents being placed today.

Obviously that interdisciplinary learning requires from teachers a complex of skills - (1) to integrate disciplinary perspectives, do it consciously and productively (Middle Years Program, 2015); (2) to include in their lesson a wide range of methods (Holbrook, 2000); (3) to use concepts, methods or forms of communication from several fields of knowledge (Middle Years Program, 2010). In a number of publications we have already noticed that Russian teachers have not got these skills today (Sinelnikov, 2016; Gevurkova, Sinelnikov, Sukhodimtseva, 2017; Sergeeva, Sinelnikov, Sukhodimtseva, 2017, etc.). In 2014 the researchers from Brazil came to the same disappointing conclusion. A poll of 101 teachers from the general schools of Rio de Janeiro and acquaintance with the plans of lessons showed that schools do not have any support of interdisciplinarity introduction and the teachers are lack of ability to develop

interdisciplinary approaches in learning (Fidalgo-Neto, Lopes, Magalhães, Pierini & Alves, 2014). In other words, the reality of introducing the principle of interdisciplinary interaction in schools in different countries is characterized by numerous problems.

Knowledge and analysis of problems are necessary for forecasting possible negative prospects for the development of the situation, including:

- risk of ignoring the importance and necessity of mastering knowledge and technologies in the field of interdisciplinary interaction by school administrators and educators (the negative consequence of risk may be the growing inconsistency of the professionalism of pedagogical staff with the requirements of the time);

- risk of non-priority use of interdisciplinary links and integrative strategies in school teaching and learning (the negative consequence of risk can be expressed in using the potential of interdisciplinary interaction according to the "residual principle", - only when the tasks related to the teaching of a particular discipline are solved).

However, understanding of existing problems and potential threats is also necessary in order to find ways to overcome them and finally answer the question: "Why are there so many difficulties when interdisciplinary innovations in educational institutions are offered?" (Segovia, Lupiáñez, Molina, González, Miñán, Real, 2010).

Considering the options for possible positive prospects, one can agree with colleagues from Brazil that the situation with the introduction of the principle of interdisciplinary interaction in the school can change for the better if the methodology of "problem training" will be used actively in teacher training courses, in the system of continuing education of specialists (Fidalgo-Neto, Lopes, Magalhães, Pierini & Alves, 2014). It is important that in the system of professional development teachers receive not only knowledge, but skills in the development of integrative programs and curricula, in using modern forms and models of interdisciplinary connections, formation and evaluation of universal skills.

And yet, the way of institutionalizing interdisciplinarity in school education seems more promising and effective. (1) Introduction in the tasks of Unified state exam and testing works of various levels (national, regional, municipal) questions, involving the ability of schoolchildren to integrate knowledge from various fields; (2) the practice of regular external and internal expertise of the integrative programs and curricula developed and implemented at school; (3) the introduction of interdisciplinarity into the list of mandatory criteria in assessing the student's results in design and research activities – these are the necessary measures to change the situation for the better, to transform interdisciplinary interaction from declared intention into a principle regularly used in practice.

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