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MODERN ASSESSMENT FORMS OF ACHIEVING META-
SUBJECT OUTCOMES AT THE GEOGRAPHY LESSONS

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Abstract

The article discusses the relevance of the designing of task models for the standardized assessment of the formation of universal learning activities and the achievement of meta-subject (cognitive) learning outcomes in school education. The authors examine the possibilities of using modern forms of control for an objective assessment of the achievement of meta-subject results. The researchers compare the learning outcomes of geographic education and the desired meta-subject results. The possible contribution of school geography as a complex of sciences in the formation of cognitive skills and achievement of meta-subject results is analyzed. The paper also considers the models of tasks for controlling the universal learning activities and inter-subject concepts, especially in the context of the formation of skills and abilities in the sphere of functional (reading, informational) literacy. Examples of tasks for verifying universal educational activities on the subject content of school geography, interdisciplinary content (geography, history, social science), on content that goes beyond the boundaries of school subjects are presented by the authors.

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1. Introduction

Meta-subject requirements for learning outcomes at secondary school education include the inter-subject concepts and universal educational skills (regulatory, cognitive, communicative), ability of their use in educational, cognitive and social practice (Federal State Educational Standards). "The essence of "meta-subjectness" ... is training of students in the general receptions, technicians, schemes, models of cogitative (thinking) work which is over school subjects ..." (Gromyko, 2001). Also an important part of meta-subjectness is the formation of reading literacy skills (Federal State Educational Standards). The attention to formation of meta-subject results as learning outcomes at secondary school meets current trends of educational development. Formation of cognitive abilities, cogitative operations, abilities to solve problems and to apply knowledge in real life have already become the important task of school education, an indicator of students readiness for life in modern world in educational systems of many countries (Care, & Griffin, 2014; Fisher, Frey, 2015; Kautz et al., 2014; Kamm, Rshaid, Rose, 2015; Kovaleva, Krasnyanskaya, 2016; Mullis, Martin, Loveless, 2016; OECD, 2016; Savery, 2006).

2. Problem Statement

In the Russian school, the formation of cognitive skills occurs in the context of subject learning. In the context of modernization of school education in Russia, changes in emphasis and goals, including geographic education, quality control of education acquires new functions and forms. One of the modern forms of control are standardized forms of evaluating knowledge and skills. They allow you to objectively and quickly test the knowledge and skills of a large number of students simultaneously. The objectivity of the assessment is provided, among other things, by the availability of specially developed evaluation criteria, which make it possible to draw an unambiguous conclusion about the achievement by the students of the audited requirements. An example of a standardized work designed to test knowledge and skills at the present time are works of the state final attestation – state exams for basic and secondary general education (Compulsory state examination, Unified State Examination). The works of state exams on Geography were designed to evaluate the subject (geography) knowledge and skills, but to solve them the student should use universal learning skills, therefore the meta-subject learning outcomes are indirectly tested at the exams. This applies to geography and other subjects, including the socio-humanitarian subjects (Frantsuzova, 2016).

3. Research Questions

The skills to find, use and present geographic information are fixed in the Federal State Educational Standards among the subject requirements for the learning outcomes of geography, and among meta-subject learning outcomes highlighted the ability to understand various sources of information, critically evaluate and interpret information obtained from different sources (Federal State Educational Standards). Geography is a subject that has a subject-specific learning outcomes that correlate with meta-subject. The development of cognitive abilities and intellectual skills of students,

which educational standard classified as meta-subject, has always been one of the most important tasks in teaching geography.

4. Purpose of the Study

The purpose of our work is the constructing of task models that can be used to objectively evaluate the achievement of meta-subject results in the context of subject-based learning.

The urgency of constructing of such task models for using in standardized forms of control seems to be quite high. Meta-subject results of learning outcomes are included in federal state educational standards. (We note that we investigate the models only for cognitive universal educational skills, although the documents define both personal and communicative meta-subject results.) Therefore, it is necessary to have a reliable instrument by which the formation of these achievement is measured. This tool should give an objective assessment, be valid, technological. The evaluation of the formation of meta-subject learning outcomes has already become a reality in the learning process. There are a lot of test works worked out for this purpose by teachers, and various educational institutions. Unfortunately, not all of them have been experimentally tested, meet the specified requirements.

5. Research Methods

To develop the basic approaches to the design of task models, the documents were analyzed that capture the understanding of the meta-subject learning outcomes at the modern Russian education (Federal State Educational Standards), work on the problems of designing tasks for a standardized evaluating of the knowledge and skills of students, on the formulation of tasks, taking into account the activity approach to check the formation thought thinking operations, on the problem of meta-subjectivity (Gromyko, 2001; Martin, Mullis, & Hooper, 2016; Kovaleva, & Krasnyanskaya, 2016; Rowntree, 2015; Savery, 2006). The models of assignments used in the work of the state final attestation were studied (Frantsuzova, 2016). Also tests for evaluating the meta-subject learning outcomes worked out by geography teachers and different educational institutions were analyzed. Some geography textbooks and workbooks used in the school were read. The questionnaire for teachers was conducted to identify the difficulties encountered in organizing and conducting an audit of the achievement of meta-subject results, as well as the possibility of using textbooks, student workbooks and teachers guide for these purposes. After the task models were designed, they were presented to teachers for peer review.

6. Findings

Several task models were designed. The tasks using statistical sources of information are shown below. The evaluating skills are – to find information contained in an explicit form; to find information presented in an implicit form; draw conclusions based on available information, critical attitude towards information (critical thinking). (For the separation of qualitative levels of see (Frantsuzova, 2016).).

Using the data in the tables, complete the tasks 1-3.

Table 01. Area of the territory and the population of some regions of the Russian Federation.

Region	Area, thousand km ²	Population by years, thousand people								
		Total			Urban			Rural		
		2000	2007	2014	2000	2007	2014	2000	2007	2014
Novosibirskaya oblast	178	2725	2670	2731	2034	1986	2136	691	655	595
Republic of Dagestan	50	2443	2659	2964	1040	1133	1336	1403	1526	1628

1. Using the data in the tables, determine in which of the listed regions for the period from 2000 to 2014 there was an increase in the number of rural population?

Answer: _____

2. In what region is the proportion of the urban population smaller? Answer: _____

3. According to the table, from 2000 to 2014 the number of urban population in the Novosibirsk region increased.

1) Does this mean that the proportion of the urban population has increased? Yes No

2) Does this mean that the share of the rural population has decreased? Yes No

The formation of reading literacy is one of the important aspects of achieving meta-subject learning outcomes. The presented model of tasks "The Travel to Greece" task block includes an adapted text (fragment of the article), a map. The content of the task relates to two subjects - geography and history (courses of grades 5-7). In this block of tasks the actual situation is modeled - the journey of students during practice. The travel route and planned sightseeing tours to several tourist centres in Greece are analysed. In these tasks, the ability to apply geographical knowledge and skills in situations close to real life is tested. In the modern world it becomes especially important to extract information from one or several sources, and then somehow treat it (form your own opinion, identify the missing information to solve a particular problem, etc.). While doing the tasks students are expected to use skills to extract information presented in an explicit form, to determine the characteristics of objects, to determine the logical connections between objects and / or phenomena; Create verbal, material and information models with the identification of the essential characteristics of the object to determine the method of solving the problem in accordance with the situation.

The "Travel to Greece" task block

Using the text and the map, complete the tasks 1-4

1. "A group of Russian students studying at the Institute of Tourism and Management during the practice plans to make a trip to Greece. During their journey, students plan to explore the nature of the peninsula ... _____. Students will visit several cities, during the journey they explore the surrounding nature. The final destination of the tourist route in Greece is the city of Heraklion (Crete). "



Figure 01. Greece.

2. Students must agree on a route with a travel agency. One of the goals of the forthcoming trip is to visit three cities: the city, which received its name from the goddess of wisdom and knowledge, is one of the oldest cities in the world _____ (A), a city located at the intersection of two important roads simultaneously - from the capital of Ancient Greece in the Black Sea and Constantinople to Rome, founded by the Macedonian king Cassander _____ (B), and the port city on the peninsula of Peloponnese, founded in the sixth century BC _____ (B).

Insert the words from the list of words below into the skips of the text of task 2. Each word can be used only once. Please note that there are more words in the list than you need to fill in the blanks.

List of words:

- 1) Athens
- 2) Patras
- 3) Thessaloniki
- 4) Heraklion
- 5) Chania

3. In consultation with the travel agency students during the practice should conduct sightseeing tours to several tourist centres in Greece. Which secondary school subjects will be of use to students who received them in the classroom?

Answer: _____

4. When conducting a sightseeing tour, students in their story should rely on key facts that characterize the natural, historical, economic, cultural aspects of the development of a particular city. Future guides made an approximate plan for their story. What issues should be disclosed in this plan?

Answer: _____

In the modern world under the conditions of updating the content of general education and teaching methods the activity of the student becomes a special object of study in the learning process, and its formation becomes the object of control. Below are examples of tasks, which on a geographical material test the ability to choose the source of information, which corresponds to the goal of the task. Tasks are carried out using geographical maps (atlases).

1. You need to find the geographical coordinates of the city of Rio de Janeiro. On which map can you identify them more accurately - the world map or the map of the continent?

2. You need to measure as accurately as possible the distance in a straight line from Stavropol to Rostov-on-Don. By geographic maps of what scale, which you have in the atlas, you can do it more accurately?

3. You have a geographical map with a scale of 1:45 000 000 and a map with a scale of 1:20 000 000. If you were mistaken by 1 mm when determining the distance on the both maps, how many km will it be in reality ?

One of the important competences that must be formed in the process of teaching geography is the ability to formulate thoughts using geographical terms and concepts and record the course of reasoning in solving various problems. Possession of the "language" of geographical science is an indicator of the success of mastering subject knowledge. In various types of control: the current, boundary it makes sense to check the assimilation of concepts and terms by mini-tests in order to identify the causes of possible problems. In Federal state educational standard of basic general education, the formation of interdisciplinary concepts is named as one of the elements of the meta-subject learning outcomes. From the point of view of meta-subjectness, interdisciplinary concepts are general concepts that are studied in courses of different school subjects, and at the same time have the same essential features. Some of these essential features are unified for concepts that are studied on all subjects, but new features can be added in each specific subject (Ambartsumova, & Korosteleva, 2016; Dyukova, 2016). As the interdisciplinary concepts of the social and humanitarian subjects concepts of state, society, ethnos, people, can be named. Interdisciplinary concepts play a special role in the formation of universal learning skills, because they allow students to form a united interdisciplinary field and act on it. It is also important and useful to single out special universal philosophical and methodological concepts that can be defined as meta-subject (wider than interdisciplinary), for example, such as "system", "structure", "development". Formation of meta-subject concepts requires special attention and approach, the application of special activities precisely in connection with their high degree of generalization (Kryuchkova, 2016). Interrelation, interaction of school subjects in the formation of interdisciplinary and meta-subject concepts allows to expand the scope and content of concepts, which we suggest students to learn. There is an integration of the subjects of the social and humanitarian cycle through the formation of meta-subject and interdisciplinary concepts (Kovaleva, & Loginova, 2009; Lazebnikova, & Koval, 2016).

Models of tasks that can be used to form the interdisciplinary concept of people, population, ethnos formed in courses of history, geography and social science.

1. What feature is missed in the description of one of the small ethnos of Russia? "This is one of the small ethnos of Russia (about 15 thousand people), the main occupation - nomadic reindeer herding, representatives of this people living on the shore, engaged in hunting sea animals. The first information about them appeared in the 17th century. The main dwelling is a collapsible conical tent-yarang made of

reindeer skins. Type of appearance mixed, generally Mongoloid. Folklore and mythology are very rich and have much in common with those of the American peoples. "

2. Indicate the general characteristic of the concepts "People" and "Population".

To evaluate the formation of interdisciplinary concepts, task models can also be used, the content of which is not related to any subject, but requires the use of skills to recognize the signs of concepts, to learn the object in a new unfamiliar situation. Assignments of this type can put students on the position of researchers, help to expand the "subject framework", to understand the role of the conceptual rang in the system of scientific knowledge. Here is an example of such task, the content of which is not related to academic subjects. The concept ethnos is evaluated.

1. Read the text about javas and answer the question to him.

In the film epic "Star Wars" on the planet Tatooine in the Sea of Dunes live javas - fantastic creatures. Most of their lives they spend in search of scrap metal and mechanical devices. Javas earned their living by collecting pieces of machinery, repairing or processing them, selling them. The society of javas is divided into clans or tribes. Once a year, all Javas tribes meet in the Dune Sea, where they trade, communicate, tell each other different fables. Javas have their own language. The most important person in the clans is a female shaman who, as her fellow tribesmen believed, had the ability to predict the future. Javas can be easily recognized by the brown, spacious hooded robes that all javas constantly wear.

Can you say that Javas are ethnos as we earthlings understand it? What are the signs of the ethnos of Javas?

The use in practice of teaching tasks, the condition of which is not related to the substantive content, but the implementation of which requires the application of universal educational activities or the transfer of subject to new content, is interesting for students. Also, it makes possible to control the awareness of the use of the skills. Examples of tasks of this type are given below. They are parts of block "Star Wars" too. Evaluating skills are: transformation of verbal information into a schematic, use of knowledge and skills to solve an educational and practical problem, applying knowledge about the methods of scientific knowledge in a new situation.

Block of tasks "Star Wars"

1. Maxim and Boris are studying in film school. They love the film epic «Star Wars» and decided to come up with a script and make a short film about the Sarlacc - a creature similar to a beak with a snake head in the middle that lives on the planet Tatooine in the Big Hollow in a territory called the Dune Sea. The children selected several objects that decorators should build on the territory of the Dune Sea. All the participants of the film group decided that the location of the objects in the Dun Sea should be like the location in the film. On the Internet, they found the following information about the location of the selected objects: 1) Obi-Wan Kenobi's hut (master Jedi) - in the south-west of the Dune Sea. 2) Star temple - in the eastern part of the Dune Sea. 3) Big Pit - strictly north of Jabba Palace, in the western part of the Dune Sea. 4) Jabba Palace - in the northern part of the Dune Sea. The Dune Sea was decided to be shot on a school sports field, which has a square shape. The southern part is where the entrance to the field is located. Indicate on the scheme of the sport field Obi-Wan Kenobi's hut, Star Temple, Great Pit

and Jabba Palace, so that the decorators could know exactly where to place each object. The boundaries of the sports ground and the entrance are shown in the figure.



Figure 02. Scheme of the school sports grounds.

2. In the movie "Star Wars" there is a planet Tatooine, revolving around the double star of the Outer Rim. About Tatooine it is known that in ancient times it was covered with vast oceans, which had long dried up. Now the surface of Tatooine is endless sandy seas, occasionally interrupted by rocky canyons, once created by the oceans. How did the Earth scientists who studied Tatooine determine that the planet was covered by oceans? Express your assumption.

When using such a task form (with an open response), it is important that clear and objective evaluation criteria be developed that make it possible to use them in standardized forms of evaluation.

Example of formulation of evaluation criteria: 1. The answer is checked by two parameters - the correct location of objects in the figure and presence of a legend

Parameter 1. Correct arrangement of objects in the drawing according to the task. It is important that the sign of the object can be indicated anywhere in the square (in the case of a two-dimensional indication of the location, for example, south-west for the Obi-Wan Kenobi hut) or a rectangle in the case of a one-dimensional indication (for example, the Star Temple can be marked in any place of the eastern part).

Parameter 2. In the students drawing, the objects should be somehow marked in the diagram or a legend is given.

2. The answer refers to the presence in the sands or rocks of the remains of marine organisms, OR about the presence of forms of relief created by water erosion, OR about the presence of sedimentary rocks.

In carrying out this task, students transfer geographical knowledge about the methods of obtaining scientific information to an entirely new field.

7. Discussion

In the development of task models, their connection with real life was taken as one of the main start points. Also the necessity of combined using of knowledge from different school subjects (history,

social science and geography) was applied. One of the most important criteria for task designing was the application of skills to analyze, synthesize, synthesize information, transfer and apply knowledge in a new unusual situation, etc. We also worked out tasks, where the formation of universal educational skills can be carried out also on the subject geographic content. Geography, being a complex of natural and social sciences, creates great opportunities for this.

It seems that approaches to the development of tasks can also be used in the designing of tasks for formative or diagnostic evaluation. Of course, they have other purposes - providing assistance to students in the learning process and the teacher in the teaching process. Consequently, other questions are required - with a step-by-step specification of the tested skills, aimed at the gradual formation and development of the algorithm. Evaluation criteria should also be different, for example, aimed at awareness of the application of various training activities, etc. When developing tasks for formative or diagnostic assessment, methodical recommendations for their application are important, advice on the interaction of the teacher with the pupil or class, etc. (Chappuis et al., 2012).

8. Conclusion

The developed task models make it possible to evaluate the achievement of certain meta-subject (cognitive) results with minimal time. It seems that they can be successfully applied in the educational process. The search for optimal models of tasks for evaluating the formation of universal learning skills and interdisciplinary concepts for standardized control, and for the formative and diagnostic assessment can be continued with other approaches to their design.

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References

- Ambartsumova, E.M., Korosteleva, A.A. (2016). Mezhpredmetnyye ponyatiya pri obuchenii sotsialno-gumanitarnym distsiplinam v osnovnoy shkole. *Prepodavaniye istorii i obshchestvoznaniya v shkole*, 9, 42–46. [in Rus].
- Care, E., Griffin, P. (2014). An approach to assessment of collaborative problem solving. *Research & Practice in Technology Enhanced Learning*, 9(3), 367-388. Retrieved from <https://pdfs.semanticscholar.org/ccaf/5b96e849f85544876cfda698c3dad845dd57.pdf>
- Chappuis, J., Stiggins, R., Chappuis, S., Arter, J. (2012). *Classroom assessment for student learning*. Upper Saddle River, NJ: Pearson Education.
- Dyukova, S.E. (2016). Osobennosti formirovaniya metapredmetnykh ponyatiy v protsesse obucheniya geografii. *Geografiya v shkole*, 8, 52–55. [in Rus].
- Federal State Educational Standards. Retrieved from <http://xn--80abucjiibhv9a.xn--p1ai/%D0%B4%D0%BE%D0%BA%D1%83%D0%BC%D0%B5%D0%BD%D1%82%D1%8B/2365>
- Federal State Educational Standard of Basic General Education. Retrieved from <http://xn--80abucjiibhv9a.xn--p1ai/%D0%B4%D0%BE%D0%BA%D1%83%D0%BC%D0%B5%D0%BD%D1%82%D1%8B/543>

- Fisher, D., Frey, N. (2015). *Checking for understanding: Formative assessment techniques for your classroom*. ASCD. Retrieved from http://fisher-and-frey.s3.amazonaws.com/documents/checking_nassp.pdf
- Frantsuzova, O.A. (2016). Metapredmetnyye rezultaty i mezhpredmetnost v usloviyakh EGE po obshchestvoznaniyu. *Pedagogicheskoye obrazovaniye: stanovleniye. strukturizatsiya. optimizatsiya. modernizatsii i prognoz razvitiya*. Moscow, 174–184. [in Rus].
- Gromyko, Yu. V. (2001). *Metapredmet «Znak». Skhematizatsiya i postroyeniye znakov. Ponimaniye simvolov. Uchebnoye posobiye dlya uchashchikhsya starshikh klassov*. Moscow, Mysledyatelnostnaya pedagogika, Pushkinskiy institut. 288). [in Rus].
- Kamm, C., Rshaid, G., Rose, A. (2015). *Learning for the Future*. Retrieved from <http://kammsolutions.com/wp-content/uploads/2016/08/Learning-for-the-Future.pdf>
- Kautz, T., Heckman, J. J., Diris, R., Ter Weel, B., Borghans, L. (2014). *Fostering and measuring skills: Improving cognitive and non-cognitive skills to promote lifetime success*. (No. w20749). National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w20749.pdf>
- Kovaleva, G. S., Loginova, O. B. (2009). *Planiruyemye rezultaty nachalnogo obshchego obrazovaniya. Standarty vtorogo pokoleniya*. Moscow, Prosveshcheniye, 120.). [in Rus].
- Kovaleva G.S. Krasnyanskaya K.A. (2016). Analiz sistem otsenki realizatsii obrazovatelnykh programm v Singapure. Yuzhnoy Koreye i Kitaye. *Nauka i shkola, 1*. Retrieved from <http://cyberleninka.ru/article/n/analiz-sistem-otsenki-realizatsii-obrazovatelnykh-programm-v-singapore-yuzhnoy-koree-i-kitae> [in Rus].
- Kryuchkova, E.A. (2016). Metapredmetnost: formirovaniye ponyatiynykh ryadov v predmetakh sotsialno-gumanitarnogo tsikla (istoriya. obshchestvoznaniye. geografiya) v osnovnoy shkole. *Nauka i shkola, 5*, 24–34. [in Rus].
- Lazebnikova, A.Yu., Koval, T.V. (2016). Integratsiya uchebnogo soderzhaniya predmeta «obshchestvoznaniye» v usloviyakh rasshiroyayushchegosya informatsionnogo prostranstva: eds. Ivanova S.V. *Collection of articles based on materials from the international research and practice conference «Educational Environment in Informational Age (EEIA-2016)»*. Moscow, 594–600. [in Rus].
- Martin, M. O., Mullis, I. V. S., Hooper, M. (Eds.). (2016). *Methods and Procedures in TIMSS 2015*. Boston College, TIMSS & PIRLS International Study Center. Retrieved from <http://timssandpirls.bc.edu/publications/timss/2015-methods.html>
- Mullis, I. V.S., Martin, M. O., Loveless, T. (2016). *20 Years of TIMSS: International Trends in Mathematics and Science Achievement, Curriculum, and Instruction*. TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College and International Association for the Evaluation of Educational Achievement. Retrieved from <http://timssandpirls.bc.edu/timss2015/international-results/timss2015/wp-content/uploads/2016/T15-20-years-of-TIMSS.pdf>
- OECD (2016). *PISA 2015 Results (Volume I): Excellence and Equity in Education*. OECD Publishing, Paris. Retrieved from <http://dx.doi.org/10.1787/9789264266490-en>
- OGE. Demoversii. spetsifikatsii. kodifikatory. Geografiya. Retrieved from <http://fipi.ru/oge-i-gve-9/demoversii-specifikacii-kodifikatory>
- Rowntree, D. (2015). *Assessing students: How shall we know them?* Routledge.
- Savery, J. R. (2006). Overview of problem-based learning: Definitions and distinctions. *Interdisciplinary Journal of Problem-based Learning, 1*(1), 3. Retrieved from <http://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1002&context=ijpbl>
- Unified State Examination. Demoversii. spetsifikatsii. kodifikatory. Geografiya. Retrieved from <http://fipi.ru/oge-i-gve-11>