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Research article

Teaching physics students of humanitarian-oriented groups in the Middle Years Programme (basic school) of the International Baccalaureate

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Problem and goal. In 1968, an international non-governmental organization of the International Baccalaureate with consultative status with UNESCO was established in Switzerland [11; 26; 27; 29–31]. The methodological basis of the International Baccalaureate is intercultural communication, communication, self-development, conceptual thinking, learning efficiency, etc. The International Baccalaureate is an internationally recognized curriculum and is implemented worldwide, including in Russia (Vladivostok, Moscow, Moscow region, Perm, Samara, Saint Petersburg, Ulyanovsk). In addition, International Baccalaureate diplomas are recognized by many foreign educational institutions.

In the process of teaching physics to students of humanitarian-oriented groups on the Middle Years Programme (MYP) (basic school) of the International Baccalaureate, some students have difficulties both in mastering the theoretical material and in solving educational text problems.

In this connection, to improve the efficiency of training of such students it is advisable not only to carry out a theoretical justification of the possibility of using methods of adaptation of texts of problems in physics and to develop adapted educational tasks with their subsequent inclusion in the content of training, but also to use modern information technologies both in the presentation of theoretical material to students (multimedia teaching tools, electronic resources, etc.) and to teach students to use computer programs ("Live physics", "Laboratory L-micro", "1C: Tutor in physics", "Physics course of the XXI century", "Open physics", "Physics in animations", "Physics. Grades 7–11. Workshop", etc.).

Obviously, that it is necessary in the future to carry out experimental and pedagogical activities revealing the effectiveness of teaching physics.

Methodology. The effectiveness of teaching physics to schoolchildren of humanitarian-oriented groups under the MYP (basic school) of the International Baccalaureate will be largely provided by the developed content of training, the implementation of didactic principles of training, the implementation of a system-activity approach in teaching, the informatization of training, linguistic analysis of the content of educational tasks, the implementation of technological approach to the design of the educational process, taking into account the peculiarities of psychological laws of formation of mental actions of schoolchildren in the process of solving physical problems [1; 3; 7–9; 12–16; 19; 20; 28].

Results. Application of the method of adaptation of the text of educational tasks, the use of informatization tools, the use of various algorithms for solving physical problems, linguistic analysis of the content of educational tasks helps to improve the quality of teaching physics to students of humanitarian-oriented groups under the MYP (basic school) of the International Baccalaureate.

Conclusion. The use of an adapted format for the presentation of educational problems, various algorithms for solving physical problems, the use of modern information technologies for teaching physics to students of humanitarian-oriented groups under the MYP (basic school) of the International Baccalaureate contributes to the increase in students' interest in learning and the formation of their fundamental system of subject knowledge in physics.

Key words: Middle Years Programme (basic school) of the International Baccalaureate; information technology; informatization of physics training; algorithms for solving physical problems; students of humanitarian-oriented groups

Problem statement. The Middle Years Programme (MYP) (basic school) of the International Baccalaureate is designed for students between the ages of 11 and 16. When studying under this program, students show their best qualities – develop their creativity, logical and conceptual thinking, the ability to formulate and articulate their thoughts, the ability to achieve intercultural understanding and dialogue, and other qualities.

Structurally, MYP consists of eight subject groups: foreign language education, native language and literature, human and society, natural sciences (chemistry, ecology, agronomy, mathematics, astronomy, physics, etc.), mathematics, art, design, physical culture and health.

If we talk about teaching physics (8–9 grade, which corresponds to 4–5 years of study), such training is carried out in the format of related concepts, concepts and research [4–6; 17; 21–23; 26; 27; 29–31]. This corresponds to the fact that in the process of teaching the student is asked questions to which he gradually has to find an answer, studying all the necessary educational information on this topic. In this case, as a rule, the answer to the question may contain information from several sections of physics.

Given these features of the MYP physics course [24–27; 29–31], and also features of development of the child at the age of 13–16 years [2; 10; 18], we will highlight the most difficult aspects in teaching physics.

Aspect 1. Complexity of mathematical apparatus (for example, nonlinear dependencies, systems of algebraic equations, trigonometric equations, elements of vector algebra, function graphs).

Aspect 2. Difficulties in mastering the training material (e.g. uniform and uniformly accelerated motion, geometric optics and wave optics, classical and relativistic mechanics, classical and quantum physics).

Aspect 3. Difficulties of visual perception (e.g. thermal phenomena, electrical circuits, electromagnetic field, atomic or nuclear physics).

Method of research. Currently, students of Russian schools are required to pass the state final certification at the end of grade 9, regardless of what program they studied during the primary school. In this regard, the goals and objectives of

teaching physics are determined simultaneously by two standards: the Federal State Educational Standards of the Russian Federation of Basic General Education [24; 25] and MYP Science guide [29–31].

Upon completion of the International Baccalaureate MYP (basic school) physics education, students must achieve certain results, such as:

– personal (the presence of the formation of cognitive interests, developed intellectual and creative abilities, the presence of confidence in the possibility of knowledge of nature, skills and self-acquisition of subject knowledge);

– metasubject (the presence of skills and abilities of self-acquisition of new knowledge; be able to independently set a goal, to evaluate the results of their activities, to anticipate the results of their actions; to understand the difference between the original facts and formed hypotheses, theoretical models and real objects);

– subject (should be able to organize their own observations, plan and carry out experiments, process and analyze the results of their measurements, to present the results of their measurements in the form of formulas, graphs or tables; be able to independently see the different relationships between physical quantities, analyze the results and make appropriate logical conclusions, etc.).

In addition, one of the results of such training should be a developed profile of the student of the International Baccalaureate (IB learner profile). IB student profile is the mission of the International Baccalaureate, which is expressed by a set of learning outcomes that meet the requirements of the XXI century.

To achieve the required results of teaching physics under the MYP (basic school) of the International Baccalaureate were implemented:

– system-activity approach, developed in the works of B.G. Ananiev, A.G. Asmolov, L.S. Vygotsky, P.Ya. Galperin, V.V. Davydov, L.V. Zankov, A.N. Leontiev, B.F. Lomov, A.R. Luriya, V.V. Rubtsov, D.B. Elkonin and other authors;

– general didactic principles and criteria for optimizing the organization of training, developed in the works of Yu.K. Babansky, V.P. Bespalko, V.I. Zagvyazinsky, B.C. Ilyin, B.C. Lednev, I.Ya. Lerner, M.N. Skatkin, A.V. Usova and other authors;

– approaches to informatization of education, developed by C.G. Grigoriev, V.V. Grinshkun, E. Dijkstra, O.Yu. Zaslavskaya, D. Collins, A.A. Kuznetsov, I.V. Levchenko, S.V. Panyukova, A.Yu. Uvarov, B. Hunter and other authors;

– multimedia teaching tools, computer programs ("Live physics", "Laboratory L-micro", "1C: Tutor in physics", "Course of physics of the XXI century", "Open physics", "Physics in animation", "Physics. Grades 7–11. Workshop" , etc.);

– interdisciplinary connections that have devoted their studies R.L. Isaeva, S.B. Kaplan, A.E. Kirichenko, J.M. Kotlyar, A.A. Kuznetsova, G.M. Morozov, N.K. Ruzin, A.A. Carpenter, V.N. Fedorova, N.V. Chkhaidze and other authors;

– psychological regularities of formation of mental actions and of the process of solving physics problems, which study found reflection in the works of G.A. Balla, G.J. Halperin, B.K. Damitov, G.S. Kostiuk, A.N. Leontiev, E.I. Machuca, A.S. Pantini, N.F. Talyzina, L.M. Friedman, A.F. Esaulov and other authors;

– constructing the learning process through a technological approach, which development has made the works of V.N. Ardasheva, V.P. Bespalko, T.A. Bohr, M.V. Klarina, G.K. Selevko and other authors;

– linguistic analysis of the content of educational tasks in physics for students in grades 8–9, which initiates approaches to the formation of a system of educational tasks (the problem should have a clear application, the student should not remain indifferent to the problem, the problem can have a beautiful and modern design, the problem should be formulated briefly and other approaches).

It should be noted that the theoretical study of questions of development of physics problems and use them in educational process were considered in the researches of V.I. Danilchuk, A.S. Kondratyev, I.Ya Lamina, V.G. Razumovsky, V.A. Marchenkova, V.V. Voroshilov, A.S. Kopylov, A.M. Afanas'ev and other authors. To the substantiation of the need and description of the features of the use of text problems in teaching physics in the framework of the program of primary and high school are devoted the works of D.A. Alexandrov, I.M. Shvaychenko, S.E. Kamenetsky, V.P. Orekhov, A.S. Kondratiev, V.I. Sosnovsky, M.P. Golubovskaya, V.I. Volodarsky, S.Yu. Trofimova, S.V. Bublikova, V.A. Larchenkova and other authors.

The need for the use of adapted texts of problems in the physics lessons of the main school in the classes of non-physical and mathematical profile is justified by three main assumptions. Set them out.

1. It becomes much easier for students to overcome difficulties in mastering the theoretical material, and they will be able to solve at least the tasks of the initial level.

2. Successful practice of solving problems with adapted texts will allow students to learn theoretical material that was previously difficult to master on one or several specific examples.

3. Understanding the content and meaning of the text problem, and, consequently, the search for a solution to the text problem becomes easier if the area of knowledge is close to the student.

The need for the use of information technology, with which it is possible to organize computer illustrations and animations, is based on the fact that allows students to understand and remember the educational material; to demonstrate in the classroom to students fundamental experiments that can not be shown without the use of a computer, for example, movement in the form of models and graphic descriptions, dynamic models of phenomena, fundamental experiments, etc.; to organize independent cognitive activity of students both in and out of school hours.

In addition, the use of information technology helps school teachers to conduct classes and monitor the performance of students.

Results and discussion. The validity and reliability of the results are based on the theory and practice of pedagogical and psychological science, the theory and methodology of teaching physics in school, the theory and practice of informatization of education, the correctness of the methods and approaches used to teach physics to students of humanitarian-oriented groups under the MYP (basic school) of the International Baccalaureate.

The approbation of the developed technique in the course of teaching physics to schoolchildren was carried out. It was confirmed the hypothesis that the use of adapted for a specific group of students presentation format of tasks contributes to

increasing the interest of students in the study of the subject of physics, better assimilation of the subject.

We formulate guidelines for the adaptation of the text of problems in physics for students in grades 8–9, enrolled in the MYP (basic school) of the International Baccalaureate:

1) the task should be close to the student or group of students;

2) the task should evoke emotions;

3) similar tasks are recommended to be combined in a series of tasks;

4) further targeting and narrowing the target audience as students become acquainted;

5) design tasks, block structure;

6) registration, figures.

It is also necessary to draw the following conclusions.

1. Adapted tasks more closely and emotionally to meet in classrooms. As a result, against the background of the interest shown to the problems, students receive the necessary knowledge on the subject.

2. In the case of complex material adapted tasks, despite the lack of understanding of the topic, retain interest in the subject, which is important for further study of the subject.

3. Adapted problems do not always lead to an increase in the average score in the class. The identified deviations are usually associated with the individual characteristics of the student (absence from several classes in a row, participation in Olympiads or major events the day before, the proximity of the end of the training module, the time of the lesson, the absence of a calculator).

4. The use of adapted problems imposes the need for additional training time to move from solving adapted problems to solving problems in the classical formulation.

Conclusion. If in the process of teaching students to use adapted to a specific group of students the format of tasks, use information technology, it will increase the interest of students in the study of the subject of physics, better assimilation of the subject.

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Научная статья

Обучение физике школьников гуманитарно-ориентированных групп по Middle Years Programme (программа основной школы) Международного бакалавриата

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Проблема и цель. В 1968 году в Швейцарии была создана международная неправительственная организация Международного бакалавриата с консультационным статусом в ЮНЕСКО [11; 26; 27; 29–31]). Методологической основой Международного бакалавриата выступают межкультурное общение, коммуникации, саморазвитие, концептуальное мышление, эффективность обучения и др. Международный бакалавриат является международно признанной учебной программой и реализуется по всему миру, в том числе и в России (Владивосток, Москва, Московская область, Пермь, Самара, Санкт-Петербург, Ульяновск). Кроме того, дипломы Международного бакалавриата признаются многими иностранными учебными заведениями.

В процессе обучения физике школьников гуманитарно-ориентированных групп по программе MYP (основная школа) Международного бакалавриата у некоторых школьников появляются трудности как при усвоении теоретического материала, так и при решении учебных текстовых задач.

В связи с чем для повышения эффективности обучения таких школьников целесообразно не только проводить теоретическое обоснование возможностей использования методов адаптации текстов задач по физике и разрабатывать адаптированные учебные задачи с последующим их включением в содержание обучения, но и использовать современные информационные технологии при изложении школьникам теоретического материала (мультимедийные средства обучения, электронные ресурсы и др.), а также научить школьников использовать компьютерные программы («Живая физика», «Лаборатория L-микро», «1С: Репетитор по физике», «Курс физики XXI века», «Открытая физика», «Физика в анимациях», «Физика. 7–11 классы. Практикум» и др.).

Очевидно, что необходимо в дальнейшем проводить и экспериментальную педагогическую деятельность, выявляющую эффективность такого обучения физике.

Методология. Эффективность обучения физике школьников гуманитарно-ориентированных групп по программе MYP (основная школа) Международного бакалавриата во многом будет обеспечиваться разработанным содержанием обучения, реализацией дидактических принципов обучения и системно-деятельностного подхода в обучении,

информатизацией обучения, лингвистическим анализом содержания учебных задач, реализацией технологического подхода к конструированию учебного процесса обучения, учетом особенностей психологических закономерностей формирования умственных действий школьников в процессе решения физических задач [1; 3; 7–9; 12–16; 19; 20; 28].

Результаты. Применение методики адаптации текста учебных задач, использование средств информатизации и различных алгоритмов решения физических задач, лингвистический анализ содержания учебных задач способствуют повышению качества обучения физике школьников гуманитарно-ориентированных групп по программе MYP (основная школа) Международного бакалавриата.

Заключение. Использование адаптированного формата представления учебных задач, различных алгоритмов решения физических задач, применение современных информационных технологий для обучения физике школьников гуманитарно-ориентированных групп по программе MYP (основная школа) Международного бакалавриата способствуют повышению у школьников заинтересованности в обучении и формированию у них фундаментальной системы предметных знаний по физике.

Ключевые слова: Middle Years Programme (программа основной школы); Международный бакалавриат; информационные технологии; информатизация обучения физике; алгоритмы решения физических задач; школьники гуманитарно-ориентированных групп

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