

Metadisciplinarity in education: Solving actual problems

Multidisciplinaredad en educación: resolver problemas reales

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ABSTRACT:

The article deals with the problems of realizing the metadisciplinary approach to Russian schoolchildren. The problems are studied in methodological, methodic and practice-oriented aspects. The article also suggests their possible solutions. Within the framework of the research, some intermediate conclusions are made, which attract researchers' attention and allow focusing on current problems of the metadisciplinary approach and its implementation in the school educational process. The implementation of a system of educational "metadisciplinary" tasks is justified as a didactic means of the educational process, which ensures perceiving the information from different school disciplines and building skills to work with it. The authors shortly clarify the role of the terms "metadisciplinarity" and "interdisciplinarity" in Russian and foreign research works. There is also an example of a "metadisciplinary" task as a didactic means of teaching schoolchildren within the framework of socio-humanitarian disciplines. A special place in the article is given to the professional competence/identity of a schoolteacher, who is considered to have much influence on the successful achievement by schoolchildren of a metadisciplinary result in the educational process. The article contains views of foreign scientists.

Key words: metadisciplinarity, metadisciplinary results, metadisciplinary tasks, universal learning activities, schoolteacher's professional competence/identity.

RESUMEN:

El artículo trata los problemas de realizar el acercamiento metadisciplinario a los escolares rusos. Los problemas se estudian en aspectos metodológicos, metodológicos y orientados a la práctica. El artículo también sugiere sus posibles soluciones. En el marco de la investigación, se hacen algunas conclusiones intermedias, que atraen la atención de los investigadores y permiten enfocarse en los problemas actuales del enfoque metadisciplinario y su implementación en el proceso educativo escolar. La implementación de un sistema de tareas educativas "metadisciplinarias" se justifica como un medio didáctico del proceso educativo, que asegura la percepción de la información de las diferentes disciplinas escolares y la construcción de habilidades para trabajar con ella. Los autores aclaran en breve el papel de los términos "metadisciplinarity" e "interdisciplinarity" en los trabajos de investigación rusos y extranjeros. También hay un ejemplo de una tarea "metadisciplinaria" como un medio didáctico para enseñar a los escolares en el marco de las disciplinas socio-humanitarias. Un lugar especial en el artículo se le da a la competencia / identidad profesional de un maestro de escuela, quien se considera que tiene mucha influencia en el logro exitoso por parte de los escolares de un resultado metadisciplinario en el proceso educativo. El artículo contiene opiniones de científicos extranjeros.

Palabras clave: metadisciplinaredad, resultados metadisciplinarios, tareas metadisciplinarias, actividades universales de aprendizaje, competencia / identidad profesional del profesor.

1. Introduction

The context of school metadisciplinarity includes methodological, methodic and practice-oriented tasks.

The methodological aspect considers education as the organization of the learning activity (Serikov, 2008). In both Russian and foreign educational theory much attention has been paid to the effectiveness of schoolchildren's activity. To illustrate this fact, we can mention B.F. Skinner's and P.J. Galperin's programmed education; the adoption of mental activity on target bases by P.J. Galperin and N.F. Talyzina; John Dewey's ideas of collective project education; A.A. Verbitskiy's contextual education; learner-centered education by I.S. Yakimanskaya; the concept of evolutive education by B.D. Elkonyn and V.V. Davydov, etc. With the development of methodology as a doctrine of organizing the activity, the following types of organizing activity can be distinguished: the traditional one, the corporate handicraft one, the professional one, the project technological one (Novikov & Novikov 2013). However, due to the introduction of the Federal State Educational Standards of basic education (FSES of BE) representing not only subject-matter, but individual and metadisciplinary results, it is important not merely to regard the general organization of schoolchildren's learning activity but to determine methodological approaches which would help learners to achieve the metadisciplinary learning result. Consequently, here comes the question: How should the metadisciplinary learning activity be organized? We can find certain developments in pedagogical science and practice. Such Russian scientists as Y.V. Gromyko (2001), A.V. Khutorskoy (2012), S.G. Vorovshikov (Vorovshikov, & Orlova, 2012) as well foreign scholars A.W. Jackson and G.A. Davis (2000) can be mentioned in this context. However, in spite of massive research performed by these scientists, the given sphere numbers more questions than answers.

The methodic aspect of metadisciplinarity in the educational process is primarily related to the specific presentation of the subject-matter educational material and to its specific content integration with other subjects. It also depends on how well learners adopt the methods of learning activity. The fact that schoolteachers are more likely to care about teaching methods and delivering the studying material than about organizing "metadisciplinary" learning activity is a current problem. This situation is marked by both Russian (S.G. Vorovshikov (2012), V.V. Serikov (2008), etc.) and foreign scientists (R. G. Boehm, D.W. Saxe, D.J. Rutherford (2003), etc.). The learning activity and educational methods became the object of studies in Russia only after the FSES of BE were introduced. This area of pedagogical knowledge is to be studied by scientists and by practicing schoolteachers.

The practice-oriented aspect of metadisciplinarity in the educational process is connected with the implementation of scientific research results in the educational practice and with practical usage of scientific psychological, pedagogical and methodological ideas (innovations). It is obvious that, regardless of how thorough the scientific work in a scientific research institute is, it is impossible to take into account all random factors which occur in particular educational practice. For this reason, the first stage of implementing a scientific development requires experimental testing at school. This, in turn, will require rebuilding the existing organizational culture of an educational institution, the schoolteachers' working practice, their retraining, financial costs, etc. Besides, there is a risk of not achieving the expected result, incurring financial loss, as well as of getting disappointed by the whole innovation process. Practice shows that innovation is more successful if schoolteachers do not only follow scientists' directions but also initiate the process. A modern schoolteacher has to be in a constant creative process and to "transfer their colleagues' theoretical constructions and experience into the subjective structures of the pedagogical process" (V.V. Serikov (2008)). In such a situation, it is not a scientist who searches for the schoolteacher, but the schoolteacher who looks for a community of innovators. In connection with this, we can speak of professional self-determination and of professional identity which reflect an individual's conceptual perception of their place in a professional group or community. (The term "identity", according to R. Wodak, determines the interconnection between two or more related substances so that their identity/equality is proved (Wodak, Cilliah, Reisinge, & Liebhart, 1999). A schoolteacher will associate him/herself with a professional group in which he/she develops as an expert in a particular sphere (S.N. Vatchkova, T.I.

Zinovyeva, O.A. Lyubtchenko and others (2015). The issue of schoolteachers' professional identity in modern society is actively presented in the works by foreign scientists: L. Tateo (2012), W.L. Komba (2013), E.T. Canrinus (2011).

A schoolteacher's professional competence is embodied in the ability to fulfil a certain general scheme or a model in practice after he/she has recognised a project of his/her teaching activity. "The attempts to build the pedagogical process directly on certain "objective models" (standards, programmes) by avoiding a teacher's subjective world have already proven to be unsuccessful" (V.V. Serikov (2008)). For this reason, the success of solving all the above-described problems depends on the teacher's personality and his/her professional competence, which is supposed to ensure the unity of the educational content and the educational process.

It is necessary to point out that currently the "metadisciplinary" community exists mostly among scientists, not among practicing schoolteachers, which prevents the metadisciplinary educational approach from being implemented on a large scale.

2. The Research Purpose

The scientists of the Socio-Humanitarian Education Center at the Institute of the Education Development Strategy within the framework of a state task for the years of 2017-2019 (#27.6122.2017) are presently working on the following scientific research: "The renovation of basic education contents and educational methods under the circumstances of the current information environment" (scientific advisors are A.J. Lazebnikova, I.J. Sinelnikov).

The main direction within which metadisciplinary results are analyzed is the area of forming, developing and checking learners' universal learning activities (ULA), such as the ability to define notions; to generalize; to draw parallels; to classify; to choose proper classification grounds and criteria; to find out causal relationship; to build logical reasoning and to make conclusions (inductive, deductive, analogical).

One of the most important learning abilities is the ability to create, to apply and to transform signs and symbols, models and schemes in order to solve learning and educational tasks.

One of the research purposes is to work out effective means for achieving metadisciplinary results. These means are understood to be a system of educational "metadisciplinary" tasks (problems). The implementation of this system in the educational process will facilitate the perception of the integrative knowledge from socio-humanitarian subjects and will as well develop learners' working skills.

In this case, subject content is regarded to as a "product of the activity" (according to V.V. Serikov), which is to be adopted by learners (Serikov, 2008). The learning material is presented in the form of a task (a learning problem). Learners perceive the system of notions and the ways to work with them. It is impossible to cope with the task without applying the above-mentioned skills. A subject task aimed at getting real-life experience is the form of "packing" such learning problems.

Another research purpose is to study the schoolteachers' readiness to realize the metadisciplinary approach under the conditions of subject education. For this reason, there is a need to develop and to test methodic materials for supporting schoolteachers' activity. These materials will ensure that the learners achieve metadisciplinary results while adopting the standard educational programme under the circumstances of sticking to the subject education.

The competence building approach, the learner-centered approach, the technological project approach and the methodology of learning activity are the key theories of the research.

The FSES of secondary BE (Federal State Education Standard of Secondary Basic Education) is the parent document (Federal State Educational Standard of Secondary Basic Education, 2012). Here follows a brief list of the basic notions and terms which are used as a basis of the research.

Metadisciplinary education results are the indices of how well learners adopt the programme of secondary basic education:

- interdisciplinary notions and universal learning actions (ULA): regulative, cognitive, communicative; the ability to use them in learning, educational and social practice;
- self-directed planning and realization of the learning activity;
- self-directed organization of cooperation with schoolteachers and peers;
- building of an individual educational path.

Metadisciplinary educational results include the adopted ULA (informative, regulative, communicative), which ensure acquiring the key competences and are a basis for learning skills.

Universal learning activities (ULA) combine in generalized modes of actions, which offer the learners a possibility to develop an all-round orientation in both subject spheres and the learning activity, which includes recognising its purposes, axiological and operational characteristics.

ULA present a complex of different learners' algorithms which ensure the ability to independently perceive new knowledge and acquire new skills.

Metadisciplinary is a specific way of presenting the learning material and a specific way of its content integration with other school disciplines.

Metadisciplinary tasks are such tasks which are aimed at building, developing and checking the ULA among the secondary BE learners.

Metadisciplinary abilities are the basic education abilities and skills (the universal ways of getting and applying knowledge). By 'abilities' we mean the power or readiness to perform a certain kind of activity. Skills are the constituent parts of an ability.

3. The Research Methods

The main methods of the research are the following: the comparative analysis of psychological pedagogic literature, the analysis of dissertations and study guides considering the problems of realizing the metadisciplinary approach in education; the generalization of pedagogical experience related to the problem; interpretation, observation, questionnaire surveys.

For the purpose of the research special didactic and methodic tools have been worked out:

- metadisciplinary tasks;
- a methodic map which allows recording a schoolteacher's and learners' activity, analyzing the performance of each in class and observing the process of solving metadisciplinary tasks and problems;
- instructions for the tested learners' tutors.

In order to carry out the research, a number of interconnected testing sites were created at the premises of educational organizations in Moscow, the Moscow Region and other regions. At these sites, the complex of tasks was tested aimed at building ULA and forming interdisciplinary notions. The research also implied a virtual account on Google for the purpose of a long-distance interconnection with the testing sites (online testing, etc.).

4. The Research Results

During the research, we prepared materials about the process and the results of the experimental activity and the interconnection between science and school practice. The results of the tasks which were performed by the learners are currently being analyzed. However, it is now possible speak of some intermediate results.

The results of the experimental activity were circulated and discussed among the research participants during the web-conference entitled "Metadisciplinary results: the problems of achieving and the approaches to solving them". The link to the webinar recording is <http://preemstvennost.ru/161110-metapredmetnye-rezultaty>

Besides, we held a poll of the webinar participants in accordance with the survey, which had been developed beforehand. Here is the link to this survey on Google: https://docs.google.com/forms/d/1J6oByGLI5jLZ_cmAnMCZpuilIhIUcVge9Dqj5hE5nKY/edit

A part of the material is presented in scientific articles. There is also a sourcebook for schoolteachers, where the main accent is put on developing schoolteachers' project competence as a factor of learners' achieving metadisciplinary results. The sourcebook unites the content of work on the testing sites. It includes the projects of schoolteachers' lessons which ensure that the learners achieve metadisciplinary results in adopting the basic educational programme under the conditions of subject education. The theoretical basis of the lesson project was presented as a developed and successfully tested

structural functional model. We held Skype and face-to-face consultations dedicated to designing the educational space of the lesson aimed at developing learners' metadisciplinary abilities.

We have prepared a theoretical review of scientific literature on the object of the research, i.e. the application of the notions 'metadisciplinarity' and 'interdisciplinarity' as of words having close meanings in Russian and foreign research works. According to M.D. Dammer, the metadisciplinary content of a school subject presents a complex of knowledge taken from different cognitive spheres which are not inside the framework of the subject sphere (Dammer 2014). Foreign practice shows that while realizing the metadisciplinary approach in Bulgaria, for example, the interdisciplinary (or integrative) aspect was given much attention to. The Bulgarian schoolteachers recommend using metadisciplinary activities (integrated lessons, projects, integrated days, integrated weeks etc.) and both individual and collective tasks of research nature (Sukhodimtseva & Sergeeva, 2016). In foreign scientific literature, the notion "metadisciplinarity" finds various explanations. For instance, H. Jacobs views it as a kind of knowledge and as an approach to education which include "methodology and language" of more than one discipline with the purpose of considering a central topic, event or fact (Jacobs & Borland 1986). The emphasis is put on the connection between different disciplines. J. Taylor comes to the conclusion that both schoolteachers' and learners' interdisciplinary work can become a pedagogical advantage (Taylor, 2008). According to K. Bellisario and L. Donovan, subject integration stimulates profound education and learners' increased activity (Bellisario & Donovan 2012).

In general, foreign scientific literature provides us with not only theory but also with technologies which facilitate the implementation of the interdisciplinary (integrative) approach by schoolteachers and tutors. This approach is quite similar to the metadisciplinary approach in the Russian science (Erickson 2006).

For the purpose of the task testing, some schools were offered diverse variants of the process organization:

A. The learners could answer the questions by using Microsoft Word. In this case, the work was organized in a fully equipped computer class. Then the answers were to be sent by email to the organizers of the experiment.

B. If any reasons prevented the learners from working on the computers, each learner's written answers were converted into an electronic file and then sent to the organizers of the experiment by email.

C. The learners could do the tasks in a computer class via Google resource, where the tasks were placed via Google Forms. The form allowed having the results and statistics handled automatically by the Google system. (The answers statistics, including diagrams, were placed directly in the Google Form, and the learners' answers were kept in a table which was automatically created by Google).

As a result, the schools used all three algorithms of organising a lesson.

The educational practice on the topic of the research faced some problems. They mainly consider the teachers' understanding of the term "metadisciplinarity" and the organization of the learners' learning activity aimed at achieving the metadisciplinary result. Within the work of the testing sites, we studied the education environment in Moscow schools, paying special attention to whether the teachers used modern educational technologies as a means to ensure the education quality under the FSES of BE. We also examined if there were necessary conditions for the learners to achieve metadisciplinary results. More than 40 lessons of different teachers were attended. While observing the teacher's and the learners' activity throughout a lesson, we determined the developmental potential of the lesson and the logics of its didactic basis (its purposefulness, the interaction of the structural components, dynamics and intensity). Special attention was paid to the character of the learners' learning activity organization aimed at achieving the metadisciplinary result.

The observations showed that nearly 50% of the learners were not involved in the learning activity. For this reason, optimal conditions for the ULA formation and development were not created, which apparently proves the necessity to develop a corresponding didactic and methodic support for this process.

To set an example, we will present a fragment of a metadisciplinary task (problem) as a didactic means of teaching learners within the framework of socio-humanitarian subjects (for more information, see (Sukhodimtseva, 2017)). The learning problem is presented as a task considering moral values in the present-day society as well as the political life of it (Social studies, 11th form).

The tasks are aimed at developing metadisciplinary abilities under the conditions of subject education. The formed abilities include converting complex (multi-aspect) information from graphic or formalized (symbolic) presentation in a text and vice versa; to trace the connection between common patterns and individual events and backwards.

The task is preceded by a short introduction to the problem:

When you take part in competitions and conferences or when you give a presentation of your project, you often have to answer questions posed by the audience, the jury or the experts. Sometimes you have to answer on the spot, to express your point of view, without any time to prepare, make explanations, etc.

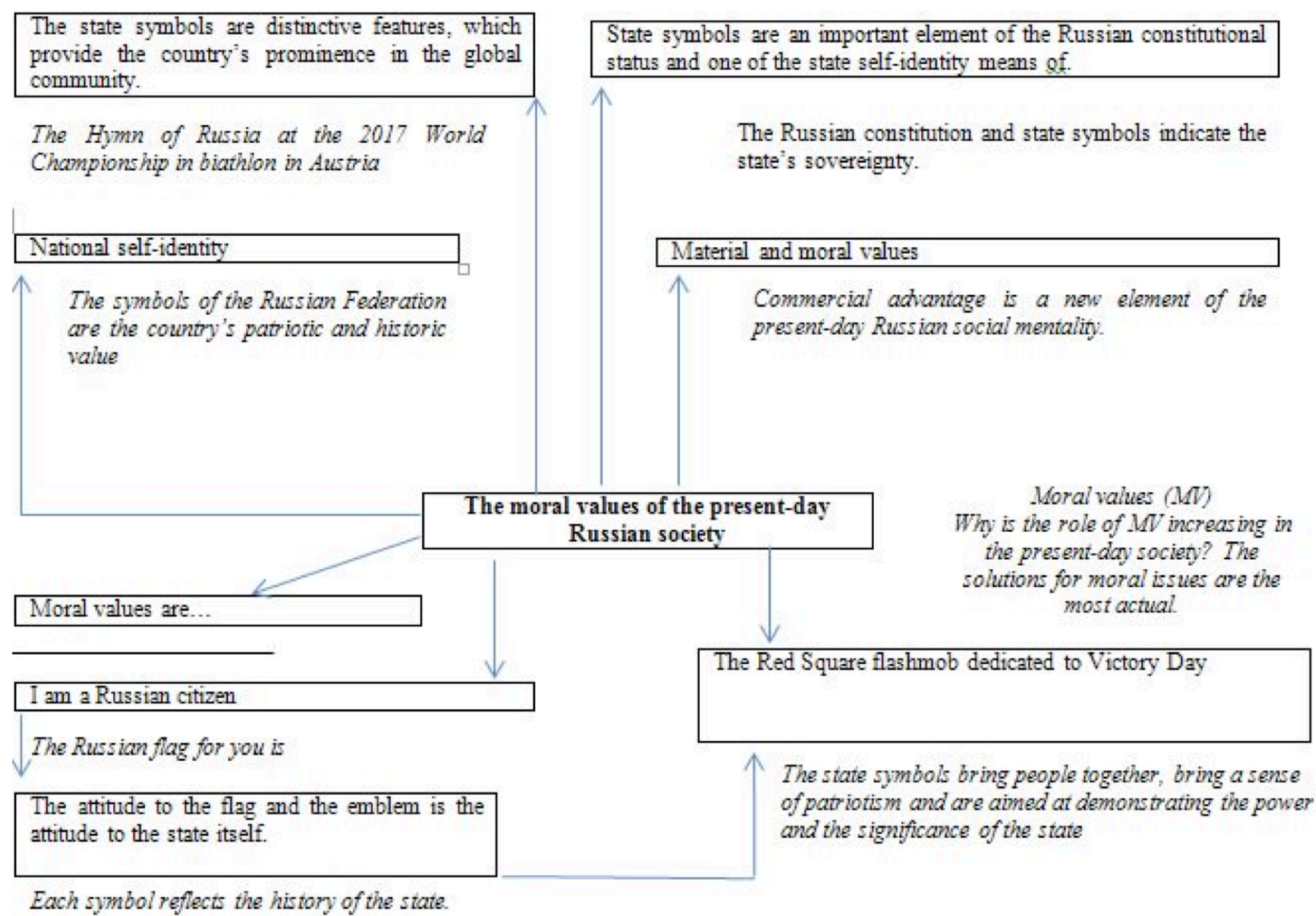
In order to be successful in such a situation, you should have good knowledge of the material, possess information about the problem, answer the questions directly, provide proof, facts, examples, etc.

This is followed by "Tasks and questions". Below comes a fragment.

The learners are offered:

1. To see the cluster map (picture 1), which may be useful at a research projects competition when it is necessary to defend the project. The cluster map includes the basic points in the form of marks and thesis which have arguments, notions, facts and events below.

Picture 1
Cluster map



2. To imagine that they are preparing for a presentation. It is necessary to foresee the questions which may be posed by potential opponents, the jury and the experts, and then complete the map by making necessary notes, filling in absent arguments, notions, facts, etc.

3. To prepare a speech on the topic: "The moral values of the present-day Russian society", to arrange the speech in thesis by using the tips below or own ideas:

<Moral values present certain ideal models set by the society, which are impossible to measure and evaluate.

The state symbols of the Russian Federation make a complex of symbols which reflect the country's historic, state, patriotic, cultural and other traditions.

The moral values of an individual indicate the highest level of his/her evolution and personal maturity.

Moral values serve as orienting points in different situations. ...>

The task implies using different ways of organizing the learners' educational process: a student should either sum up his/her ideas or give a detailed answer. Depending on the way chosen for giving a speech, the offered cluster map serves as a basic guideline directing learners' further actions. A teacher may use the cluster card as a hand-out in order to teach the learners how to communicate constructively, how to defend one's point of view, how to show one's initiative in behaviour, how to independently organize cooperation, etc. A teacher may as well use the cluster map with the purpose of controlling the skill to speculate and to defend one's point of view. Another option of using the task is to use it as a diagnostic means. Using the material which is not connected with a certain discipline, a teacher checks the skill of getting information from a picture, analyzing and interpreting it.

The results of the international PISA-2015 research confirms the need for introducing such kind of tasks, because Russian 15-year-old schoolchildren show less developed skills of comprehending and estimating text information in comparison with their peers from OECD countries (the Organization for Economic Cooperation and Development) (Main results of PISA-2015 international research).

5. The Results Discussion

The results allowed systematizing the problems of the metadisciplinary approach in education. The problems were considered in the following aspects:

methodological aspect, i.e. how should the "metadisciplinary" school activity be organized? The research shows that the optimal solution for this problem will be the methodology of the learning activity (Novikov, & Novikov, 2013), which enables to organize the learning activity in an integral system with distinct characteristics, a logical structure and implementation process. For more information, see (Sukhodimtseva 2017).

methodical aspect, i.e. what are the ways to introduce the subject learning material and what are the ways of its content integration with other school subjects, what are learning activity methods which could lead to metadisciplinary results? The research shows that the thing of the primary significance for a teacher is to have didactic tools which enable to create the conditions for the learners to adopt necessary ULA. In the current research, such tools are presented as metadisciplinary tasks. For more information, see (Sukhodimtseva 2017).

practice-oriented aspect, i.e. what are the conditions of introducing the innovations to the educational practice and developing teachers' professional competence? The need in a community of 'metadisciplinary' teachers is viewed as a problem which has not found its solution yet. We assume it to be one of the perspective directions for future research.

6. Conclusion

The research results gave grounds for making some intermediate conclusions, which attract researchers' attention and allow focusing on current problems related to metadisciplinary approach and its implementation in the educational process.

1. Metadisciplinary in school education is currently an actual issue of scientific research and pedagogical practice. The implementation of the metadisciplinary approach is accompanied by a number of problems which need urgent solution. These problems are of methodological, methodical and practice-oriented nature, i.e. nowadays, a teacher lacks effective methodological courseware and pedagogical practice samples for his/her pedagogical metadisciplinary performance. However, the requirement for learners to correspond to the FSES of BE makes Russian teachers search for innovative solutions.

2. The search of the means for successful learners' performance takes teachers to a new level of professional competence, makes possible the community of 'metadisciplinary' teachers and actualizes solutions to the problems of professional identity. Scientists' assistance is considered to be priceless for them. At the created testing sites, the alliance of science and practice results in new pedagogical projects and innovative ideas, i.e. new didactic tools in the form of metadisciplinary tasks for socio-humanitarian subjects are being developed and implemented. In order to use them at lessons, teachers learn to create conditions for the learners to adopt the metadisciplinary content of a school subject and to work with this material. Namely acting shows the learners' level of adopting the subject and metadisciplinary material.

3. A teacher should focus not only on the ways of his/her pedagogical activity arrangement, but on creating necessary conditions for learners to adopt the methods of learning activity (the ability to study, to use the acquired knowledge in different learning situations and in social life, etc.). The approach to the learning process organization demonstrates the strategy of the teacher's professional activity. The methodology of learning activity can be taken as a scientific basis, where the form of organizing the learning activity is determined by the education contents.

4. For the purpose of lesson planning, a teacher is offered to use a structural functional model which enables the teacher to determine the place of a certain

lesson in the whole system of the given subject sphere as well as a complex of basic learning situations/problems. The offered metadisciplinary tasks help to organize learners' metadisciplinary activity during a lesson. The tasks, an example of which was given in the article, are classified into the following groups:

- depending on their metadisciplinary expressiveness;
- depending on the degree of the cognitive constituent;
- depending on the clause which is included in different types of texts (an original, juridical or historical source).

The clauses (texts and images) and requirements (questions) imply that learners have to use their knowledge from two or more subjects. The metadisciplinary nature of the task is expressed through addressing to the information which can be analyzed and interpreted by means of educational and logical skills.

Further research is connected with the development of a metadisciplinary elective course and building an educational programme, which will contribute to the learners' experience of making competent solutions to the learning problems as well as to the creation of an individual learning activity system. This system is supposed to reflect individual insight into studying and the methods of solving both learning and real-life problems.

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