# Interactive Electronic Textbooks

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*Abstract*: - The author examines conception of modern electronic textbook. Such textbook must be based on a standard paper textbook and must contain bases of lessons, using which a teacher can create own unique lessons. On interactive pictures the tasks of initial printing textbook, which can be changed hundreds of methods, are preliminary set. Large freedom is provided in control of image on the screen. System with many managing elements makes possible to create any training configuration. Electronic application contains adjusting file and Base of data (interactive files) for the course of any of the exact sciences: algebra, planimetry, stereometry, physics. The author gives experience of application of interactive electronic textbooks in the Russian schools.

*Key-Words*: Electronic textbook, Interactive figure, Freedom of choice of the parameters, 3D figure, 2D figure, The lesson

## 1 Introduction

A large quantity of computer textbooks exists for the application in the field of studying in exact sciences. The following types of textbooks adapt in Russia today:

- arrangement of the paper textbook on the electronic carrier,
- training film (animation), in which the user can select frame, but cannot change its content,
- java applets, which are the separate illustrations of solution of the simplest problems,
- geometric designer for creating the training units. This program imposes excessively high demands on teacher concerning his qualification. This application decreases the possibilities of the independent study of material.

All these electronic applications only to the small degree use possibilities of contemporary computer technologies.

## 2 Need of Creating of Qualitatively New Electronic Textbooks

Possibilities of contemporary electronic textbook significantly exceed the possibilities of printed textbook. Fundamental difference consists in the dynamicity of electronic textbook. Word is chilled in the traditional paper textbook and it is not capable of answering the question of the curious student: "What will be, if we make differently instead of this?" Visual applications, such as the illustrated text of textbook or the cartoon of the electronic application, which enter now into the arsenal of a teacher, are static in the sense that they are similar to the motion picture, which can be stopped and wound, but content of which cannot be governed. It is rigidly assigned by the compiler. The interactive electronic Russian textbook of the future is the training multimedia product, which includes the Base of data (interactive files), the organizing Library, the auxiliary video films, which train in work with the textbook, and the demonstrating examples of real work of the teacher with the product. A teacher can create own unique lessons, beautifully and enthrallingly to present them the students. On interactive pictures the tasks of initial printing textbook, which can be changed hundreds of methods, are preliminary set. Teacher or student sees the same as in the book. The easy motion of hand with the mouse makes possible to obtain thousands of modified tasks.

## 3 Development of Interactive Electronic Textbooks by the aid of Program Interactive Mathematical Art

### 3.1 Technology

Idea of electronic textbook lies in the fact that the themes of paper textbook, the tasks examined in it become the basis, on which the class of one type tasks is created. The best of the existing lines of Russian textbooks, for example, the Algebra of A.G. Mordkovich or the Geometry of I.F. Sharygin become the ideological basis of similar electronic textbooks.

The material bases of electronic textbook are the same technologies, which adapt in the computer games, so loved by contemporary children. Students will use the methods, worked out by them in the computer games, in the process of studying the serious sciences. Programming ensures the work of interactive electronic textbook, it includes: freely extended program Net.Framework 2.0, DirectX 9.0c for 3D figures and the author's program Interactive Mathematical Art (In Ma), created by the firm Deoma. Interactive electronic textbook contains installer and Database in the form of complete set of interactive files. Each file contains one or several interactive figures, associated text and digital information, which in the totality clearly present the selected theme of textbook. A user as needed can derive on the screen of drawing, illustration and the calculations, which parameters can be changed at any moment. The model is created by the developer of computer program for each specific objective. It distinguishes principally this model from the well-known geometric designers, for example, SkechPad or Sinderella. The teacher, who uses a program designer, must itself know how to create construction. He must be the competent user of program, have time for developing the computer construction for each lesson and often have sufficiently high qualification for creating the complex developments. Russian teacher is not the same. However, a Russian teacher is competent mathematician or physicist, who easily can use the created basis of lesson. This basis automatically constructs necessary element, as soon as user presses on the button "answer". Geometry can have by this element, for example, tangent at the assigned point of any configuration, created by the teacher. The course of algebra similarly obtains the fulfillment of the necessary calculation. For example, an equation of the specific type is solved with the arbitrarily assigned by the teacher parameters. When the teacher has elements of the base of data of such training multimedia product, he is concentrated on what to him is necessary for the instruction - on the procedures of the supply of material. The teacher does not create figure, does not solve equation, does not select data for the mathematical model, but uses the finished, easily varied block of information. Basic complexity of the creation of such training multimedia product lies in the fact that the developer of computer program is obligated to be simultaneously mathematician (physicist) and programmer. On the contrary user (student or teacher) can be very inexperienced both in the computer part and in mathematics, since on the screen he has the finished model of mathematical or physical object or phenomenon. It is easy to govern the model by method, familiar on the computer games, with the aid of the controlled interactive points, the scales and panels. System with many managing elements makes possible to create any training configuration, necessary for user. The teacher can change it for the purpose to examine important element, to verify property, to study conversion. The elucidating text is placed on the screen, phonogram is located in a number of developments. Stereometric image can be turned on the screen to examine it from any side and at any angle. The forms and the numbers can be changed within reasonable limits.

### 3.2 The Experience of the Application

Interactive electronic textbook makes possible to convert the dull rote learning of abstract theory into the captivating game with the beautiful living picture. Thinking of young people is uncommon, they are more greatly interested in the possibility to experiment, to check their ideas, than to observe the assigned subject. Therefore large freedom is provided in control of image on the screen. Let us examine an example. The task is known, in which the train stays before the semaphore and than increases speed in order to make up time. We must learn its speed knowing the length of stage and delay time. The analysis of the answer to mathematical model in the textbook is reduced to the rejection of negative answer. In the electronic textbook, where the user can arbitrarily change the parameters of the problem, a number of the completely new questions appear, which usually are not considered in the textbook. For example, the author observed as the flight speed of the flock of geese, equal to 200 km/h, was found on the lesson at a change in the conditions of standard task (version with the flight of geese to the wintering). The jokes of children about the "reactive geese" began immediately. One considered, but they

caught many, and the idea of checking the sense of answer entered into their thinking. Students, who worked with this electronic textbook, no longer can obtain the answer of the task, for example, "three and one-half workers". The electronic textbook, with its possibility of varying of initial data, qualitatively is differed from the paper original. Strong students, who are fascinated by exact science, use interactive figures for the deep understanding of the object. The interactive electronic textbook, may be, is more useful for weak student, it helps to generate interest in the exact science. The inattentive, distracting adolescents use their energy on the lessons with the interactive electronic applications in the game with the controlled points, changing the pictures, sometimes in unexpected foreshortenings. The visual image can be much moved, and the students attempt to break it, sometimes successfully, and in this case celebrate, that here the author of electronic textbook nevertheless undervalued that the student devised. When the study of stereometric section occurs, which is shown in the only form in the book, such students suddenly reveal tens of different pictures. They begin to compete, who will create the more unexpected section. Studying with the aid of such interactive benefits helps students to clarify something in the science, to feel its beauty and depth. Similar interactive mathematics can become the dear science for the weak, on the school measures, students, who understand and memorize formulas with difficulty. The means is important for them, not formula must be protagonist in the studying, but the figure, which they can change. The main means of studying must become the dynamic and correct, living and beautiful figure, in which the trainee will perceive himself with owner. Interactive figures are useful not only with the explanation of new material. For example, finalizing the habits of the construction of the sections of polyhedrons or solution of equations with the aid of the Theorem of Viet simplifies substantially. Assiduous weak student because of the electronic textbook obtains the possibility of repeated solution of close ones in the sense of tasks. He can independently verify each answer, himself create hundreds of tasks, decide and here verify the faithfulness of the answer obtained by it. The latter possibility is convenient also for the teachers, who obtain the generator of uniform tasks and means for the checking of the correctness of their performance, and so for the parents, who are ready to check the successes of their child, but do not know how they themselves to solve problems. However, electronic textbook bears the mass of troubles for the teacher. Usually the teacher has the traditional textbook, which can be solved prior to the beginning of the lesson. Such customary and comfortable situation is shaken, when the students report that it is foolish to prove that, which is erroneous in certain case (enthusiasts to find inadvertence in the geometric assertion always will be found). Another problem exists. Many Russian teachers older than thirty years simply fear to use the computer in their work. Fortunately, this psychological problem can be solved. Already the lessons are conducted in Murmansk, in course of which the teacher, who uses program, does not work with the computer during the lesson. Children (best students) with the interest are prepared for the occupation as the assistant of the teacher and demonstrate material necessary to teacher on the lesson with the aid of the computer. Teacher only commands, what interactive figure mast be shown or what values mast be established on the scales.

## 4 Conclusion

Silence and attention to audience are rapidly changed by the stormy activity of class on the lessons with the application of interactive electronic textbooks. Noticeable extension of knowledge is observed in the majority of students. Students easily master the created electronic textbooks. The parents of students, who are studying in the elite mathematical schools, intensively acquire electronic textbook. The best Russian teachers, for example, the conquerors of the competitions of known in Russia fund "Dynasty", with the enthusiasm inject textbooks in the practice. All this in the totality makes possible to assume that similar electronic textbooks will become the important element of Russian education through several years. The publishing houses, which are specialized in the release of textbooks, such as "Mnemozina", "Drofa" buy for the published by them textbooks the interactive electronic applications created by firm Deoma in accordance with the concept presented. For example, the electronic textbook will be applied to each textbook on the Algebra for 7, 8 and 9 classes of author A. G. Mordkovich for the general education Russian school beginning from 2008.